ENVIRONMENTAL MANAGEMENT PLAN

FOR

SOUTHERN TRANSPORT DEVELOPMENT PROJECT

Updated version- incorporating findings of the Supplementary Environmental assessment carried out in August-September 2006 by University of Moratuwa, findings of Environmental Impact Assessment Report on stage 2- four lane expansion of ADB section-STDP in March 2007 and comments received in May 2007 from Environment and Social Division of RDA

ROAD DEVELOPMENT AUTHORITY
MINISTRY OF HIGHWAYS
SRI LANKA
MAY-2007

FINNROAD
In association with **Surath Wickramasinghe Associates**
(EMP.Updated.June 2007)

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ABBREVIATIONS

ADB	–	Asian Development Bank
AP	–	Affected Person
BDO	–	Business Development Officer
CEA	–	Central Environmental Authority
CRO	–	Community Resettlement Officer
CSC	–	Supervision Consultant (Engineer)
DD	–	Deputy Director
DS	–	Divisional Secretary
EA	–	Executing Agency
EIA	–	Environmental Impact Assessment
EIMO	–	Environmental Impact Monitoring Officer
EMP	–	Environmental Management Plan
EMU	-	Environmental Management Unit of RDA
ESD	-	Environment & Social Division
GN	–	*Gramaseva Niladari*
IOL	–	Inventory Of Losses
ITI	–	Industrial Technology Institute
JBIC	–	Japanese Bank for International Co-operation
km	–	Kilometer
LARC	–	Land Acquisition and Resettlement Committee
LARD	–	Land Acquisition and Resettlement Division
MC	–	Management Consultants
MOH	–	Ministry Of Highways
NBRO	–	National Building Research Organization
NGO	–	Nongovernmental Organizations
PAP	–	Project Affected Person
PD	–	Project Director
PM	–	Project Manager
PMO	–	Project Managers' Office
PMU	–	Project Management Unit
QA	-	Quality Assurance
QC	-	Quality Control
RA	–	Resettlement Assistant
RDA	–	Road Development Authority
RIP	–	Resettlement Implementation Plan
ROW	–	Right of Way
RRP	–	Report and Recommendation of the President (ADB)
RSC	_	Road Safety Component
STDP	–	Southern Transport Development Project
SHC	_	Southern Highway Component
SIMO	–	Social Impact Monitoring Officer

New additions in the EMP are highlighted using different fonts and colours.
Arial- Original version of the EMP
Arial- Italic-(Pink Colour) From Supplementary EIA done by University of Moratuwa
Lucida Console- (Purple Colour) ADB section Stage .2 -4 lane- environmental study
Century-Comments from Environmental & Social Division of RDA (ESD)

I. INTRODUCTION

1. The Asian Development Bank (ADB) has assisted the Government of Sri Lanka, through the Road Development Authority (RDA) in developing improved road connection between Colombo and Matara. The proposed connection is referred to as the Southern Highway Component (SHC) of the Southern Transport Development Program (STDP).

2. The Project is designed as a duel carriageway, access-controlled expressway and implemented in two sections from Kottawa to Kurundugahahetekma and from Kurundugahahetekma to Matara. The first part of the Project will be financed by the Japan Bank for International Co-operation (JBIC) and the latter section by ADB. JBIC has approved a loan of $120 million for the first part of the Project while ADB approved a $90 million loan for the second part[1].

A. Purpose of this Document

3. This Environmental Management Plan (EMP) is based on the environmental impact assessment (EIA) carried out during project preparation in 1999[2]. Subsequent environmental studies such as the Environmental Findings Report prepared by Wilbur Smith Associates Inc. in 2000, the requirements of the letter of conditional approval of the Central Environmental Authority (CEA) as given in Appendix 1, and other project documents such as Loan and Project Agreements—were taken into account in preparing this EMP.

4. This EMP has been developed for the final trace, which is the alignment on which the civil work contracts of the Project are based on. The final trace takes into account revisions suggested by CEA to avoid adverse environmental impacts of road alignments crossing critical wetland areas. Additional environmental and social assessment studies are being undertaken by the University of Moratuwa and the University of Colombo. Finding of those studies was received in September 2006. The study on Environmental Impact Assessment of Expansion of Four Lanes –stage two-Kurundugahahetakma to Godagama, ADB section ,was conducted in September 2006 for following ADB procedures for early improvement to four lanes. Those findings were also incorporated in to the EMP.

5. The purpose of the EMP is to provide a framework to minimize the adverse environmental impacts of the Project in all its phases. It defines the roles of key stakeholders, and reporting and feedback mechanisms. The EMP also provides basis for the systematic collection of data to determine the actual environmental effects of the Project, compliance with regulatory standards, and measures the success of the environmental protection activities identified during the EIA process. This document also provides indicative cost estimates for various mitigation measures and monitoring systems.

6. The draft prepared by the Project's Management Consultants[3] (MC) was reviewed in the light of comments made by the CEA and ADB. The first draft was submitted for CEA and ADB on 1st June 2004 and re-submitted on 16th August and 21st

[1] ADB. 1999. *Report and Recommendation of the President to the Board of Directors on a Proposed Loan to Socialist Democratic Republic of Sri Lanka for the Southern Transport Development Project.* Manila.

[2] An environmental impact assessment carried out by Moratuwa University in 1996 was updated in 1999 during project preparation.

[3] Finnroad in Association with Surath Wickramasinghe Associates

September 2004, and subsequently two revisions were made in September and October 2004. The September submission of EMP fulfills the CEA requirements.

7. ADB requested that the EMP complies fully with ADB's Environmental Assessment Guidelines 2003 (Chapter VI) and the final EMP should be acceptable to ADB. CEA also stressed the need for following their standard format. This Draft EMP is an attempt to meet both requirements. Based on ADB's Environmental Assessment Guidelines 2003, the contents of a complete EMP prepared during implementation should include ten sections: (a) Summary of Potential Impacts, (b) Description of Planned Mitigation Measures, (c) Description of Planned Environmental Monitoring, (d) Description of Planned Public Consultation Process, (e) Description of the Responsibilities and Authorities for Implementation of Mitigation Measures and Monitoring Requirements, (f) Description of Responsibilities for Reporting and Review, (g) Work Plan including staffing chart, proposed schedules of participation by various members of the project team, and activities and inputs of various government agencies, (h) Environmentally Responsible Procurement Plan, (i) Detailed Cost Estimates, and (j) Mechanisms for Feedback and Adjustment.

8. The monitoring program outlines the monitoring objectives, the specific information to be collected by sampling or other means, and the respective management of operations. In consideration of recommendations given as mitigation measures for potential environmental impacts indicated in the EIA report, as well as recommendations from the RDA field staff—the preparation of parameters to be monitored continuously during project implementation with participation from RDA project staff is incorporated in the EMP. MC used Sri Lankan standards, in the absence of which, the MC suggests ADB recommended standards such as the World Bank's Pollution Prevention and Abatement Handbook and World Health Organization standards.

B. Management Structure

9. The Ministry of Highways / Road Development Authority (RDA) is the EA for the southern highway component of the Project. [Ministry of Transport (MOT) is the Executing Agency (EA) for the Road Safety Component (RSC) of the Project]. RDA is responsible for the national road development of the country. The management structure for the Project is described in the Figures 1 and 2. These figures describe the different authorities and their roles, and the operational framework. The Project Director (PD) will be responsible for the implementation of the Project and will directly report to the Secretary of MoH. There are three Deputy Project Directors (DPD) for the Project: two responsible for the construction and civil works and another responsible for land acquisition, resettlement and environmental aspects of the Project. The Supervision Consultants (SC) are responsible for the supervision of construction activities of the highway. They are stationed in field offices in Baddegama and Bandaragama.Halcrow Group Ltd. was the SC and now Roughton International for the ADB section and PCI for the JBIC section of the Project. Finnroad in association with Surath Wickramasinghe Ltd is the MC for the project. There are two site project offices; one for the JBIC financed section and another for the ADB financed section. They are established at Kalutara and Galle, respectively. Separate Project Managers (PM) are heading these offices.

10. There is a separate consultancy group called Centre for Poverty Analysis (CEPA) responsible for external monitoring of environmental and social impacts of the Project. They would be directly reporting to ADB and PD. The consultants will have field level officers who are undertaking monitoring activities on a continuous basis. For the Southern Highway Component (SHC) the Government has established a Project Coordination Committee (PCC) and the PCC coordinates the ADB and JBIC financed components of the SHC, in particular land acquisition and resettlement, adverse environmental impact mitigation, technical standards scheduling etc. The chairperson of the PCC is the Secretary (MoH) and other permanent members include representatives from External Resources Department (ERD) of the Ministry of Finance and Planning, Ministry of Transport, RDA, National Planning Department, JBIC, ADB, CEA, MC, Road safety consultants and SC. MC acts as the Secretary of the PCC.

Management Group (MG) is coordinating the practical implementation activities of STDP in MoH. The Secretary (MoH) is the Chairman of the MG. Other permanent members include Chairman (RDA), GM (RDA) and PD(PMU) . MC acts as a Secretary of MG.

Environmental and Social Division (ESD) was established in Land Division of RDA in the middle of 2006 with a main objective of provision of necessary guidance and social and environmental inputs to projects are implemented by RDA.

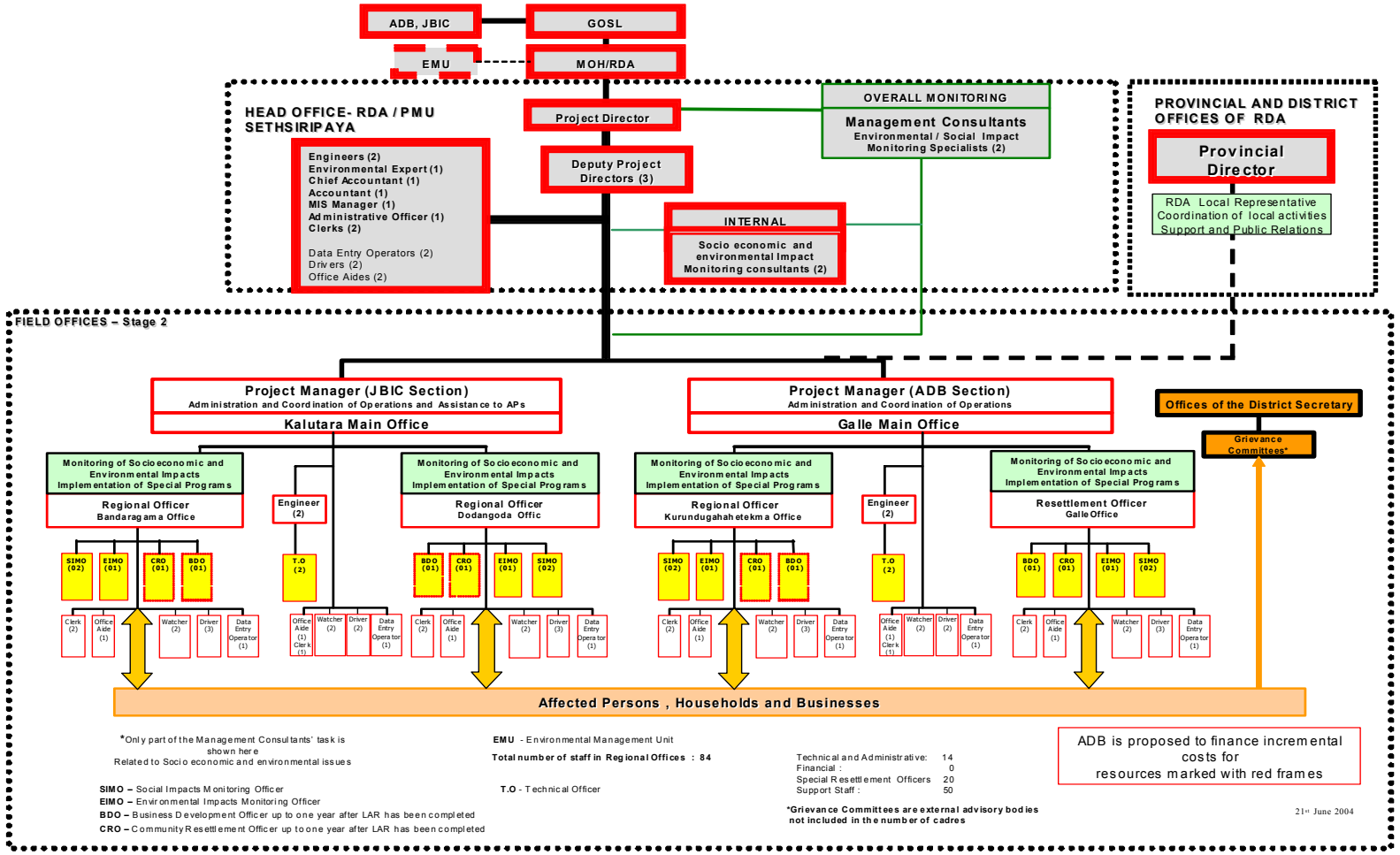

Figure 1: STDP/PMU Organization

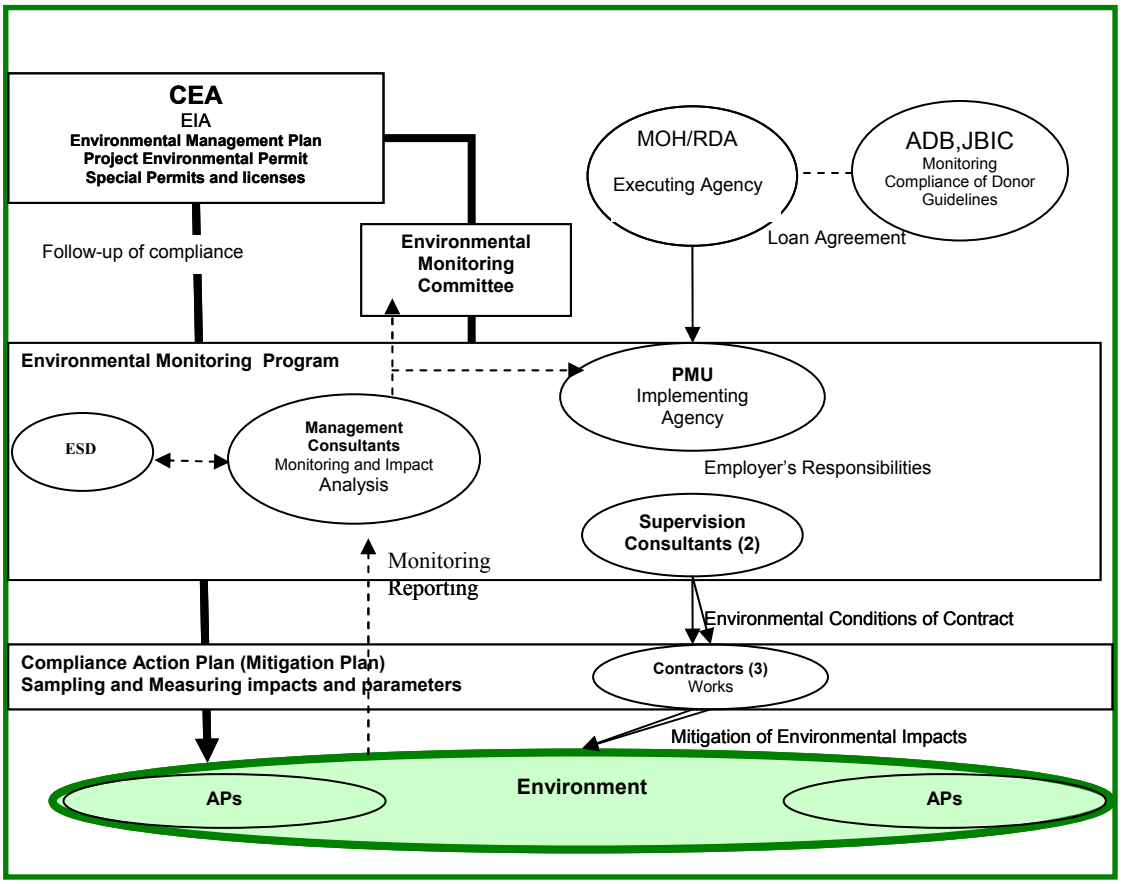

Figure 2: Environmental Management

11. For the purpose of implementing the Environmental Management Plan, an Environmental Monitoring Committee (EMC) has been set up under the CEA. The EMC comprises representatives from RDA, project management unit (PMU), representatives of Divisional Secretaries of 16 DS offices, and representatives from other relevant Govt. Agencies. EMC will have meetings with affected persons (AP) or their representatives. The implementation of mitigation measures arising from the Environmental Assessment, and as outlined in the section below, will be the responsibility of the PMU, project consultants, and contractors. The independent monitoring team will monitor the implementation of the EMP and will report to the EMC through the CEA. Figure 2 outlines the process and the reporting mechanism.

12. At the operational stage: air quality, water quality, noise level, road accidents, garbage disposal, transportation of dangerous chemicals, and landslides and soil erosion will be monitored. Base line data collected before construction on above environmental concerns are monitored during construction and the same will be continued during operation. Either the same EMC or separate EMC will be established for monitoring work during the operations stage. The cost will be borne by the implementation agencies and companies. This EMP shall form an integral part of the contracts for the services, operational and maintenance activities of the SHC.

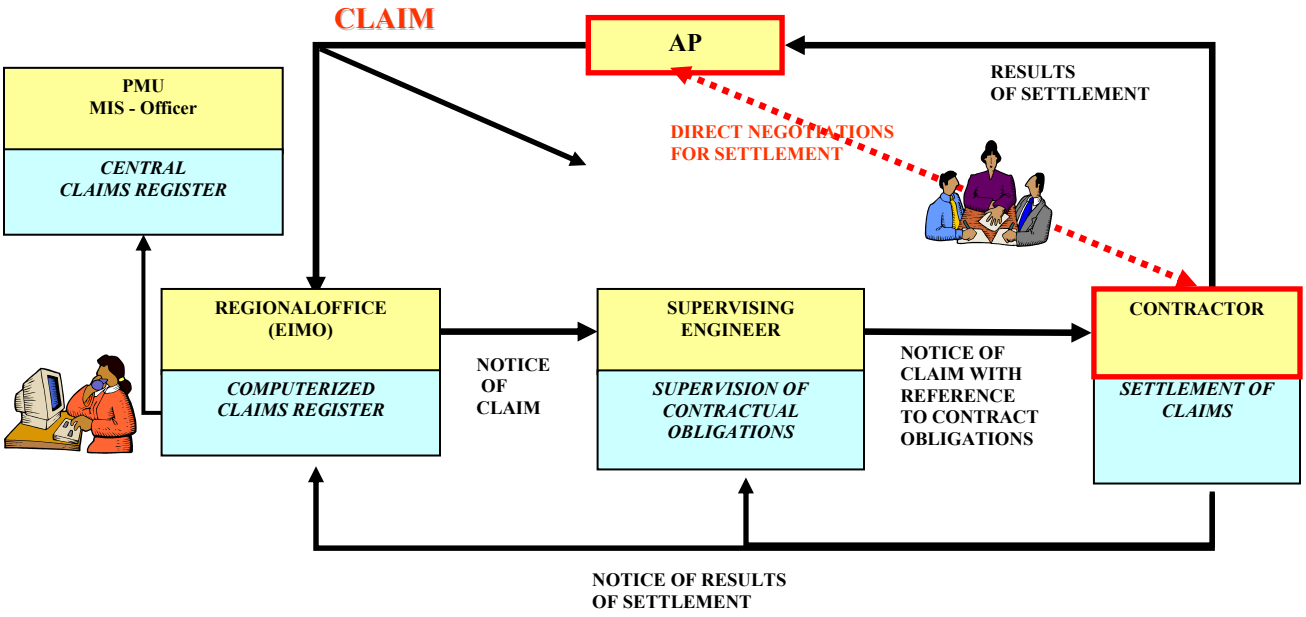

Figure 3: Claims Management

13. Figure 3 illustrates arrangements for submission and processing of claims by APs during implementation. During operational phase, the civil works contractor and the supervision consultants will be replaced by a maintenance contractor and a corresponding supervisory body. Management consultant will be available only for an initial period of maintenance and operations. RDA is responsible for all environmental claims arising from regular expressway operations. There will be some long-term environmental impacts due to the Project location requiring long-term solutions to such problems. Monitoring and mitigation of these impacts is the responsibility of RDA. Therefore, it is important to document all claims by APs from the beginning of the works, and continue this process for some period of operations and maintenance to avoid any confusion regarding the responsibility for adverse environmental impacts and duplication of claims.

C. Environmental Role of the Management Consultants

14. Monitoring environmental impacts due to the commencement of highway construction on behalf of RDA is one of the main responsibilities of the MC. They will also be responsible for developing an appropriate monitoring mechanism for operational phase of the Project. Another important responsibility of the MC is to assist the RDA, to comply EMP requirements, in establishing and implementing a proper internal monitoring system to assess potential adverse environmental impacts due to construction work. This will be carried out through the Environmental Impact Monitoring Officers (EIMO) in each of the two RDA/STDP Regional Offices including other field offices near the construction site.

II. SUMMARY OF POTENTIAL IMPACTS

15. The following section summarizes the most important potential environmental and social impacts of the Project as identified by the environmental assessment studies such as the EIA and the 'Environmental Findings Report' of 2000. Tables 1 and 2 provide summaries for anticipated impacts during construction and operation. Details of mitigation measures are given in Appendix 2.

Table 1: Anticipated Environmental Impacts during Construction

Pre construction impacts	**Direct/ Indirect**	**Primary/ Secondary**	**Temporary/ Cumulative**	**Reversible/ Irreversible**	**Short-Term/ Long-Term**	**Mitigation Priority – Comments**
A. Social Impacts **Property acquisition and relocation**	**Direct**	**Primary**	**Temporary**	**Reversible**	**Short term**	**High**
Disturbances to livelihoods	**Direct**	**Primary**	**Temporary**	**Reversible**	**Short term**	**High**
Social marginalization	**Indirect**	**Secondary**	**Temporary**	**Reversible**	**Short term**	**High**
Impacts During Construction						
B. Hydrology Upstream Flooding and Drainage Congestion*, impacts on upstream, down stream & surface drainage pattern and continuity.*	Direct	Primary	Cumulative	Reversible	Long-Term	High
Impact on wetlands at Weras Ganga / Bolgoda Lake, Koggala, and Madu Ganga	Direct and Indirect	Primary	Part temporary and part cumulative	Partially Reversible	Long-Term	High – final trace rerouted to avoid direct impact
Soil erosion, water pollution, and impacts on groundwater caused by construction of bridges and earthworks	Direct	Primary	Part temporary and part cumulative	Partially Reversible	Partially Long-Term	Medium
Impacts on irrigation schemes i.e. paddy areas, channel network & irrigation structures.	*Direct*	*Primary*	*Part temporary and part cumulative*	*Partially Reversible*	*Partially Long-Term*	*High,Re-lay the channels,construct new structures etc.*
Impacts on ground water level variation at cut and fill areas	*Direct*	*Primary*	*Cumulative*	*Irreversible*	*Log-term*	*High*
B. Construction Material Management Soil erosion and water pollution from borrow pits and disposal sites	Direct	Primary	Temporary	Partially Reversible	Short-Term	Medium – CEA has defined restrictions on quarry sites
Soil erosion and dust emissions from heavy equipment, access roads, and other temporary utilities	Direct	Secondary	Temporary	Partially Reversible	Short-Term	Medium
C. Asphalt and Concrete Plant Operation Emissions from process equipment	Direct	Secondary	Temporary	Partially Reversible	Short-Term	Medium
Wastewaters and solid waste disposal	*Direct*	*Primary and secondary*	*Temporary*	*Partially Reversible*	*Short-Term*	*Medium*
D. Spoils Disposal Water and soil pollution from uncontrolled disposal .*Impediments to drainage paths and ground water re-charge*	Direct	Primary	Temporary	Partially Reversible	Short-Term	Medium
Acidification and hardness problems to surface & ground water quality due to disposal of peat.	*Direct*	*Primary*	*Temporary*	*Partially Reversible*	*Short term and partially long-term*	*Medium*

E.Ground water quality Pollution due to heavy construction equipment, blasting and excavation.	*Direct*	*Primary*	*Temporary*	*Partially Reversible*	*Long-term*	*Medium*
F. Air Quality and Noise Emissions from heavy construction equipment, blasting and excavation	Direct	Primary	Temporary	Partially Reversible	Short-Term	Medium
Asphalt and concrete plants	*Direct*	*Primary*	*Temporary*	*Partially Reversible*	*Short-Term*	*Medium*
G. Sociological Aspects Land Acquisition & Relocation/Resettlement	Direct	Primary	Temporary	Irreversible	Long-Term	High
H. Aesthetic Aspects	Indirect	Secondary	Temporary	Reversible	Long-term	Low
I. Road Safety	Direct	Primary	Temporary	Reversible	Long-term	Medium
J. Archeological, religious and Cultural Sites	Indirect	Secondary	Cumulative	Reversible	Long-term	Low
K. OTHER IMPACTS Noise & vibration from construction sites and access roads	Direct	Secondary	Temporary	Reversible	Short-Term	Medium
Vegetation loss owing to permanent/temporary facilities	Direct	Primary	temporary, cumulative	Reversible	Long-Term	Low
Loss of habitat of sensitive flora and fauna	Indirect	Secondary	Cumulative	Reversible	Long-term	Low – route avoids sensitive ecosystems
Wastewater and garbage from construction sites & camps	Direct	Secondary	Temporary	Reversible	Short-Term	Low – included in contractor specifications
Cracks and Damages to properties from blasting operations	*Direct*	*Primary*	*Cumulative*	*Irreversible*	*Short-term*	*High*

Table 2: Anticipated Environmental Impacts during Operations

IMPACTS DURING OPERATIONS	Direct/ Indirect	Primary/ Secondary	Temporary/ Cumulative	Reversible/ Irreversible	Short-Term/ Long-Term	Mitigation Priority
A. Hydrology Permanent alteration of drainage patterns. *Aggravated flooding*	Direct	Primary	Cumulative	Reversible	Long-Term	High
B. Construction Material Management Continued excavation and earth moving for maintenance	Direct	Primary	Temporary	Partially Reversible	Short-Term	Medium
C. Asphalt, Crushing and Concrete Plant Operations Continued operations and maintenance	Direct	Secondary	Temporary	Partially Reversible	Short-Term	Medium
D. Spoils Disposal Disposal of maintenance wastes	Direct	Primary	Temporary	Partially Reversible	Short-Term	Medium
E.Surface Water quality Deterioration Surface water quality deterioration due to urban run-off and development of secondary activities such as industries and commercial	*Direct*	*Primary*	*Cumulative*	*Partially Reversible*	*Long-term*	*Medium*

enterprises along the road traces						
F.Ground water pollution Ground water quality deterioration due to development of secondary activities such as industries and commercial enterprises along the road traces	*Direct*	*Primary*	*Cumulative*	*Partially Reversible*	*Long-term*	*Medium*
G. Air Quality and Noise Air pollutants and noise emissions from vehicles	Direct	Primary	Cumulative	Partly Reversible	Long-Term	Medium
H. Sociological Aspects Land Acquisition & Relocation/Resettlement,*Flooding,water loging,soil deposition & disturbance to paddy areas & resulting social inconvenience & protests etc.*	*Direct*	*Primary*	*Temporary*	*Irreversible*	*Long-Term*	*High*
I. Aesthetic Aspects	Indirect	Secondary	Temporary	Reversible	Long-term	Low
J. Road Safety	Direct	Primary	Temporary	Reversible	Long-term	Medium
K. Archeological, religious and Cultural Sites	Indirect	Secondary	Cumulative	Reversible	Long-term	Low
L. OTHER IMPACTS Soil erosion and water pollution from embankment/cut slopes	Direct	Secondary	Temporary	Reversible	Short-Term	Low – storm water retention basins
Surface water quality deterioration due to improper garbage disposal by road users	*Direct*	*Primary*	*Cumulative*	*Reversible*	*Long-term*	*Medium*
Solid waste and wastewater from fuel and rest stations, and maintenance and operational depots	Direct	Secondary	Cumulative	Reversible	Long-Term	Low
M. Hazardous Materials Transportation Spills and/or vapor emissions during careless transport practices or accidents	*Direct*	*Primary and secondary*	*Temporery, Cumulative*	*Reversible and partly irreversible*	*Long-term*	*Medium*

This summary of general impacts prepared incorporating impacts in 3 stages such as preconstruction, construction and operational, describe in EIA,SEIA and Environmental Findings Report of STDP.

A. Physical Environment

1. Hydrology and Drainage

(i) Construction activities such as material exploitation, reclamation of lands and improper disposal of spoil materials clearing activities, paving of the surfaces and envisaged development activities, levelling of hillocks, borrow operations cause to change the surface water flow patterns to streams and impact will be local flooding during rains and changes of moisture content of the soil.

(ii) In cases where the road spans across narrow valleys, the filling for construction would cause significant flooding.

(iii) Where the project trace is located on low flood plains of the major rivers due to blockages of stream floor at major rivers during rains, the flood situation will be altered.

(iv) Unconnected culvert crossing to lead away drains would cause flooding water congestion upstream and related impacts on ground water. More detailed possible impacts are described in the Hydrology Report.

(v) Undersized temporary culvert crossings in the service road would cause flooding and water stagnation.

(vi) Ground water level can change in cut and fill areas.

(vii) Ground water and surface water in downstream waterways and related area will deplete if combining of upstream drains are done especially in small catchments.

2. Drainage

(i) The proposed traces were considered on a control point basis to identify the impacts on flooding and drainage in relation to the surface water and ground water quantity. *Unless adequate surface drainage flow passage across the road embankment is provided the lands will have water logging and also salinity impacts.* It will be necessary to provide drainage or irrigation structures on retention areas, which are clearly identifiable as paddy or marsh on the 1:50,000 topo maps and with relevant updates on the information in those maps.

(ii) Irrigation scheme segmentation and disturbances to supply and drainage channel would cause drainage impacts.

(iii) Drainage pattern changes and embankment construction would create impacts on surface and ground water.

3. Water Quality:

Surface water quality

(i) Adverse construction impacts could result mainly from unsystematic construction practices. Pooling of water, blocking of waterways, restrictions to surface run-off and flood water flows are adverse effects brought by unplanned stock piling and disposal of spoil, unstable excavations and careless camp siting. Changes in water quality and water levels from such practices could affect flows in to or out of existing water bodies.

(ii) Application of weedisides and pesticides rich in heavy metals,organo-chlorides or organophosphates for landscaping and surface cover clearing

purposes could result in surface water pollution with subsequent long-term toxic effects on biota.

(iii) Significant oil spills from construction machinery and vehicles may lead to contamination especially during rainy days as run-off carries oil rich water.

(iv) Disposal of wash waters from machinery used in concrete and asphalt plants could lead to visual pollution in terms of colour and turbidity and contamination with oily materiel and heavy metals such as Pb.

Ground water quality

(i) Application of pesticides rich in heavy metals, organo-chlorides or Organophosphates for landscaping and surface cover clearing purposes could also cause groundwater contamination due to percolation through soil material having higher hydraulic conductivities, especially in areas having a significant amount of sandy material.

(ii) Construction of bridges and culverts could result in groundwater contamination Deep excavations and cuts done below the mean sea level and deforestation And vegetation clearing activities could lead to substantial salinization with subsequent adverse effects on well water used for drinking and agricultural purposes.

(iii) Piling of cleared vegetation without any removal and/or replanting could also lead to groundwater contamination with organics and nutrients as a consequence of anaerobic degradation by microbes.

(iv) Unsystematic disposal of excavated peat materiel may also lead to acidification and hardness problems during rains periods when the acidity of the peat material gets leached out, thereby resulting in dissolution of certain minerals such as gypsum, calcite, dolomite, etc.

4. Air Quality, Noise, and Vibration

(i) Vehicles travelling on unpaved roads generate dust. Operating vehicles at high speed under dry weather conditions can increase such pollution.

(ii) Improper handling and transferring of materials can also potentially generate dust. Improper storage of materials can potentially generate dust if not properly covered. Cut and fill operations, asphalt and concrete materials, use of pesticides can also pollute air condition.

(iii) Use of construction equipment connected with the extraction, handling and transportation of material can cause increased noise levels. Rock blasting produces very high noise and vibration levels that may have adverse effects on any nearby communities.

(iv) Regular and proper maintenance of construction vehicles and machinery to avoid smoke emissions.

(v) Care should be taken to select resettlement sites close to the ROW which no effects from dust, noise and vibrations.

5. Erosion and Siltation

(i) Considering the type of soils and the rainfall in the region, the soil loss estimates would range from 190-4000 tons/ha/yr for slopes ranging between 1.5%-6%. The soil loss rates are high due to the high rainfall experienced in the project area and the values quoted are for soil surfaces with Red Yellow Podsols, stripped of vegetation.

(ii) The soil loss will increase when clearing, cut and fill operations are ongoing during construction.

(iii) Creation of high slopes with slope angles ranging from 30° to 75°, created due to construction of the highway and extraction of construction materiel, will increase the erosion.

(iv) Where the project is located on low-lying paddy lands the siltation of paddy lands from eroded soils would take place. Haphazardly laid soil dumps would cause eroded materials to deposit in the paddy fields affecting paddy cultivation

(v) Construction of bridges and culverts would cause a retarding action of flow at close vicinity of the road trace. This will cause additional siltation during construction.

(vi) Moving earth or removing vegetative cover will create erosion in the high lands and siltation in the low lands.

(vii) There is a risk of siltation in the coastal area, which decreases the attraction value for tourism.

(viii) Soil dumps on drainage paths & retention areas would aggravate flooding & cause problems to groundwater recharge.

6. Earth Stability

(i) Material exploitation as borrow would cause embankments with undesired slopes to collapse becoming unstable with rainfall. The roadside embankments also would create similar impacts on earth stability due to the same reason.

(ii) Slopes, that were designed using the material properties and the subsurface condition obtained from the site investigation, may become unstable due to the unforeseen changes of the actual subsurface conditions.

(iii) Slopes that are stable under present conditions might become unstable due to subsequent loading at the top of the slope.

(iv) Impounding of water at the top of the slope might introduce additional seepage forces causing instability of the slope.

7. Irrigation and Flood Protection Schemes

(i) The material extraction for construction would cause those lands to become uncultivable and this would create a significant adverse impact.

(ii) Road excavations and filling of embankments would create obstructions to the flow of irrigation water and the safe passage of drainage water.

(iii) The movement of machinery and labor required for agricultural work would be hampered if the farms are divided by the road trace.

(iv) The altered drainage patterns due to the crossing of the flood protection schemes by the new road create a significant imbalance in the draining of the waters trapped by the road embankment and due to escaping of undesired floodwaters in to the protected regions.

(v) Reclamation of lands for the project and the dumping of the disposed materials from the project on irrigated lands would cause rise of water level

either surface or ground water in irrigated lands in the near vicinity, causing adverse affects in irrigation and flood protection schemes.

(vi) The irrigation and drainage canals and operation and maintenance roads constructed for such canals crossing the road traces would be affected by the separation created by the highway. If irrigation water movement is hampered then the productivity of the scheme would be adversely affected and obstruction to drainage water would lead to higher salinity.

(vii) Inadequate coordination between RDA project staff and District Irrigation Engineer regarding Irrigation Schemes would cause operational difficulties.

8. Spoil Disposal

(i) Improper disposal of material can potentially cause obstruction to natural drainage ways creating local flooding.

(ii) Dumping unsuitable materials affects surrounding environment including disturbances of irrigation systems and crops.

(iii) Un-planned disposal of waste such as organic soil can pollute the ground water. Also it causes breeding mosquitoes.

(iv) Unsystematic disposal of excavated peat material near water bodies may lead to acidification and even hardness problems during rainy periods.

(v) Spoil disposal in recharge area or disposals blocking recharge forces hamper ground water recharge sources.

(vi) Visual segregation is also an impact due to improper disposal practices.

9. *Exploitation and storage of construction material*

(i) Unplanned exploitation of construction material from borrow areas could result in poor quality construction material and environmental problems such as collection and stagnation of rain water in the excavation.

(ii) Storage of construction material on sloping grounds could increase erosion and silting the low-line areas.

(iii) When excavated material within the trace is used as fill material, and if proper planning and management of cut and fill operations is not followed, large amount of material need to be kept in temporary storage thereby causing environmental issues such as: erosion, silting, landslides etc.

(iv) Unsafe and unhygienic conditions of those locations case to people adjoining to have bad impacts. Also causes to visual segregation conditions.

10. Settlement and ground subsidence

(i) The targeted soft ground improvement techniques such as replacement and pre-loading might result in long term settlement of the roadway due to variability of the subsurface conditions and the poor quality control during construction stage. These situations cause to delay construction activities as scheduled. Such effects during operation may be more worst and highway maintenance time will be high.

11. Biological Environment

(i) Some areas of scrubland will be affected. Amount to be confirmed by the additional environmental study.

(ii) Marshlands of the project area form a part of the abundant paddy field eco-system. Some areas of this habitat will be affected. Amount to be confirmed by the additional environmental study.

(iii) The fauna living in rivers and streams will be affected during the construction and operation phases. Turbidity may be caused due to sand and silt being stripped up when constructing bridges across rivers and streams; accidental spilling of oil from machinery and construction materials such as cement and asphalt may temporarily pollute the water and cause harm to aquatic life. Rain water flowing along highway and interchange areas may mix with water sources during operation of highway.

(iv) There are several amphibians, reptiles and small mammals living along the trace whose small populations will get divided by the Expressway embankment, which will endanger their survival.

B. Social Impacts

1. Social Structure

(i) Significant resettlement impacts are expected. Displacement may result in the loss of social acceptance/recognition gained by various means and loss of social status.

(ii) Social structure of the remaining community after relocation or in the area will not be adversely affected.

(iii) Adverse impacts for joyful lives with entertainment within social relationships during the past on certain communities living on the path of the Highway. Some of the communities are organized as caste groups, political groups, migrant groups, traditional settlers, relatives of a single lineage etc.

2. Population, Migration, and Settlement

(i) During resettlement some problems for APs may occur due to host communities and insufficiency of common amenities**.**

(ii)During the operational stage of the project, settlements of migrants may be created particularly in areas around the proposed interchanges.

3. Education

(i) Because of the re-location children of some displaced families will have to find alternative schools.

(ii) Positive impacts will be more facilities for education in existing schools especially close to intersections.

(iii) Environment of close to some schools may be affected due to construction impacts such as noise, dust road traffics etc.

4. Accessibility and Mobility for day to day Activities

(i) Travel distance and time between Colombo to Matara will be reduced.

(ii) Land acquisition for the Highway will cause problems of access for the residents where their agricultural lands and places of employment are concerned.

(iii) The distance of travel will increase because of the destruction of footpaths and minor roads.

(iv) Severance of existing transports routes, which cross the Highway, will generate traffic during the construction stage.

5. Accessibility and Mobility for Special Services

(i) Special services under common amenities will be less for the resettled people.

(ii) Easy access for places which fulfill APs day to day requirements will be disturbed temporally.

6. Public Health and Safety

(i) Transportation of materials and waste disposal will affect the health and safety of residents in the area.

(ii) Dust emissions and noise case to have health problems to people including children and pregnant mothers.

(iii) Potential breeding grounds for mosquitoes due to borrow site operations.

(iv) Road accidents and accidents due to transport of hazardous materials during the operational stage.

(v) Improper site identification for relocation and inadequacy/lack of water and sanitation as such sites.

7. Housing

(i) Demolishing of houses and other structures will be the most significant impact on the social aspect in the lives of residents in the project area. The sentimental value of such a house is at times higher than that of its real market value. Losing such a property therefore will be an economic as well as a social loss for these families.

(ii) The potential damages to the remaining houses during construction are also high. It is possible that such damages will occur during the construction stage when blasting, compaction vibrations, cutting and filling.

8. Infrastructure Facilities

(i) Facilities such as vehicular transport systems, electricity and telecommunication facilities are available in the project area. There will be temporally disturbances to use electricity, telegraph posts since they may be damaged when clearing the site, cutting, filling, and reclaiming land.

(ii) Water supply schemes will be disturbed.

(iii) It is expected that planned and unplanned/informal economic activities will be started in the project area during its operational stage, hence improved infrastructure facilities are to be expected.

9. Transport Facilities

(i) Severance of transport routes due to cutting and filling, construction of bridges and culverts will affect the goods and passenger transport services during the construction period. Delays in getting to schools, offices, medical centers, and work places will be the probable impacts of severance of transport links.

(ii) During the operation of the project in these delays will not be there.

10. Lifestyle

(i) Since the cultivable land is the main source of income and employment for a majority of people in the area, loss of land will result in loss of livelihood for most of the people, which will be a significant negative impact. In addition, there may be uncontrolled development of goods and services in newly

developed urban centers which will not be affordable to the people economically and culturally.

(ii) The positive impacts of life style will be; the reduction of travel time , accessibility to better infrastructure facilities and services , potential diversification of existing employment patterns (e.g. agricultural to non-agricultural activities) and avenues for alternative source of income.

11. Socio-Economic Aspects

(i) Employment: Direct negative and positive impacts can be expected
(ii) Agricultural productivity along the road trace: Direct negative impacts Induced secondary benefits
(iii) Tourism development: Induced secondary benefits. Negative impact as well ; Drugs, Prostitution, illegal businesses etc.
(iv) Structures along the road trace: Direct negative impacts
(v) Business volumes and tax: Induced secondary benefits
(vi) Property values in the project area: Induced secondary benefits
(vii) Illegal businesses as a negative impact due to the work force's demand during construction and surrounding areas of interchanges during operation stage.

12. Aesthetic Aspects

(i) During construction activities the following impacts are anticipated i.e. damage to vegetation, damage to top soil, erosion of sites due to excavation, dust, excessive noise levels, vibrations, hindrance to proper drainage.

(ii) During operational activities the following activities could be anticipated i.e. encroachment on historic/cultural monuments if fails Govt enforce UDA law properly , excessive noise levels, circulation to sites, pedestrian and vehicular, visual intrusion by structures and billboards that may come up by the roadside, disturbance to landscape character / quality of site

(iii) Road side lighting and vehicle head lights within rural environment will change the past conditions

(iv) Introduced soft Landscape and texture of hard Landscape paving

13. Places of Worship and Religious Interest

(i) The anticipated environmental impacts on the places of worship and religious interest would be; dust, excessive noise levels and vibration during construction period, excessive noise levels during the operation stage, changes in quality and required conditions of the religious environment.

(ii) *The long term anticipated environmental impacts can be formed due to rapid development of the rural town centers such as, Baddegama, Kurundugahahethekma, and Malapalla near Kottawa*.

III. DESCRIPTION OF PLANNED MITIGATION MEASURES

16. An Environmental Management Plan has been provided containing environmental impacts and planned mitigation measures in the various phases of the Project (Table 3). Appendix 2 provides details including: (i) proposed timing for implementing mitigation measures, (ii) proposed specific location for implementing mitigation measures, (iii) proposed party to implement mitigation measures, (iv) proposed party to monitor mitigation measures.

The amounts of total costs for relevant sections have been calculated in consideration with both ADB and JBIC sections.

17. The mitigation measures shall also take into account the expected changes and transitional arrangements in the legislation and Government standards and regulations. At least the following changes are anticipated during 2005;

- New Highway Act including the concept of “expressway” and “restricted access highway”. The Act is expected to have regulations concerning building limits adjacent to the RoW, environmental damages (littering, garbage), limitations of planting trees and vandalism.
- Motor Traffic Act is expected to also include the concept of “expressway” and “restricted access highway” and related new regulations especially geared towards increased traffic safety
- Revised Environmental Standards on air quality, water quality, soil & groundwater, noise and vibration control
- Three km corridor will be established under the UDA planning regulations to control the development of land use along the SHC. Zoning plans will be established for all Interchange areas to avoid ad-hoc development.

Table 3: Description of Planned Mitigation Measures

Environmental Concern	Objectives	Mitigation Measures [Completed and To Be Implemented]	Cost estimates
PRE-CONSTRUCTION STAGE			
1. Social Impacts: **Impacts and mitigatiory measures are described in the Resettlement Implementation Plan since it is not described in detailed.** (Compensation payments for land/property acquisition and expenditure on resettlement are included as the Estimated costs for Social Impacts.)	To ensure that the adverse impacts due to the property acquisition and resettlement are mitigated according to the RP.	COMPLETED: 1. Inventory of Losses (IOLs) for each PAP prepared. 2.Resettlement Implementation plan was prepared 3. Public consultations on the compensation package conducted. 4. All the impacts identified by the EIA were incorporated in to the RP and relevant entitlements included in to the Entitlement Matrix. UNDER IMPLEMENTATION 1. **Social Impacts** To ensure that the adverse impacts due to the property acquisition and resettlement are mitigated according to the RIP. Social Preparation basically completed. Impacts are ***NOT LIKELY UNLESS THERE ARE UNFORSEEN CIRCUMSTANCES.*** If unforeseen additional land will be required for Stage 2, the following mitigation measures should be adopted: 2. Acquisition of lands activities started and expedited in order to minimize the uncertainty of people. 3. Started to implement RP and held LARCs to provide compensation and assistance to the PAPs. 4. When acquiring residential land and houses, alternative land is given together with sufficient compensation to enable families to build and move into new houses. If such re-location land is not available, land acquired near the interchanges for development is offered to the displaced people. 5. All the payments/entitlements are paid according to the Entitlement Matrix, which was prepared according to the RP.	Please refer cost table in section IX of this document
2. Hydrological Impacts	Minimize Upstream Flooding and Drainage Congestion Minimize impacts on downstream wetlands.	COMPLETED 1. Preparation of Drainage and hydrology report as recommended by CEA completed and designs consultants have incorporated them in to relevant designs. 2. All hydraulic structures such as bridges, culverts and other drainage structures were designed in accordance with 100-year, 50-year, and 25-year flood conditions 3. Best engineering practices applied to avoid diversion of water between rivers and streams, and avoid disturbance of paddy and wetlands (adequate permeability of road base and appropriate drainage structures) 4. Final trace modified to avoid major wetlands (Weras Ganga / Bolgoda lake, Koggala, and Madu Ganga) 5. Bridges and drainage structures over various water bodies in the river basins of the Gin Ganga , Polwatu Ganga, Nilwala Ganga,Kalu Ganga,Benthara Ganga, Welpenna Ganga and Koggala lake have been designed to maintain pre-project flows. TO BE IMPLEMENTED 1. Final design QA/QC to ensure that drainage specifications are met	Please refer cost table in section IX of this document

		2. *All unconnected culvert crossings should be properly connected to the lead away drains to establish drainage continuity and ease flooding.* 3. *Soil dumping should not disturb the existing drainage paths & retention areas.* 4. *Complaints from stakeholders about flooding and drainage congestion should be handled by a committee comprising all relevant line agencies.(DS,GS,Pradeseeya Saba, District Irrigation Engineer, Agrarian services etc)* 5. *Liaise with the Irrigation Department and obtain approvals for the construction of Bridges across major waterways and other irrigation structures.* 6. *Liaise with Provincial Irrigation Engineer and Department of Agrarian Services to resolve issues regarding minor irrigation schemes.* 7. *Drainage structure designs to be critically evaluated and critical culverts (e.g.Galle Port access road culvert on Lunuwila Ela) to be enlarged to cater to high return periods and inundation aspects* 8. *Monitoring and recordings of rains and water levels at critical water ways and at each drainage structure of project* 9. *Proper measurements of pipe culverts with number required, location vise for the service road to be taken in comparing with seasonal rains levels.* 10. *To study earth stability at cut slopes and high embankments locations in comparing with surface water flow and drainage systems to avoid land slides.*	
3. Erosion Control (EC) and Temporary Drainage(TD)	To improve mitigation in Stage 2 and comply with CEA conditions. To include preliminary designs for EC and TD in stage 2 Contract.	1. Identify locations for EC and TD along all embankments to be expanded and at all culverts and cross tunnels/metal structures. 2. In contracts/variation order for 4 lane construction specify locations for EC and TD based on Stage 1 experience and complaints and include in contract as a payment milestone(s)	Please refer cost table in section IX of this document
4. Noise Barriers	To ensure noise impacts are acceptable in operational phase.	1. Conduct detailed acoustic assessment for all residential, school, temples, (other sensitive structures) within 50m of road. Base on best estimate of traffic for 4 lane road in 2025. 2. If noise at sensitive receiver exceeds CEA criterion [E.G.LEQ 67 DB (A)] design and include in stage 2 construction acoustic measures to control noise at source, EG. Earth berm/ solid barrier t attenuate noise to below CEA criterion.	Please refer cost table in section IX of this document
5. Exploitation handling, transportation and storage of construction materials.	To minimize contamination of the surroundings due to implementation of works,	In order to minimize and or avoid adverse environmental impacts arising out of construction material exploitation, handling, transportation and storage measures to be taken shall be in consideration of the following EIA/CEA conditions/recommendations; - Conditions that apply for selecting sites for material exploitation - Conditions that apply to timing and use of roads for material transport	Please refer cost table in section IX of this document

	asphalt, concrete and aggregates crushing plants.	- Conditions that apply for maintenance of vehicles used in material transport or construction - Conditions that apply for selection of sites for material storage - Conditions that apply for rock blasting and aggregate production - Conditions that apply for handling hazardous or dangerous materials such as oil, explosives and toxic chemicals. - Compile materiel management plan monthly and include in progress report.	
6.Spoil Disposal	To ensure adequate disposal options for unsuitable soils.	Identify sufficient locations for disposal of 1,000,000m3 spoil (or best estimate) In contracts/variation order for 4 lane construction, specify locations for disposal at unit rates for re-measurement. Designate disposal sites in the contract and cost unit disposal rates according to distance.	Please refer cost table in section IX of this document
7. Impacts on Road Trace Design	To ensure that the recommendations given with the conditional approval by the CEA were successfully followed by the Design consultants.	COMPLETED. 1. The proposed final trace has been designed to avoid Koggala, Madu Ganga and Bolgoda wetlands. 2. Overpasses and underpasses have been designed. 3. Existing irrigation and flood protection schemes have been identified. 4. The impacts related to the aesthetic value of the local environment have been considered and will be included and extended for Stage 2 . TO BE IMPLEMENTED. 1. Issues related to road trace such as access, overpasses, underpasses, irrigation, additional acquisition, land slides etc to be resolved by the Supervision Consultant in consultation with RDA.	Please refer cost table in section IX of this document
CONSTRUCTION STAGE		**Mitigatory measures described here are in general for whole ROW from Kottawa to Matara. Contractor should use these instructions in the EMP as directions/check list or and guidelines to use them to prepare their site and activity specific 'method statements' which are to be submitted to the Supervision Consultants before commencement of each activity as a contractual requirement.**	
1. Hydrology and Drainage Aspects	To ensure the proper implementation of activities mentioned in CEA conditional approval letter in	TO BE IMPLEMENTED 1. Preparation and implementation of a thorough plan (hydrology and drainage) including its review and updating. Plan should be approved by CSC one month before construction and reviewed and or updated for implementation during construction 2. Use of extensive erosion and sedimentation control measures at all construction sites (e.g. geotextiles, silt	Please refer cost table in section IX of this document

[4] Planting of same amount of trees and vegetation that was removed

	relation to Hydrology of the project.	fencing, benching of cuts, sediment basins and sediment traps, filter fabric fences, straw bale barriers etc). 3. Provision of proper drainage systems at all construction, material exploitation; and storage sites prior to their use. Stockpiles should also be covered before heavy rains and should not be located within 20 m of water causes. There should be an intervening vegetated buffer to control any unexpected run-off. 4. Best engineering practice and timing of activities for erosion and sedimentation control measures at all construction sites (e.g., geotextiles, silt fencing, benching of cuts, stabilizing vegetation and using appropriate slope dimensions etc.] 5. Provision of proper drainage systems at all construction material exploitation and storage sites prior to their use. 6. Scheduling of excavation operations to minimize potential erosion 7. Limitations on excavation depths in use of recharge areas for material exploitation or spoil disposal. 8. Minimizing the removal of vegetative cover, and revegetation at 1:1 on all construction sites[4] If consider about the survival rate of some plants replanting could be done at a ratio 3:1 *9. Ensure connectivity of all lead way drainage paths. This should be systematically recorded.* *10. Ensure sufficient crossings and openings in the service road to avoid short term inundation.* *11. Examine critical, culverts and if necessary further increase the opening size to cater to a higher return period.* *12. Systematic collection and analysis of the stakeholder complaints regarding drainage.* *13. Liaise with Irrigation Department, SLLRDE, etc. to obtain approvals for drainage structures.* *14. Incorporate additional measures as recommended in Drainage Report.*	
2. Orientation for Contractor, and Workers	To ensure that the Contractor and workers understand the Environmental requirements and implementation of mitigation measures.	TO BE COMPLETED 1. Special briefing and / or on-site training for the contractors and workers on the environmental requirements as described in the EMP of the project. 2. Agreement on critical areas to be considered and necessary mitigation measures, among all parties who are involved in project activities. *3. Liaising with line agencies (Dept of Irrigation, Dept. of Agrarian Services, SLLRDC, Provincial Irrigation Engineer, DS, GS, and Pradesheeya Saba) in drainage issues related stakeholder complaints.* TO BE IMPLEMENTED 1. Ongoing review and orientation sessions as necessary for new workers	Please refer cost table in section IX of this document
3. Water quality	To ensure adverse impacts on water quality caused by construction activities are minimized.	TO BE IMPLEMENTED 1. Best management practices applied to equipment maintenance and operations to control contaminated run-off water 2. Storage of lubricants, fuels and other hydrocarbons in self-contained enclosures. 3. Proper disposal of solid waste from construction activities and labour camps (licensed sanitary landfills or designated construction debris disposal sites). 4. Cover the construction material and spoil stockpiles with a suitable material to reduce material loss and sedimentation. 5. Minimum distance of 100 meters between stockpiles and water bodies, or greater distance as needed to minimize disturbance of natural drainage 6. Borrow and spoils disposal sites at minimum distance of 100 meters from drinking water sources.	Please refer cost table in section IX of this document

		7.Planned and quantified vegetation clearing and deforestation *8. Regulations and enforcement in washing construction vehicles, equipment and machinery.* *9. Regulations and enforcement in the use of the weedisides containing hazardous materials that are highly toxic and could bioaccumulate.* *10. Regulations and the enforcement in the use of weedicides (not containing hazardous materials that could bioaccumulate) during rainy periods.* *11. Treatment of wastewater from asphalt or concrete plants using pH correction and physicochemical treatment to the CEA standards for inland surface waters.* *12. Provision of oil and grease traps to curtail run-off carrying them to water bodies (if asphalt and concrete plants are to be located in the vicinity of water bodies)* 13. Preparation of temporary drainage management plan; one month before commencement of works. 14. Proper installation of TD and EC before works within 50m of water bodies. 1. Meaningful water quality monitoring up and downstream at all bridges during construction within 100m of rivers.	
4.Ground water quality	*To ensure adverse impact on ground water quality caused by construction activities are minimized.*	*TO BE IMPLEMENTED* *1. Regular and proper maintenance of machinery, construction vehicles and equipment to prevent oil spills* *2. Heavy restrictions on oil storage (except in self-contained cans placed in sheds) to prevent spills.* *3. Avoid heavy deforestation and excessive vegetation clearing as much as possible.* *4. Prohibitation in the use of weedicides containing hazardous materials that could bioacumulate.* *5. Regulate the dumping of waste material and other wastes.*	Please refer cost table in section IX of this document
5. Irrigation Impacts	*Identify impacts during construction and provide mitigation measures to minimize damages and cultivation losses.*	*As determined by the Engineer and request of farmers and relevant authorities mitigatory measures decided and implemented.* Following also to be considered. 1. To keep close coordination with farmer organizations, Dept.of Irrigations, Dept.of Agrarian services, SLLRDC, and other Local Authorities on relevant matters. 2. Joint investigations and collective planning for temporary/long term solutions to be done with above organizations. 3. Without proper investigations and recommendations from relevant institutions agricultural lands not to be used for materiel extractions.	Please refer cost table in section IX of this document
6. Air quality	To minimize the airborne particulate matter released to the atmosphere.	TO BE IMPLEMENTED 1. All heavy equipment and machinery shall be fitted in full compliance with the national and local regulations. [National environmental air emissions fuel and vehicle standards E.O Gazette 1137/35 of June 2000, updates by air emissions fuel and vehicle standards (importation standards) 1268/18 December 2002 and 1295/11 June 2003] 2. Routine water sprays on stockpiled soil and sand to prevent dust generation 3. Vehicles transporting soil, sand and other construction materials shall be covered. 4. Speed limits to be rigorously enforced and transport through densely populated areas should be avoided where possible. 5. Concrete plants, asphalt (hot-mix plants), and metal crusher activities to be controlled; these facilities should be	Please refer cost table in section IX of this document

		upwind of sensitive receptors (e.g., schools and hospitals) a minimum 500 meters and downwind of sensitive receptors a minimum of 100 meters. *6. Care should be taken in stockpiling construction material with adequate coverage against wind, Sun and rain.* *7. Care should be taken to avoid spillage of construction material and dust emissions during unloading of construction material to the project site.* 11. *Regular and proper maintenance of construction vehicles and machinery to avoid smoke emissions.* 12. Base line air quality standards to be monitored and a list of more sensitive areas to be prepared and ensure watering and other mitigatory measures.	
7. Noise/Ground Vibration	To minimize noise level increases and ground vibrations during construction operations.	TO BE IMPLEMENTED 1. All heavy equipment and machinery shall be fitted in full compliance with the national and local regulations. [Extra Ordinary Gazette No. 924/12 May 1996 amended by E.O Gazette 937/7 April 1999] 2. Heavy equipment operations shall be restricted to daylight hours in sensitive locations. 3. Percussion (pile driving) operations shall be avoided in sensitive areas unless geotechnical conditions require this method to be used. Hammer- type pile driving operations shall be avoided during night time. 4. Borrow and disposal sites should be located at least 200 meters from residential areas unless suitable methods will be used to mitigate the noise and vibration impacts to acceptable levels.. 5. Blasting activities to be minimized and controlled. Blasting to be scheduled at regular intervals with prior notice to nearby residents. Reasonable compensation to be paid to those houses that are damaged by blasting effects. 6. Contractor shall take adequate measures to minimize noise nuisance in the vicinity of construction sites by way of adopting available acoustic methods. - Contractor may obtain guidelines for noise reduction from ISO/TR11688-1:1995(E), which enumerates methods by which air-born, liquid – born and structure-born noise sources may be curtailed with suitable design criteria. (Summary of design is in the Annex of EIA) *7. Regular and proper maintenance of construction vehicles and machinery to avoid undue noise including irritating hums.* *8. Intensive monitoring of noise levels specially in near by noise sensitive areas such as residences and schools and if predicted noise levels are excessive, then provision of noise barriers.* *9. Limitation of the use of explosives and mode of blasting for rock blasting activities where feasible.* 10. Detonators to be selected according to the sensitivity of the site. 11. Maximum blasting amount /specifications to be reduced based on monitoring of the impacts. 12. Cover against fly rocks shall be used following adequate standards.(weight, durability)	Please refer cost table in section IX of this document
8. Soil Erosion/Surface Run-off	To minimize soil erosion due to the construction activities of highway To prevent adverse water quality impacts due to negligence. To ensure unavoidable impacts are	TO BE IMPLEMENTED 1. Preparation of TEMPORERY EROSION CONTROL PLAN one month before commencement of works and to be reviewed monthly. 2. Planning of cut and fill, land reclamation etc.while considering climatic conditions. The area can be subject to heavy rain. 3. Proper installation of TD and EC before works within 50 m of water bodies. 4. Meaningful water quality monitoring up and downstream at all bridges during construction. Rapid reporting and feedback to SC. 5. Construction sites (including borrow and disposal sites) should be graded to original contours, re-vegetated, and compacted properly in accordance with design specifications 6. Cut areas and stockpiles will be configured to maintain stability of the slopes.	Please refer cost table in section IX of this document

	managed effectively.	7. Temporary or permanent drainage works shall be installed and maintained to minimize to erosion. 8. The Contractor should consult Ag. Societies, Ag. Authorities in the area to solicit input on mitigation measures. 9. Stabilizing vegetation to be planted and maintained in a continuous/ongoing manner 10. Large scale nurseries should be located with access to good supply of water for the care and storage of appropriate vegetation to be re-used on site. *11. Use of temporary or permanent drainage systems to collect water coming to the slope and drain out without causing soil erosion.* *12. Avoid cut and fill operations and other works such as vegetation clearing and soil excavation during rainy days unless silt traps and interceptor drains are incorporated in the construction sites as much as possible to prevent erosion and subsequent siltation of near by water bodies.* *13. Proper protection methods for soil dump (covers etc.)to avoid erosion.* *14. Prepare a plan to commence and complete slope protection work prior getting affected by rain etc.* *15. Retarding actions of water flow due to construction of bridges and culverts to be minimized avoiding rainy seasons for construction.*	
9. Exploitation Handling, Transportation and Storage of Construction materials	To minimize contamination of the surroundings (Due to Implementation of works, asphalt, concrete and metal crushing plants)	TO BE IMPLEMENTED *1. Conditions to be followed have been described in the EIA report and also in the subsequent EA by proponent in relation to selecting sites for material exploitation, to timing and use of roads for material transport, for maintenance of vehicles used in material transport or construction for selection of sites for material storage, for rock blasting and aggregate production, and for handling hazardous or dangerous materials such as oil, explosives and toxic chemicals etc.* *2. Excavation material from the borrow pits should be carried out without creating unsuitable surfaces of excavation such as near vertical slopes.* list of borrow areas to be prepared one month prior to stage 2 construction. A list of routes of transport of construction materials is to be prepared for the contract and agreed one month prior to stage 2 constructions. In case substantial additional materials will be required and will be sourced from wooden sites, replacement of trees and woodland at a ration 3:1 and include in progress report. *3. Avoid, as much as possible, excavation and transportation of soil during rainy weather conditions.* *4. When excavated material within the trace are used as fill material, proper planning and management of cut and fill operations to minimize distance of transport and temporary storage.* *(i) Before the beginning of the construction, marking of the cut sections and the corresponding fill sections on a map for the entire trace considering distance of transport, easiness of transport, construction process etc.* *(ii) Regular revision of the map depending on the progress of construction.* *(iii) As much as possible, direct transportation of the exploited construction material from generated location to the fill section should be practice without keeping the exploited material in temporary storage.* *5. Maintaining and inventory of the volume of exploited material in temporary storage and revision of the construction sequence to minimize the volume in temporary storage.* 6.Update material management plan monthly and include in progress report	Please refer cost table in section IX of this document

10. Spoil and Construction Waste Disposal	To minimize the generation of spoil and construction waste.	TO BE IMPLEMENTED 1. Preparation and implementation of waste management plan to be submitted to the SC and approved by PMU one month prior to starting stage 2 works ,to be updated once a month. 2. Reutilization of construction wastes to maximum extent practicable 3. Identification of safe disposal sites 4. Provision and maintenance of proper drainage and erosion control facilities 5. Secure storage of used oil and lubricants in full compliance with the national and local regulations. 6. Prohibition on burning of waste oils - 7. Proper maintenance of machinery to minimize oil spills. *8.* Planning of disposal sites and to avoid disposal in retention areas, abundant paddy areas etc.with proper permission of Local Authorities. *9. Excavated peat should be (i) dumped to abundant paddy fields provided adequate drainage and precautionary facilities are provided or (i) traded off to fuel making sector or agricultural and horticulture industry.* *10. All scrap materials such as cables, metal structures, steel wires, insulators involved in power line construction needs to be removed after the construction works. Incorporate attempts to evaluate the recycling potential of such material.*	Please refer cost table in section IX of this document
10a.Spoil (unsuitable soil) Waste Disposal	To minimize the environmental impacts arising from generation of spoil waste.	1. Estimating the amounts and types of spoil and construction waste to be generated by the project. 2. Investigating whether the waste can be reused in the project or by other interested parties .(earth berms,noise barriers, amenity planting at intersections) *3. Planning of disposal sites and to avoid disposal in retention areas, paddy areas etc.* Identifying potential safe disposal sites close to the project. *4. Excavated peat should be (i) dumped in approved locations provided adequate drainage and precautionary facilities are provided or (i) traded off to fuel making sector or agricultural and horticulture industry.* 5. Use designated spoil disposal areas where specially instructed(paid by unit/distance rate) 6. Investigating the environmental conditions of the disposal sites and recommendation of most suitable and safest sites. 7. Proper drainage paths and or drainage facilities to be established. 8. Piling up of loose materials should be done in protected areas to arrest washing out of soil. Debris shall not be left where it may be carried out by water to down stream flood plains, dams lagoons etc. 9. Used oil and lubricants shall be recovered and reused or removed from the site in full compliance with the national and local regulations. Oil wasted must not be	Please refer cost table in section IX of this document

		burned. 10. Machinery should be properly maintained to minimize oil spill during the construction. 11. Adopt all approval conditions from CEA including drainage plans before disposal commences.	
11. Work Camp Operation and Location	To ensure that the operation of work camps does not adversely affect the surrounding environment and residents in the area.	TO BE IMPLEMENTED 1. Identify location of work camps in consultation with Grama Niladharies (GNs). The location shall be subject to approval by the RDA. If possible, camps shall not be located near settlements or near drinking water supply intakes. 2. Cutting of trees shall be avoided and removal of vegetation shall be minimized. 3. Water and sanitary facilities shall be provided for employees. 4. Solid waste and sewage shall be managed according to the national and local regulations. As a rule, solid waste must not be dumped, buried or burned at or near the project site, but shall be disposed of to the nearest sanitary landfill or site having and complying with the necessary permits. 5. The Contractor shall organize and maintain a waste separation, collection and transport system. 6. The Contractor shall document that all liquid and solid hazardous and non-hazardous waste are separated, collected and disposed of according to the given requirements and regulations. 7. At the conclusion of the project, all debris and waste shall be removed. All temporary structures, including office buildings, shelters and toilets shall be removed. 8. Exposed areas shall be planted with suitable vegetation. 9. The RDA and Supervising Engineer shall inspect and report that the camp has been vacated and restored to pre-project conditions. *10. Avoid, as much as possible, use of sloping lands for work camps to avoid removal of vegetation cover on sloping lands to minimize soil erosion and slope stability problems.* 11. Orientation programmes for workers on sanitary requirements to be provided. Quality/safety engineers to do continuous monitoring on workers practices necessary.	Please refer cost table in section IX of this document
12. Loss of Vegetation Cover of the Areas for Temporary Work-space	To avoid several negative impacts due to removing of green surface.	TO BE IMPLEMENTED 1. Clearing of green surface cover for construction, for borrow or for development, cutting trees and other important vegetation during construction should be minimized. 2. Landscaping and road verges to be accomplished in continuous/ongoing manner. 3. Planting of trees/shrubs/ornamental plants to contribute to the aesthetic value of the area and compensate for the lost capability of the area to absorb carbon dioxide. 4. At the conclusion of the project, all debris and waste shall be removed in pre-selected and approved locations by local authorities. 5. All temporary structures, including office buildings, shelters and toilets shall be removed	Please refer cost table in section IX of this document
13. Safety Precautions for the Workers and General Public	To ensure safety of workers	TO BE IMPLEMENTED 1. Providing adequate warning signs, barriers and lighting as appropriate 2. Providing workers with skull guard or hard hat 3. The Contractor shall instruct his workers in health and safety matters, and require the workers to use the	Please refer cost table in section IX of this document

		provided safety equipment. 4. Establish all relevant safety measures as required by law and good engineering practices.	
14. Traffic Condition	To minimize disturbances of vehicular traffic and pedestrians during haulage of construction materials, spoil and equipment and machinery, blocking access roads during blasting of rocks, damages/maintenance problems for roads and bridges used by the haulage trucks, dust nuisance to school and hospitals.	TO BE IMPLEMENTED 1. Formulation and implementation of a construction related traffic management plan. 2. Vicinity of schools and hospitals to be considered. Installation of traffic warning signs, and enforcing traffic regulations during transportation of materials and equipment and machinery. Conditions of roads and bridges to be considered. 3. Conducting awareness programs on safety and proper traffic behavior in densely populated areas near the construction sites. 4. Assign traffic control personnel in coordination with the Traffic Police officials *where construction and associated traffic has created significant impacts*.	Please refer cost table in section IX of this document
15. Salinization	To minimize salinization caused by using sea sand To avoid/minimize adverse impacts of salinity increase on ecosystem To minimize deep excavations, which extend below the mean sea level and which alter the water table create situation of salinization	TO BE IMPLEMENTED 1. Offshore sand mining will require an environmental impact assessment additionally. 2. If sand is mined from offshore deposits this sand should be stockpiled on the shore and proper arrangements will be made to desalinate before being transported to the project site. 3. Provision of drainage for the seepage water removing from interception of ground water table in deep cuts, and stabilization of the side slopes. (Drainage Report) 4. Deforestation must be discouraged to retard the process of salinization. 5. The proper design of hydraulic and irrigation structures should be adopted to curtail formation of stagnant water bodies, which may cause elevated levels of salinity. *6. Avoid deep cuts and excavations unless alternative foundation techniques such as sheet piling and injected bentonite walls are considered.*	Please refer cost table in section IX of this document
16. Impact on Wetlands	To ensure that damage to wetlands and its ecosystem is	TO BE IMPLEMENTED 1. Wash water with liqued, solid waste, construction debris, and discarded packing will be disposed at approved facilities should not to dump in to wetlands.	Please refer cost table in section IX of this document

	minimized during construction.	2. Residual debris from concrete plants to be disposed a minimum distance of 500 meters from wetlands 3. Construction material and structures are prohibited on wetlands 4. Application of pesticides to be prohibited during rain. Environment-friendly fertilizers to be used within contract specifications and in consultation with the Supervision Consultant Engineer. 5. Review of other studies on impacts on wetlands.	
17. Social Impacts	To ensure minimum impacts from construction labor force. To ensure minimum impacts on public health. To ensure minimum effects of indirect impacts of constructions to the people who are living close to the boundaries of ROW; Dust, Noise, Vibration and Rock blasting effects etc. To minimize access problems for local population during construction. Additional land acquisition requirements.	TO BE IMPLEMENTED 1. Worker orientation to include awareness and prevention of vector borne and communicable diseases; appropriate sanitation facilities to be maintained in labor camps. 2. Claims/complaints of the people on construction nuisance/damages close to ROW to be considered and responded to promptly by the Contractor 3. Contractor should organize temporary means of access to avoid short-term negative impacts. 4.If and when necessary additional land acquisition same procedures which used before construction to be used as described in Resettlement Implementation Plan.	Please refer cost table in section IX of this document
18. Institutional Strengthening and capacity Building	To ensure that RDA and PMU officials are adequately trained to understand and to appreciate issues related to EMP	TO BE IMPLEMENTED 1. Setting up of Environmental Management Unit (EMU) within RDA 2. Development of a strengthening plan for the EMU 3. Maintaining sufficient environmental expertise in PMU for implementation, supervision and monitoring of the EMP activities *4. Planning and implementation actions to strengthen liaising activities with line agencies related to flood, drainage, irrigation etc.* *5. Capacity building of proponent staff on environmental needs related to road constriction.*	Please refer cost table in section IX of this document
19. Slope stability	*To ensure that manmade slopes are stable and have and adequate*	*TO BE IMPLEMENTED* *1. Variation of the subsurface condition encountered during construction and assumed during the design stage should be noted and designs reviewed accordingly.*	Please refer cost table in section IX of this document

	factor of safety against failure.	*2. Monitoring of the phreatic surface within critical slopes during the wet season.* *3. Minimization of surface water infiltration in to the slope by providing cut off drains and a proper drainage system within the slope.* *4. Planting of suitable types of vegetation on the slope surface to increase to stability and reduce erosion.*	
20. Settlement and ground sbsidence	*To minimize the post constructional settlement and subsidence of the road surface.*	*TO BE IMPLEMENTED* *1. Suitable quality assurance scheme be devised and implemented during ground implementation stage.* *2. Monitoring of the settlement of the pre-loaded sections to make sure that sufficient settlement has taken place before removal of the preload and placing the road surface.* *3.Supervision Consultant to ensure the quality of relevant work and in case of problems occur, re- designing and implementing relevant mitigatory measures.*	Please refer cost table in section IX of this document
21. Damage to properties due to blasting	*To ensure adverse damages are mitigated*	*COMPLETED* *1. Some crack surveys* *2. Limited compensation payments* *3. Planning a suitable monitoring mechanism and personnel* *TO BE COMPLETED 1 . Crack surveys prior to activities* *2. Assessment and payment of compensation to ensure damaged structures are repared.* *3. Assessment and deploying of monitoring personnel according to an agreed plan.* *4. Adjusting the blasting plan according to the sensitivity of the site using the results of test blasts in consultation with GSMB. .* *5.* Avoid using excessive amount of explosives. 6. Building awareness on procedures of blasting among Govt. institutions, local authorities and NGOs. *7. Proper safety methods to be implemented during blasting including alarming systems/signal systems.* *8.Each blast to be monitored in consideration with noise,vibration,dust and used parameters.normes etc*	Please refer cost table in section IX of this document
OPERATIONAL STAGE			
1. Air Quality	To minimize air pollution from road usage. (Air pollution due to increased levels in PM10, NO, NO_2, CO, SO_2 and Ozone.)	TO BE IMPLEMENTED 1. Law enforcement on vehicles conditions. Other National measures due to regulations on fuel type and purification of exhaust gases. 2. Promoting mass transport and traffic management. 3. Establishing vehicle emission regulations and standards. 4. Strict enforcement of the regulations subsequent to an awareness program. 5. Design and provision of a vegetative barrier to arrest the spread of air borne particles to residential areas.. *6 Provision of a vegetative barrier to arrest the spread of air borne particles to residential areas.* *7. Mechanisms to carryout random monitoring of vehicular exhaust emissions and implementation of heavy fines or penalties for vehicles not meting standards.*	Please refer cost table in section IX of this document

2. Water quality	To monitor impacts from traffic particulates in run off	Track concentrations of indicator chemicals in tea, soil and water at specific locations. Design appropriate mitigation measures. Establish 'safety zones'	Please refer cost table in section IX of this document
3. Noise	To minimize the noise level enhancement resulting from road traffic. To control noise pollution from exceeding tolerable levels on embankment sections within a 400m corridor extending to 600m wide corridors with the increase of traffic volume.	TO BE IMPLEMENTED 1. Establishing standards and regulations for noise levels emanating from vehicles. 2. Strict enforcement of regulations, subsequent to an awareness program for drivers of the highway. 3. Establishing a national policy on vehicle imports – noise levels, too, increase with age of vehicles. 4. In sensitive areas such as schools, places of worship, hospitals and libraries, sound barriers including tree linings will have to be employed. *Any development of cracks in noise barriers such as high walls should be monitored and such cracks or damages should be immediately repaired.* 5. Relocation of APs and Improvement of house structures, if / when appropriate. 6. Appropriate building limits to SHC to be established in consultation with the UDA and MoH. 7. Noise levels for residential and other areas prepared by CEA to be applied. 8. Noise mapping for different estimated levels of traffic and definition of types and locations of noise barriers and other mitigation measures to be carried out with immediate effect.. *9. Intensive monitoring of noise levels specially in near by noise sensitive areas such as residences and schools is of paramount importance and if predicted noise levels are excessive, then provision of noise barriers is necessary.*	Please refer cost table in section IX of this document
4. Road Accidents	To control serious and fatal accidents on the expressway due to high speed and increased number of accidents on access roads	TO BE IMPLEMENTED 1. Road user information/ education, traffic signs and road markings. 2. Law enforcement by Traffic Police with Highway Authority 3. Emergency services 4. Establishment of accident review committee *5. Use of appropriate traffic control staff with Dept.of Police.* 6. Mechanism to regularly maintain construction access roads and signs.	Please refer cost table in section IX of this document
5. Garbage disposal	To control garbage disposal by road users creating	TO BE IMPLEMENTED 1. Information campaigns.	Please refer cost table in section IX of

	pollution and aesthetic discomfort.	2. Fines against littering at rest places and interchanges. 3. Regular cleaning of the roadsides. 4. Placing garbage bins along the roadsides with signboards *5. Planning and provision of large bins and containers at interchanges and rest places lined with biodegradable bags and having lids to prevent access to dogs, cats, flies and birds. Bins to be provided shall be of different colours with clear instructions and figures in brief for the purpose of separation of perishable wastes from recyclables.* *6. Plans and programmes for regular collection of garbage from the bins.*	this document
6. Transportation of dangerous chemicals/Goods	To control transportation of dangerous chemicals and substances may create environmental hazards to air and water quality. (=By Accidents)	TO BE IMPLEMENTED 1. Timely attendance to accidents and warning for the public on environmental hazards. 2. Warning signs on vehicles. 3. Licensing for transport of dangerous goods 4. Implementation of stringent laws and policies pertaining to the safe storage and transport of prescribed wastes and other hazardous materials. 5. Issuing of waste transport certificates by the CEA for waste transporters and tracking down prescribed wastes from it s production to final disposal or treatment.	Please refer cost table in section IX of this document
7. Land slides and soil erosion	To minimize land slides due to excessive erosion of slopes and waterways with corresponding silting of the eroded soil.	TO BE IMPLEMENTED 1. Maintaining proper vegetation cover and erosion protection 2. Constant surveillance as part of routine maintenance *3. Provision of adequate drainage facilities.* *4. Identification of sections of the road with critical slopes and monitoring of those sections especially during rainy seasons for indications of landslides such as cracking, toe ripples, seeping spring etc.* *5. Monitoring of the new constructions outside the ROW that may cause slope instability.*	Please refer cost table in section IX of this document
8. Maintenance construction works	*To minimize surface and ground water quality and air quality deterioration and generation of high noise levels associated with highway maintenance construction works.*	*TO BE IMPLEMENTED* *1. Implementation of proper solid waste management techniques and the mitigatory measures applicable for the construction phase with reference to minimization or prevention of surface and ground water quality deterioration, air pollution and generation of high noise levels where deemed necessary.* *2. Monitoring surface and ground water quality, air quality and noise levels during the entire period of the maintenance construction works and depending on the location due to complaints made by the local people at their premises.*	Please refer cost table in section IX of this document
9. Road side development activities	*To control any negative adverse impacts on water bodies, ground water quality and air quality due to development or*	*TO BE IMPLEMENTED* *1. Implementation of strict land use control.* *2. Monitoring and controlling of changes to land use in project and designated area.* *3. Land use zoning by the UDA.* *4. Land use zoning proposed by the proponent.*	Please refer cost table in section IX of this document

	expansion of secondary roadside activities (e.g. industries and commercial enterprises)		
10. Crops and vegetation	To monitor impacts from traffic emissions	Track concentrations of indicator chemicals in tea, soil and water at specific locations.	Please refer cost table in section IX of this document
11. Visual Intrusion	*To minimize visual intrusion and thereby to maintain the rustic nature of the landscape as much as possible.*	*TO BE IMPLEMENTED* *1. Plantation with thick and tall native trees to reduce noise, arrest gaseous pollutants and dust, intercept rain and decelerate urban run-off while improving the aesthetics of the landscape.* *2. Identification of critical locations to be incorporated with mitigating measures.* *3. Prepare a detailed plan of mitigation of visual impacts.*	Please refer cost table in section IX of this document
12. Social Impacts	- To ensure that people in the surrounding area will not be affected due to traffic nuisance such as dust, noise and vibrations. - To ensure that there will not be any cultural problems (caste, racial, drugs, prostitution, and illegal businesses etc.) among re-settlers or with host communities, in new locations such as new urban centers at interchanges.	TO BE IMPLEMENTED 1. Controlling/management systems of vehicle speed, noise and quality of vehicles to be undertaken properly. Necessary awareness building programmes for general public to be implemented by RDA. 2. Necessary signboards with limits of noise and speed of vehicles to be placed properly. A mechanism to be established through local authorities to receive public complaints in this regard and solutions from the Highway Authority. 3. The services of Social Services Officers who are attached to Divisional Secretariats to be utilized to identify and plan necessary mitigatory activities to minimize cultural problems. The services from NGOs to be taken by UDA to assist to organize new urban communities by themselves. *4. Provision of medical advice and services within the project area.* *5. Maintenance of registry of personnel working and visiting construction sites.* *6. Closely liaise with village headman (Grama Niladhari) to keep track of employment, illicit activities etc.*	Please refer cost table in section IX of this document

IV. DESCRIPTION OF PLANNED ENVIRONMENTAL MONITORING

18. The mitigation measures proposed in the working draft of the EMP will be carried out by the responsible agencies. Among the environmental parameters considered in the EMP, the items mentioned in Table 4 were prioritized for inclusion in the monitoring plan.

19. **The baseline conditions of existing water quality, air quality and noise levels have been established before commencement of the construction as requested by CEA, Environmental Management and Assessment (EM&A) Division. National standards will be followed:**

- Noise Control Regulations - Extra Ordinary Gazette No. 924/12 May 1996 amended by E.O Gazette 937/7 April 1997
- National environmental air emissions fuel and vehicle standards E.O Gazette 1137/35 of June 2000, updates by air emissions fuel and vehicle standards (importation standards) 1268/18 December 2002 and 1295/11 June 2003
- ambient air quality gazette 850/4 1994 Dec amended by E.O Gazette 1309/20 Oct 2003
- The amounts of total costs for relevant sections have been calculated in consideration with both ADB and JBIC sections.

20. Monitoring and mitigation responsibilities during the works and operational stage will be divided into two categories;

i) Direct impact of the Works due to the Contractor's activities (General Conditions of Construction Contract Clause 22.1)

ii) Unavoidable impacts as a result of the execution of the Project (General Conditions of Construction Contract Clause 22.2)

With respect to (i) the Contractor shall be responsible indemnifying the Employer for any claims that may arise from death or injury to third parties or loss of, or damage to, any property as a result of the Works.

With respect to (ii) RDA shall be responsible to monitor and mitigate any negative impacts of the Project and indemnify the Contractor against all claims etc.

All decided environmental parameters are monitored following existing environmental standards established by Central Environmental Authority (CEA)

At the same time CEA monitor progress of such activities with the Monitoring Committee using monthly progress reports to be submitted by STDP.

21. The Supervision Consultants (Engineer) supervise that the above-mentioned responsibilities of the Contractor have been fulfilled according to the Construction Contract.

Table 4: Environmental Monitoring

1. Hydrology

(* Consultant has used the word of EA=Executive Agency for the Responsible Agency. Here we call it as RDA.)**

Monitoring Objectives	Parameters to be Monitored	Monitoring Locations	Frequency	Responsible Agency	Cost estimates
<u>During Construction</u> To ensure minimized hydrological and drainage effects such as flood levels, ponding and water logging and depletion of ground water.	Water table, Water levels, pH value, Sulfate content, Iron Content, Sediment level Suspended solids	Areas where acidic or high sulfate soils, Embankment areas in flood plains, and deep cut sections below ground water level. Water levels just upstream of embankment, Areas where soil contains high iron pyrites, pH and chemical components at just downstream of excavations and filling sections. Erodable areas/cut and fill sections, *temporary and permanent irrigation /drainage structure locations.* *General low lying high flood prone areas, irrigation schemes (paddy grown areas), major drainage structures such as bridges and culverts.* (Exact locations to be identified and listed)	According to Drainage Report, climatic conditions of each area and timetable of cut and fill operations.	*RDA with assistance of the Engineer and the Contractor.*	PI. refer the cost table in the section IX of this document
<u>During Operation</u> -To minimize landslides and excess erosion of slopes and waterways with corresponding silting of the eroded soil. *To ensure that floods will safely pass through the drainage structures, with minimum acceptable upstream retention.*	Records of rainfall pattern/seasons Records of flood levels Stability of vegetation covers after construction. Functions of constant surveillance programs as part of routine maintenance.	Newly constructed or created embankments with vegetation cover. *At and in the vicinity of irrigation schemes, drainage structures, irrigation and flood protection structures associated with project.*	Before and during rainy seasons.	*RDA*	

2. Water Quality

Monitoring Objectives	Parameters to be monitored for Surface water bodies/Ground water wells	Monitoring Locations	Frequency	Responsible Agency	Cost estimates
<u>During Construction</u> To avoid contamination of water by construction and related activities as accidental oil spills, disposal of solid waste, spoil, construction material and domestic wastewater. <u>During operation</u> To ensure existing water sources will not be spoilt due to traffic dust, oil extractions or due to deep cuts during constructions.	pH Conductivity, Salinity, Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Suspended Solids (SS), Nitrate, Phosphate, Chloride, Oil/Grease, Zinc, Lead, Total coli form /Fecal coli form, Iron and Manganese Monitoring to follow Sri Lankan standards or guidelines in the World Bank Pollution Prevention and Abatement Handbook. Baseline data will be compared with current status.	Monitoring locations are in the Drainage Report of STDP *2003 and locations identified or identified in the environmental assessments to be surveyed for monitoring*. Same locations monitored during constructions. *Water bodies 27 SW in the final trace and 28 SW in the combined trace of the ADB section and water bodies 29SW and 30SW in the Gale Port access Road area (see EA Report) during both construction and operation phase. Sampling has to be carried out at various locations in the water bodies to ensure an insight into pollution patterns.*	Every six months during construction stage (Dry/Wet Seasonal basis) *and at a higher frequency where necessary.* Every six months (Dry/Wet Seasonal basis-Twice per year)	*RDA with the assistance of the Engineer and the Contractor.* *RDA, as directed by the CEA*	Pl. refer the cost table in the section IX of this document

3. Sediment Quality

Monitoring Objectives	Parameters to be monitored	Monitoring Locations	Frequency	Responsible Agency	Cost estimates
During Operation *To avoid contamination of sediments in the water bodies due to post construction related activities (e.g. disposal of sewage and industrial waste waters and hazardous industrial solid wastes, urban run-off etc.) hence subsequent adverse impacts on biota especially benthic fauna.*	*TP, organic pesticides and various heavy metals such as Pb, Fe, Zn, Cd, Cr, Hg, and As.* *Samples have to obtain in duplicate.* *The USEPA developed TCLP test or CEA guidelines has to be carried out for the sediments having high levels of heavy metals in order to evaluate the potential adsorption of contaminants that is likely to occur during changing environmental conditions such as pH.*	*1. 27SW in the final trace and 28SW in the combined trace of the ADB section and water bodies 29SW and 30SW in the Galle Port Access road area (see EA Report) during and operational phase.* *2. Other locations identified as important from subsequent monitoring.*	*Sediment quality monitoring every six months during operational phase*	*RDA as directed by CEA during operational phase(with assistance from ITI or NBRO)*	Pl. refer the cost table in the section IX of this document
Irrigation Impacts *In the event of the irrigation schemes being by-sected*	*Alternative channel lay out and appurtenance structures.*	*To be listed*	*As and when necessary*	*Contractor under the instruction of the Engineer*	

4. Ground Water Quality

Monitoring Objectives	Parameters to be monitored	Monitoring Locations	Frequency	Responsible Agency	Cost estimates
To avoid ground water quality deterioration arising due to construction activities and post construction related activities.	*Depth of groundwater,pH, electrical conductivity, total and faecal coliform levels, total hardness, total alkalinity,SO_4^{2-},Cl,TSS,TDS,BOD_5,DO,TN,NH_4^-,N,NO_2,NO_3, TP, organic pesticides and various heavy metals such as Fe, Mn, Pb, Zn, Cd, Cr, Hg.*	*Wells near the construction site and borrow areas. In the ADB section locations 4GW, 7GW and 8Gw in the final trace and 5GW, 9GW, 10GW and 11GW in the combined trace should be monitored with other*	*Every six months during both construction and operational phase.*	*RDA as directed by CEA during construction(with the assistance from Engineer,Contractor,ITI or NBRO) EA as directed by CEA during operational phase with assistance from ITI or NBRO)*	

		identified important locations for comparison purposes.			

5. Air quality

Monitoring Objectives	Parameters to be monitored	Monitoring Locations	Frequency	Responsible Agency	Cost estimates
<u>During construction</u> To minimize the Air Pollution in both construction and operation phases to ensure maintaining of Ambient air quality standards.	Carbon monoxide, Sulfur dioxide, Nitrogen dioxide, ground level ozone, PM 10, SPM (Suspended Particulate Matter /Dust levels) 8 hourly. Monitoring to follow Sri Lankan standards or guidelines in the World Bank Pollution Prevention and Abatement Handbook Baseline data will be used to compare current status.	Monitoring locations should be the list of sensitive locations prepared by the Consultant using the EA and other available data and practical situations. List of some locations are already available from the Baseline studies and detailed Engineering Reports.	The monitoring for dust levels (8 hrs average) should be carried out depending on complaints from local people, at relevant premises. At least 24 hour monitoring at critical locations in dry weather condition and at least every 2 weeks during construction phase. The values expressed should be at least 8 hours and 24 hours averages as identified appropriate.	*RDA with the assistance of Engineer and the Contractor as directed by CEA.*	Pl. refer the cost table in the section IX of this document

<u>During Operation</u> - To minimize air pollution from road usage and operation associated activities. *- To ensure effectiveness of law enforcement on vehicles' conditions and emission levels.*	- Increased levels in PM 10, NO, NO2, SO2, CO, and Ozone. *NOx, CO, SO2, ground level O3, Pb, PM 10, SPM, (suspended particulate matter/dust) and Pb with reference to CEA stipulated standards for ambient air quality during both phases.* *During the operational phase NOx, SO2, CO, Pb, and SPM in vehicular emissions with reference to emissions standards.*	- Effectiveness of law enforcement on vehicles' conditions and emission levels. *Areas by the road side in both ADB section and Galle Port Access road area. The locations 7A, 8A, 10A, 11A, and 12 A monitored by ITI in June 2003, should also be considered. Identified locations for road operation, law enforcement.*	At least 24 hours monitoring for CO, SO2/ NO2/ O3 and PM10 at Dry weather conditions at each location. *The monitoring frequency needs to be at least once in six months during the operational phase.* *The values expressed should be at least 1 hour and 24 hour averages during the operational phase.* *Other than above, monitoring of vehicular emissions (NOx, SO2, CO, Pb, and SPM) to be carried out regularly and as directed.*	*RDA with the assistance from Law enforcement units as directed by the CEA during operational stage.*	

6. Noise/Ground Vibration

Monitoring Objectives	Parameters to be monitored	Monitoring Locations	Frequency	Responsible Agency	Cost estimates
To minimize the noise emission and Ground Vibration/ Air blast over pressure levels.	Mean sound level (Leq (24) Day -night sound level (Ldn) [80 dBa, day; 55 dBa night] L A, eq one hour at Day time L A, eq, 15 Minutes at night time Peak Particle Velocity, Air blast over pressure level.	Monitoring locations will be selected using Baseline Data available and identified locations in attachment 3. Comparisons to be carried out using current	<u>During construction</u>. Monitoring for noise levels (One hour at daytime) and Vibration/ABOP levels should be carried out depending on complaints	*RDA with the Engineer and the Contractor during construction stage.* *RDA for noise*	Pl. refer the cost table in the section IX of this document

	Baseline data will be used to compare current status. *Mean sound level (Leq (24)), day-night sound levels (Ldn), LA, eq one hour at day time ,LA eq,15 minutes at night time, peak particle velocity and air blast over pressure level (ABOP) during construction. Special attention should be paid to development of cracks and crevices in near by building structures.*	information of Rock blasting sites, Crusher plant site, and Piling sites of the ROW. Noise analysis that has been carried out in JBIC and ADB sections in 2001 shall be refined to noise mapping of the SHC influence zone to identify critical locations and appropriate actions. More information is in the EMP (Appendix. No.2) *Residential areas in the ADB, JBIC sections and Galle Port access road area and other identified noise sensitive areas (category B areas/lands) such as schools. 7N, 8N, 9N, 10N, 11N, and 12 N in the ADB section monitored by ITI in November 2002, February 2003 should also be monitored for comparisons purposes. More information is in the EMP. (Appendix-02)*	from local people at their premises. *As required by the construction activities as recommended by the Engineer.* *During construction phase noise monitoring should also be conducted depending on complaints made by local people at relevant places. Also vibration/ABOP levels should be monitored during construction depending on complaints made by local people from their places and whenever blasting and other vibration including activities are to be carried out.* .	*mapping* .	
<u>During Operation</u> To minimize the noise level resulting from road traffic. To control noise level exceeding	As above and the effectiveness of actions taken by authorities to establish standards and regulations for noise levels emanating from vehicles, enforcement of law, sound	Potentially sensitive locations have already been identified (See appendix 3).	According to Baseline Report, noise level should be measured at 12 interchanges and other 39 locations during operational stage.	RDA directed by the CEA during operation stage.	

tolerable levels from embankment sections within a 400m corridor extending to 600m wide corridors.	barriers and other associated actions.				

7. *Exploitation Handling, Transportation and Storage of Construction materials*

Monitoring Objectives	*Parameters to be monitored*	*Monitoring Locations*	*Frequency*	*Responsible Agency*	*Cost estimates*
To minimize the impact from Exploitation handling, Transportation and storage of construction materials.	*1. quantity of materiel in temporary storage* *2. Type of materiel* *3. Hazard level of materiel in relation to environmental damage including water, drainage etc.* *4. Duration of storage and climatic season* *5. Method of transportation*	*Temporary storage locations and the locations where materiel is exploited and transport routes.*	*During Construction= Once a week* *During Operation= As required*	*RDA with assistance of Contractor during constrction.* *RDA with the assistance of Law enforcement authorities during operation.*	Pl. refer the cost table in the section IX of this document

8. Social impacts

At the end of the Detailed Designs, commenced relevant activities of monitoring of social impacts based on the Comprehensive resettlement Plan (RIP) prepared by the RDA.

Monitoring Objectives	Parameters to be monitored	Monitoring Locations/ Project stages	Frequency	Responsible Agency	Cost estimates
Ensure APs are resettled in a similar or better social and physical environment with facilities they used to enjoy. To ensure that APs are adequately and according to the Entitlement Matrix of RIP, compensated. To avoid adverse direct and indirect impacts due to resettlement and property acquisition of APs. To ensure that the income levels of APs will not be lower than the levels they have enjoyed due to resettlement and property acquisition. To minimize indirect impacts on dust, noise, vibration (due to rock blasting and other activities) effects to the people close to ROW.	Entitlements according to the RIP and the quantity actually received by each PAP in comparing with the nature of their losses. Adverse social effects of relocation as disruption of cultural ties, access to social infrastructure etc. Impact on income restoration possibilities & income level, Impact on female-headed and disadvantaged families. Availability of income earning sources, specially, employment opportunities for daily wage earners. Potential conflicts/disputes situations within communities. Operational capacity of newly established Housing Committees. Supply and demand of outside community services and consumer goods, food items etc. in new locations. Social gatherings between the host community and the resettlement community. Contractor's response to the complaints/claims on such construction nuisance, which will be submitted by affected people.	<u>Pre-construction stage</u> Relevant basic data on each AP are properly recorded in files of Inventory of Losses (IOLs) and the data collection of Socio-economic study. Status of each PAP during social preparation stage and during consultations. During re-location of APs Income / livelihood restoration efforts of resettled APs. <u>Construction stage</u> Complaints/claims from APs who are living close to the ROW, on indirect Impact due to constructions, during construction stage.	Monitoring will be assigned to an organization with institutional capabilities to conduct social impact monitoring as detailed above. Methodology and frequency of monitoring will be decided jointly by RDA and Independent Monitoring agency. Once a month at the beginning .	*RDA with the assistance of Management Consultants.* *Contractor: Assessment and Settling of public complaints/claims of APs during construction.* *Engineer: Assessment of disputed claims and supervising Contractor's solutions for claims.*	Pl. refer the cost table in the section IX of this document

<u>During operation</u> To ensure that the people in surrounding area will not be affected due to traffic nuisance such as dust, noise and vibrations. To ensure that there will not be any cultural problems among re-settlers with host communities, or in new locations such as newly developed urban centers near interchanges.	Low enforcement efficiency in relation to indirect traffic nuisance. Awareness building programmes among public. *Notices and boards at critical locations.* *Access road status and road convenience status.*	- Areas of residents closer to the highway and interchanges. - Resettlement sites *- Household samples identified from AP and resettled persons.*	According to the periodical programmes *prepared in consultation with Social Environment Expert.*	*Local Authorities*	

9. *Natural Environment*

Monitoring Objectives	*Parameters to be monitored*	*Monitoring Locations/ Project stages*	*Frequency*	*Responsible Agency*	*Cost estimates*
1. To minimize the impacts on aquatic eco systems.	*Fauna and Flora associated with the systems. Water quality water levels and drainage. Sedimentation levels maps of critical systems future developments, and land use zoning.*	*Identified critical(affected) aquatic systems, and especially at major river crossings such as Ratgama Lake, Gin Ganga,Polwatta Ganga and other locations given in EA Reports.*	*Periodical programmes in consultation with an ecologist depending on the nature of importance to suit both construction and operation phases.*	*RDA with the assistance of the Engineer and the Contractor.*	Pl. refer the cost table in the section IX of this document
2. To minimize the impacts on Terrestrial Eco System.	*Noise, Dust and Smoke levels Fauna and Flora associated with systems of concerns.*	*Identified critical terrestual eco-*	*Periodical programmes in consultation with an*	*RDA with the assistance of the Engineer and the*	

	Warning signs for road users maps of critical systems, future developments and land use zoning.	*systems during construction and operation phases along with locations indicated in EA Reports.*	*ecologist depending on the nature of importance to suit both construction and operation phases.*	*Contractor.*	
3. Effects on marsh land Ecosystem.	*Fauna and Flora, water quality, water levels, drainage, sedimentation. Maps of critical systems, future developments and land use zoning.*	*Identified critical marsh lands during construction and operation phases along with other sites indicated in previous EA programmes.*	*Periodical programmes in consultation with an ecologist depending on the nature of importance to suit both construction and operation phases.*	*RDA with the assistance of the Engineer and the Contractor.*	

10. Road Accidents – During operation

Monitoring Objectives	Parameters to be Monitored	Monitoring Locations	Frequency	Responsible Agency	Cost estimates
To control serious and fatal accidents on the expressway due to and increased number of accidents on access roads	Law enforcement efficiency Sufficiency of programs on road user information systems /education, traffic signs and road markings. Success of emergency services, Proper functioning of accident review committee.	Sensitive locations – black spots identified by Consultants Records of accident review committee	At least once in three months	RDA	Pl. refer the cost table in the section IX of this document

11. Garbage Disposal – During Operation

Monitoring Objectives	Parameters to be Monitored	Monitoring Locations	Frequency	Responsible Agency	Cost estimates
To control garbage disposal by road users creating pollution and aesthetic discomfort	Efficiency of establishment of relevant programs and successfulness of their functions. *Adequacy of bins for garbage collection and efficiency of garbage collectors and road cleaners. Awareness programmes and sign boards. Mapping of critical locations.*	Crowded areas such as interchanges. Aesthetically attractive places or picnic areas. Places with garbage bins along the highway.	Once in two months Regular supervision of the garbage collection frequency and road cleaning.	*RDA in collaboration with Local Authorities*.	Pl. refer the cost table in the section IX of this document

12. Transportation of dangerous goods – During operation

Monitoring objectives	Parameters to be monitored	Monitoring locations	Frequency	Responsible agency	Cost estimates
To control transportation of dangerous goods that may create environmental hazards.	Requirements/standards for licensing of transporting such dangerous chemicals. Appropriate marking of the dangerous transport vehicles.	- Records maintained by relevant authorities - Main entrances of the Highway	Everyday	*RDA with Law enforcement Agency / Highway Patrols*	Pl. refer the cost table in the section IX of this document

13. Slope Stability

Monitoring objectives	***Parameters to be monitored***	***Monitoring locations***	***Frequency***	***Responsible agency***	***Cost estimates***
<u>During Construction</u> *To minimize slopes instability impacts during construction.* *1. Due to changes in actual conditions.*	*Thickness of the overburden, dip angle and the dip direction of the bedding plains, soil strength parameters and elevation of the ground water surface design assumptions.*	*Locations with more than 10 m. high overburden materiel above the bedrock.*	*Prior to excavations during early excavations.*	*RDA with the assistance of the Engineer and the Contractor.*	Pl. refer the cost table in the section IX of this document
<u>2</u>.Due to unforeseen factors	*Rainfall(intensity, duration and frequency) , settlement of the top of the slope, cracking of the surrounding area , appearance of springs at the bottom of the slope and elevation of the ground water table near the top of the slope. Design assumptions.*	*Locations along the trace with lower lower factor of safety against slope failure and any other location identified by a Geotechnical Engineer.*	*During wet season, during/immediately after unforeseen events effecting slope stability.*	*RDA with the assistance of the Engineer and the Contractor*	
<u>During Operation</u> *To maintain stable side slopes along the road trace, to minimize slope instability impacts.*	*Settlement of the top of the slope, cracking of the surrounding area including the road surface, appearance of springs at the bottom of the slope and elevation of the ground water table near the top of the slope.*	*Locations along the trace with lower factor of safety against slope failure and any other locations identified by a Geo-technical engineer.*	*During wet season and at or around unforeseen events.*	RDA	

14. Other aspects of Monitoring during Operation

Monitoring objectives	*Parameters to be monitored*	*Monitoring locations*	*Frequency*	*Responsible agency*	*Cost estimates*
To ensure buffer zones and landscaping in the vicinity of the highway are well maintained.	*Maintenance of buffer zones, landscaping status, vegetation growth and type.*	*Identified areas of the highway where zonation and landscaping using greenways concept has been done.*	*Weekly*	*RDA with the assistance with local authorities*	Pl. refer the cost table in the section IX of this document
To ensure that undue secondary development activities in the vicinity of the highway do not occur.	*Surveys pertaining to development of secondary activities along the highway. Maps of zonation.*	*Locations should be carefully identified and regularly inspected with responsible agencies.*	*Inspections once in two weeks.*	*UDA, law enforcement agencies.*	

15. Settlement and Ground subsidence- during operation

Monitoring objectives	*Parameters to be monitored*	*Monitoring locations*	*Frequency*	*Responsible agency*	*Cost estimates*
To mitigate impacts due to road trace subjected to settlement	*Settlement of the road surface and cracking, comfort indicators due to undulations.*	*Location where soil improvement is carried out and other locations identified at designs or during construction.*	*Once in six month*	*RDA*	Pl. refer the cost table in the section IX of this document

V. DESCRIPTION OF PUBLIC CONSULTATION PROCESS

22. Considerable amount of recommendations of Environmental Impact Assessment Report (CEA), Social Impact assessment Report (UoC), Resettlement Implementation Plan (RDA) and Resettlement Action Plan (MC) were based on affected communities in the Project impact area. Specially during planning, Implementation and monitoring activities of the Project should consult affected parties as much as possible to achieve the project implementation objectives.

23. It is necessary to identify when, how, for what and the tools of public consultation are to be used in consideration with the main project phases; Project Preparation, Construction and Operation. The following table describes the required activities.

Organizer	Approach	Times	Subject	Attendees
Project Preparation				
RDA, EIA Preparation Agencies	Public consultation	At least once	Project priority, effects, attitudes to the project, and suggestions	Residents within construction area
	Expert workshop	At least once		Specialists from various sectors
PPTA Team	Public workshop	At Least twice	Comments and recommendations of the public	Representatives of residents and social sectors
Construction Phase				
RDA	Public consultation and site visits Monitoring progress of provisions of solutions by the Contractor for Public Complaints.	At least twice a year Weekly review meetings with the Contractor and the Engineer (PCRM)	Adjusting of mitigation measures if necessary, construction impacts, comments and suggestions -Do-	Residents within construction area Assistance from Community Consultative Groups could be used.
	Survey /Audit on resettlement	At least twice a year	Comments and suggestions	Persons affected by resettlement and relocation NGOs/POs assistance could be taken.
	Expert workshop or press conference	At least once a year	Comments and suggestions on mitigation measures, public opinions	Experts of various sectors, media
	Public workshop	At least once a year	Adjusting of mitigation measures if necessary, construction impacts, comments and suggestions	Representatives of residents and social sectors
RDA-Regional Offices	Progress review sessions	At least twice a year	To discuss issues, decide solutions, re-planning	All program staff members of each RO

Operational Phase				
RDA	Public consultation and site visits	At least once every two years	Effects of mitigation measures, impacts of operation, comments and suggestions	Residents within construction area
	Survey social /environmental impacts and resettlement	At least once a year	Comments on resettlement, improvement of living conditions, livelihood and poverty reduction; comments and suggestions	Persons affected by resettlement and relocation
	Expert workshop or press conference	At least once every three years	Comments and suggestions on operational impacts; public opinions	Experts of various sectors, media
	Public workshop	At least once every two years	Effects of mitigation measures, impacts of operation, comments and suggestions	Representatives of residents and social sectors

VI. DESCRIPTION OF THE RESPONSIBILITIES AND AUTHORITIES FOR IMPLEMENTATION OF MITIGATION MEASURES AND MONITORING REQUIREMENTS

24. In consideration with the activities described in the Chapter 08 of Resettlement Implementation Plan (RIP) of STDP on institutional arrangement for implementation of Monitoring and Evaluation of program activities, sufficient skills should be with the members of program staff. Chapter 09 of the ADB Hand book on Resettlement also emphasizes the same.

25. In addition, the Resettlement Action Plan (July-2003) prepared by Management Consultants of STDP have recommended to have proper Planning, Reviewing and Orientation sessions for most of the program implementation activities.

26. During construction, four field offices are to be established to carry out environmental monitoring. Three parties, namely the Contractor, Supervision consultant and Management consultant, will carry out the monitoring. During operational stage it would be the responsibility of the RDA to carry out the monitoring under the CEA's direction. Therefore, RDA and PMO are to be strengthened in environmental management, through awareness of requirements of environmental legislation, developing an EMP, and institutionalizing emergency response measures. The RDA has initiated this process through the appointment of a Deputy Project Director who shall be responsible for overseeing the environmental monitoring.

27. To fulfill the above requirements, necessary skills should be available with the RDA, Management Consultants, Supervision Consultants and the Contractor.

28. Through the Institutional strengthening and Training programs, implementation of programs of identifying needs of skills and relevant training, preparation and implementation of such programs would be necessary.

29. Incorporating services of Experts in such programs and appointing required staff is also equally important to achieve these objectives realistically.

1.New Recruitments		**Location/Institution**	**Timing**
Environmental Impact Monitoring Officers (4Nos) Social Impact Monitoring Officers (04 nos.)		-4 field offices	During construction
Environmental Experts (03 Nos.) Environmental Managers (03 Nos.)		- RDA (1), Supervision Consultants (2) - Contractors (3),	During construction
2. Strengthening Activities	**Agencies**	**Strengthening Plan**	**Timing**
Capacity Building	RDA ESD PMO	Institutional organization; Development of responsibilities for each position Resettlement Reviewing MIS Management Reporting (Progress, Issues)	During Project Preparation and Implementation
Monitoring and Evaluation	Same as above	Procurement of related monitoring instruments and equipment Internal Resettlement Monitoring Resettlement Evaluation	Same as above

		Environmental Impact Monitoring		
3.Training	**Attendees**	**Contents**	**Period (Days)**	
EMP implementation and Adjustment, settlement of disputes	RDA ESD PMO CEA	Development and adjustment of EMP; Emergency response; Environmental laws and regulations; environmental management	5-7	
Environmental processes,	Same as above	Engineering technologies; Pollution control; Equipment selection and procurement	8-10	
Water quality and quantity monitoring	Same as above	Monitoring methods; Data collection, processing and reporting system	8-10	
Environmental policies and plans	RDA ESD CEA	Environmental laws and regulations; Environmental management; emergency response	3-5	

VII. DESCRIPTION OF RESPONSIBILITIES FOR REPORTING AND REVIEW

30. Environmental monitoring is based on baseline measurement of indicators. The following reports contain the relevant locations and testing results:

(i) Background Noise Monitoring Report, ITI, May 2003.
(ii) Drainage Report on STDP: Effects on Ground Water Levels and Water Quality in the Project Area, University of Moratuwa, May 2003.
(iii) Report on Baseline Air Quality Data for Southern Expressway, CP 42898, ITI, March/June 2003.

Social impacts monitoring baseline is in the IOL and Socio-economic data collected by the Resettlement Assistants.

31. Monitoring of the impacts requires a proper documentation and reporting system and a computerized database for items listed including preconstruction, construction and post construction monitoring results. This database will be established and maintained in the Contractor's office during construction and regularly copied to the Supervising Consultant-Engineer and RDA / MIS system where the MC consultants have access to it for overall monitoring of the impacts. The Contractor will submit monthly environmental reports with results of testing and verification to the Engineer to be forwarded to RDA. At the same time internal monitoring will be done by EIMO with the guidance of MC. EIMO 's report will be studied by relevant PM who will submit it to the PD. MC will review both reports and PD/ RDA will forward the report to CEA, JBIC and ADB complemented by RDA's own general monitoring results, if necessary. The reporting format will correspond to the monitoring program as presented elsewhere in this report. The line of reporting is given in Figure 4.

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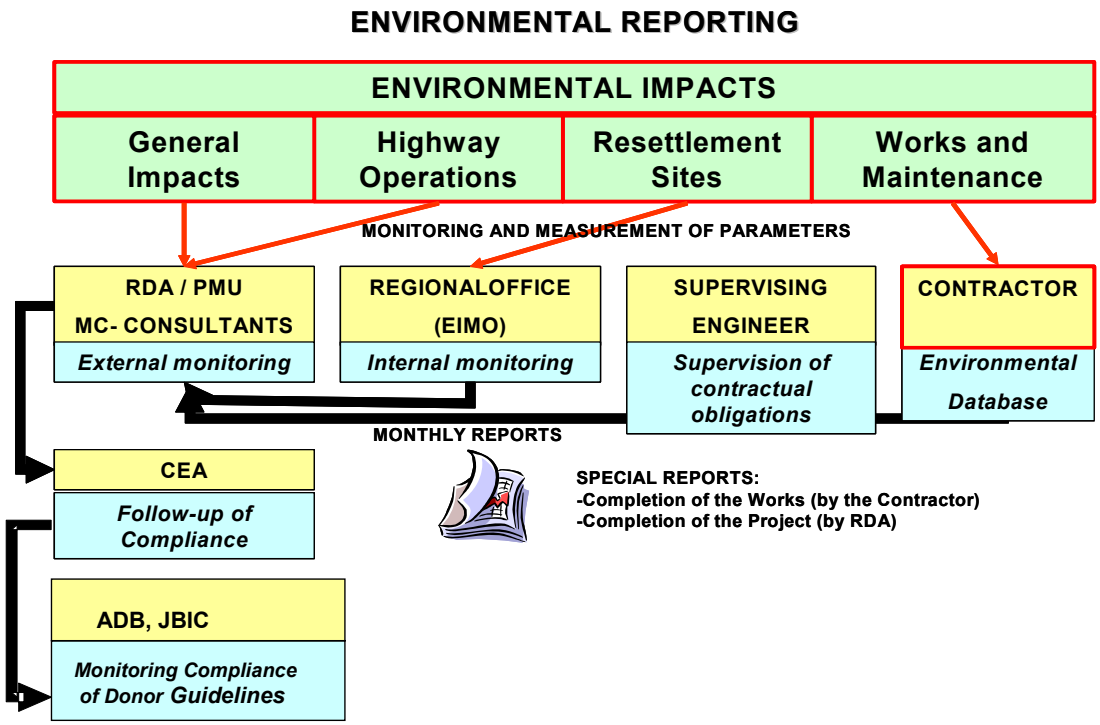


Figure 5: Environmental Reporting

VIII. WORK PLAN

32. This includes staffing chart, proposed schedules of participation by various members of the project team, and activities and inputs of various Government agencies.

Further clarifications in relation to the following chart describing the Work Plan:

A. Supervision Consultancy – Two Supervision Consultants (ADB and JBIC sections)

Two Environmental Experts/Advisors with qualifying degree and experience in environmental sector and Site Inspectors/Officers shall be formally appointed with proper TORs to strengthen supervision of current environmental impact management activities by the Supervision Consultants. Proper progress reviewing and reporting system to be maintained by the SC in coordination with the Contractor and RDA. Site inspectors shall be trained to monitor and supervise environmental aspects of the Works.

B. Contractor-

Total of three Environmental Managers and three environmental officers with qualifying degree and experience in environmental sector shall be formally appointed (one for each Contractor) in ADB and JBIC sections. The Contractor's site management shall be trained to monitor and supervise environmental aspects of the Works.

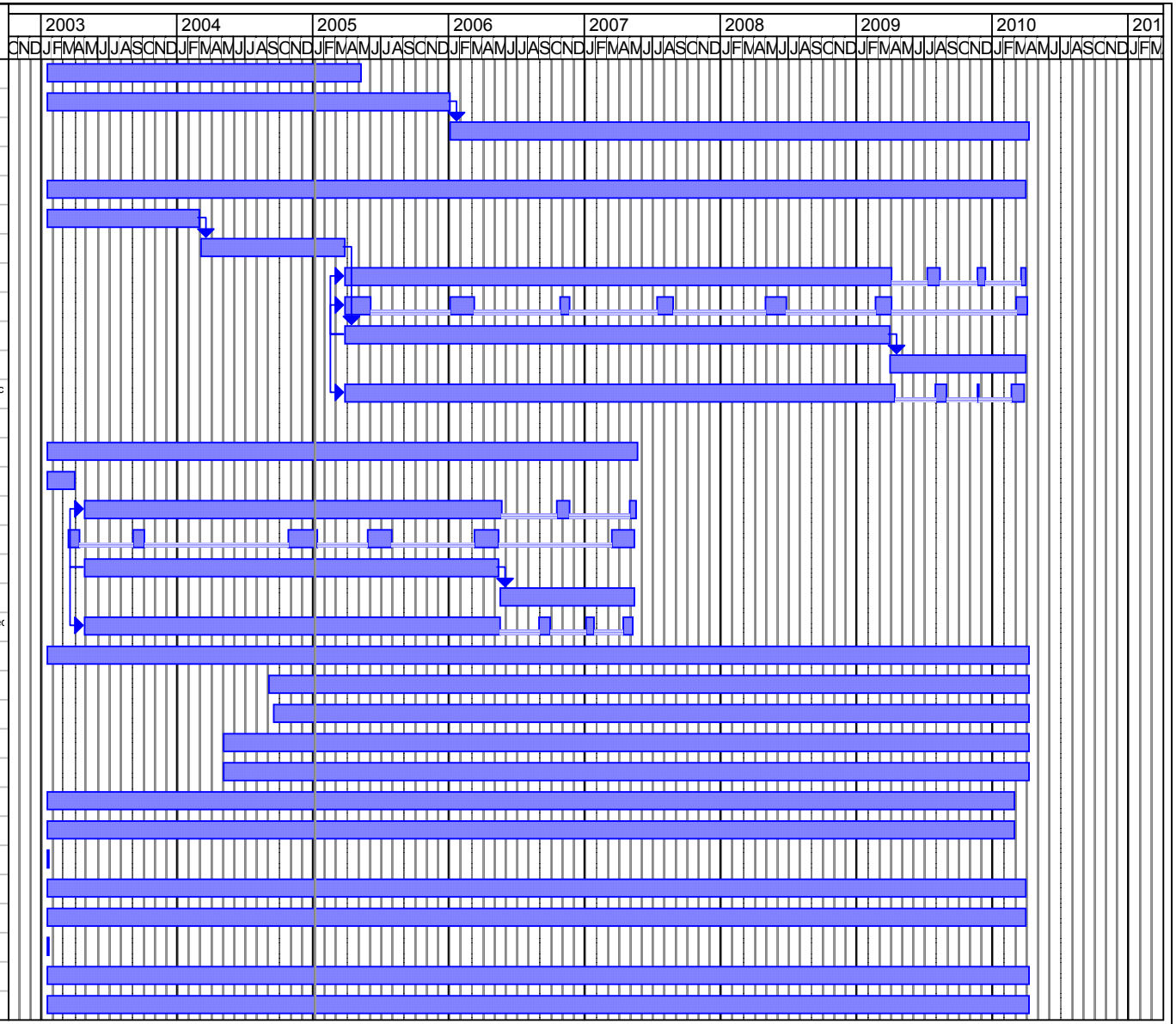
C. RDA- Project Executing Agency

(i) Deputy Director (LAR & Env.) assumed his duties in September 2004. DD will coordinate relevant activities with the Project Managers, EIMOs and SIMOs.
(ii) Environmental Impact Monitoring Officers (EIMO) and Social Impact Monitoring Officers (SIMO) to be appointed to each Regional Office.
(iii) One local environmental expert will be additionally recruited for special environmental tasks.
(iv) An Environmental Unit shall be established in RDA coordinating all environmental activities in RDA including the STDP. This unit shall include sufficient foreign expertise during the initial stages with training requirements for local environmental expert staff. Details of this arrangement shall be worked out in agreement with CEA and RDA. The following schedule does not include this Unit.

D. Other Government / Local Government Agencies

(i) Divisional Secretaries, Grama Niladaries from DS Offices, Officers from District Offices from CEA and Officers from Dept. of Agrarian Services are being involved in solving environmental problems on a daily basis.

ID	Task Name
1	**Resettlement and Land Acquisition (RDA)**
2	**Road Safety Consultancy (SWEROAD)**
3	**Stage2 - Expressway Component**
4	**JBIC - Section**
5	**Design and Supervision Consultancy (PCI)**
6	Design Review and Bidding Documents
7	Procurement of Works and preconstruction activities
8	Environmental Expert (1) Site Inspectors (6)
9	International Environmental / Resettlement Expert
10	**Construction Contract Period (2 Contracts)**
11	Defects Liability Period
12	Environmental Manager (2) Environmental Officer (2) Site Inspec
13	**ADB-Section**
14	**Supervision Consultancy (HALCROW GROUP)**
15	Design Review
16	Environmental Expert (1) Site Inspectors (6)
17	International Environmental / Resettlement Expert
18	**Construction Period (KUMAGAI GUMI)**
19	Defects Liability Period
20	Environmental Manager (2) Environmental Officer (1) Site Inspec
21	**RDA - Implementation Agency**
22	**Impact Studies (RDA)**
23	Deputy Director (LAR&Env.)
24	Project Managers (2, in Regional Offices)
25	EIMO (4), SIMO (4)
26	**Management Consultancy (FINNROAD)**
27	Environmental / Social / Resettlement Experts (2)
28	**Govt/Local Government Agencies**
29	Divisional Secretariats & Ag. Serv
30	Grama Niladaries and others as and when required
31	**CEA - Monitoring**
32	Regular Monitoring Committee meetings and site visits
33	CEA District level Officers



IX. DETAILED COST ESTIMATES

33. Environmental measures are identified in the table below. These comprise the pre-construction stage cost estimated at over US$ 29.5 million, for both JBIC and ADB sections, and construction stage costs estimated at over US$ 6.9 million for both sections. Monitoring cost is estimated as US$1.5 million. The assumptions used in developing the cost estimates are provided as footnotes.

34. Monitoring costs during operations will be borne by the implementing/operating agencies. The cost allocation also includes a budget for institutional strengthening.

COST FOR ENVIRONMENTAL IMPACT MITIGATION MEASURES		
Environmental Concern	**Estimated Costs (in USD 000')**	
PRE-CONSTRUCTION STAGE	**ADB Section**	**JBIC Section**
1. Social impacts	13200	15300
2. Hydrological impacts	250	290
3. Erosion control	100	110
4. Noise barriers	50	50
5. Exploitation handling and storage of const.materiels	50	50
6. Spoil disposal	20	20
7. Impacts on road trace design	20	25
Sub-total	***13690***	***15845***
CONSTRUCTION STAGE		
1. Hydrology & drainage, Irrigation Impacts.	750	870
2. Orientation for Contractor and Workers	25	25
3. Water Quality (Ground+Surface)	15	15
4. Air Quality	60	66
5. Noise/Ground vibration, Damages to properties from blasting	200	210
6. Soil erosion/surface runoff, Slope stabilization & Settlement Ground subsidence	270	280
7. Explosive handling, transportation and storage of construction materials.	100	110
8. Spoil and construction waste disposal	200	224
9. Work camp operation and location	125	135
10. Loss of vegetation cover of the areas for temporary work space.	300	350
11.Safety precautions for the workers	To be borne by the Contractor	To be borne by the Contractor
12.Traffic condition	50	50
13.Salinization	250	250
14.Impact on wetlands	150	150
15.Social impacts	275	300
16.Institutional strengthening and capacity building	500	500
Allowance for Mitigation During ***OPERATIONAL PHASE****	50	50
Sub-total	***3320***	***3585***
Contd...to page 57		

COST FOR ENVIRONMENTAL MONITORING	**(For both sections)**
1. Social Impacts (Construction stage)	20
2. Hydrology - (Construction+ Operational)	115
3. Water Quality, Ground Water- -Do-	250
4. Air Quality - -Do-	175
5. Noise/ Ground Vibrations, Explosive handling/transporting/storing - -Do-	175
6. Social Impacts – (Only for Operational Stage)	150
7. Road Accidents - -Do-	150
8. Slope stability, Sediment quality (Constrution+Operational)	150
9. Settlement and Ground subsidence (Constrution+Operational)	150
10. Garbage Disposal - - Do-	120
11. Transportation of Dangerous goods - -Do-	20
12. Protection of Natural Environment - -Do-	40
13. Expenditure on CEA Monitoring Committee activities	30
Sub- total	***1,545***

The figures in the above table are included in the Project costs through various consultancy / construction contracts and the GOSL commitment dispersed through the costs of the Works and incremental costs in the ADB Loan Agreement. The costs include both inevitable Project impact mitigation and direct impacts of the works.
The purpose of the cost estimate is to show in general terms the Government responsibility and input, in financial terms within the framework of the Project financing and this EMP, for environmental considerations.

Assumptions regarding the figures presented in the above cost table:

1. ADB and JBIC sections of the STDP were considered to be equal in length (as against the actual 65km vs. 68km) and cost estimates were also equally divided into two segments irrespective of the actual physical ground settings of the two segments. However, LAR costs are based on prevailing actual budgets.
2. These preliminary cost estimates need to be subsequently updated/improved by RDA taking into consideration the ground realities of the segments.
3. Broad cost estimates for the environmental concerns identified in the EMP were reached using SEIA for the Fuzhou environmental improvement project in the Peoples Republic of China, ADB 2004 as a guiding document for relative sizes of the estimates.
4. Total costs related to studies and actual implementation of works respectively includes costs for all executive and implementation agencies.
5. Costs related to operation and maintenance phases will be borne by the executive and the implementation agencies/companies
6. Environmental monitoring cost estimates were based on provisional cost recommendations given in Environmental Finding Reports of STDP and expert opinion where information is lacking.
7. Operational phase estimates for environmental monitoring were substantially higher than the construction phase estimates due to their relative time duration of monitoring.
8. All mitigation measures are expected to be incorporated in the construction phase.
9. An allocation of USD 50,000 each was identified for two sections as cost of mitigation for the operational phase. This allocation could be used for mitigation measures that may be identified during the proposed monitoring programmes.

35. During Operations, the air quality, noise, road accidents, garbage disposal, transportation of dangerous goods, landslides and soil erosion will be monitored. The cost calculated here should be included in total project costs of proposed programme activities, will be implemented by deferent Agencies during operation of the Highway.

XI. MECHANISMS FOR FEEDBACK AND ADJUSTMENT

36. RDA and PMU have arranged to develop a mechanism to accommodate continued feedback and adjustments in the Project implementation, monitoring and supervision work. As described elsewhere in the documents, implementation of the EMP will be the responsibility of the EA and the contractors during the implementation stage and during operations. The independent monitors will be sending the monitoring reports to the Environmental Monitoring Committee through the CEA. Any decisions and recommendations, including any specific adjustments, within the framework of the overall project objectives discussed during the committee meetings will be conveyed by the CEA to the EA. The implementation of these specific requests will be the responsibility of the EA. The independent monitors will send special reports back to the committee on the progress made on the specific requests. Complaints hotlines will be set-up for contractors, RDA, and CEA. The hotlines will be advertised at public consultations, the project website, and in construction sites, and other project areas. The cost for implementation of the adjustments will be the responsibility of the EA.

The Donors will be kept informed of the Environmental Monitoring Committee decisions. Minutes of the Committee meetings shall be sent regularly to the Donors.

MC will include environmental status and monitoring results in their respective Monthly and Quarterly Reports to RDA, ERD and Donors.

Appendix 1:

Conditions given through the Environmental Clearance from the CEA

From CEA

Ref No. 08/TRANS/01/99

Date: July 23, 1999

Chairman
Road Development Authority
"Sethsiripaya"
Battaramulla

Environmental Impact Assessment (EIA) of Southern Expressway Development Project

This is to inform you that the Central Environmental Authority (CEA), after study of the EIA report of the proposed Southern Expressway dated March1999 and submitted by you on 4th May 1999, your responses to the comments received from the public and public hearing and subsequent responses received from you on clarifications sought by the Technical Evaluation Committee (TEC) appointed by CEA and the final report of the TEC has decided in terms of regulation 13 of the National Environmental (procedure for approval of projects) Regulation No. 01 of 1993 to grant approval for the implementation of the above project subject to the following terms and conditions:

General

I. This environmental clearance is valid for the implementation of the Southern Expressway as specified in the EIA Report dated March 1999 submitted by the Road Development Authority (RDA).
II. This clearance is valid for three years from the date of issuance of the letter unless upon written application to CEA within thirty days prior to expiry date, the validity period is extended.
III. RDA should where necessary obtain fresh approval in terms of Regulation 17 (i) (a) contained in Gazette Extra – ordinary No. 772/22 of 24th June 1993, in respect of any alterations that are intended to be made to the project.
IV. RDA is bound to ensure that the terms and conditions given in this letter are adhered to and have full control over a third party that may be involved in project implementation. CEA should have access to the contract documents pertaining to environmental aspects, entered into by RDA and any outside contractors.
V. RDA shall intimate to CEA, the date of commencement of project construction activities, inclusive of a phased implementation schedule.
VI. A copy of this letter of clearance should be kept in the project site(s) at all times, for purpose of perusal by concerned agencies.
VII. It is the duty of RDA to inform CEA of any environmental impacts which are not anticipated at this stage. In such an event, relevant guidelines and necessary mitigatory measures should be implemented as directed by CEA or the Monitoring Committee. RDA should ensure that such impacts are properly assessed and addressed even at a later stage of project development.
VIII. RDA is obliged to temporarily suspend any project activities on the instructions of CEA, if unforeseen adverse impacts associated with the project cannot be adequately mitigated on due notice being given by CEA.
IX. The Urban Development Authority in its Colombo Metropolitan Regional Structure Plan has identified the Weras Ganga / Bolgoda lake wetland as a major recreational

area. It is recommended that the final trace should be moved on to the original RDA trace, as specified in the EIA Report, at this location.

X. Wetland Site Reports and Conservation Management Plans have already been prepared for Koggala, and Madu Ganga wetlands. The proposed expressway should be sited in such a manner to avoid traversing through these wetlands.

XI. The proposed expressway should be sited in such a manner as to minimize traversing through wetlands other than those mentioned in IX and X above as far as practically possible. A comprehensive drainage plan to be designed implemented in order to minimize impacts on all wetland areas.

XII. The project proponent should co-ordinate closely with planning agencies such as the UDA, and relevant Provincial and local Authorities, Divisional Secretariats to resolve any conflict with existing development plans along the trace and also co-ordinate with the relevant authorities in the preparation of development plans for interchanges and also to regulate land use adjacent to the expressway.

A Hydrology and Drainage Aspects

1. Adequate steps shall be taken to mitigate the adverse impacts on surface water hydrology, ground-water hydrology, flooding, drainage congestion and storm-water drainage as identified in the EIA report.
2. The two most significant hydrological impacts identified – viz, flooding and drainage congestion upstream and the impacts on wetlands downstream should be mitigated in keeping with the recommendations given in the Annex 1. The mitigatory measures shall be incorporated in the final detailed designs.
3. To ensure that these impacts are properly analyzed and are designed accordingly, the Terms of Reference for the design Consultant to the RDA shall incorporate the following items to be studied and submitted in a "Drainage Design Report"
    - i) Hydrological analysis for each catchment
    - ii) Identification of areas sensitive to flooding
    - iii) Hydraulic design of bridges and other structures
    - iv) Computation / estimation of changes in ground water levels in wetland areas and in areas where the downstream drainage paths have been modified.
    - v) Quantification of any changes in flow regimes into receiving inland water bodies, which could influence water quality in those water bodies.
    - vi) Changes in drainage patterns in flood protection schemes / drainage schemes encountered by the expressway terrace.
4. The Project Proponent shall submit a copy of the completed "Drainage Design Report" to the CEA, with sufficient time to obtain comments and concurrence of other affected parties.
5. In view of the need to incorporate baseline data on ground water in the project area, RDA shall institute collecting such information now and submit them to the CEA.
6. Recommendations given in sub section 7.2.7 and 7.2.10 of the EIA report shall be implemented by the Project Proponent.

B Construction material exploitation, Handling, Transportation and storage.

1. Recommendations given in the sub sections 7.2.1,7.2.,7.2.3 and 7.2.6 of the EIA report should be implemented.
2. If offshore sand is to be used as fill material, a separate EIA should be carried out for mining, storage, transport and placement. A mining licence should be obtained from Geological Survey and Mines Bureau (GS & MB) for offshore sand mining.

3. Licence for borrow pits must be obtained from the GS&MB for all mining activities such as quarries and borrow pits.
4. Mining licence/s should be obtained for mining of river sand required for construction activities.
5. Additional quarries for the supply of rock aggregate shall be identified at the early stage of the project activities, and approvals shall be obtained form GS&MB, CEA and the relevant Local Authority before the commencement of operations.
6. Necessary approval shall be obtained from CEA and the relevant Local Authority for the operation of the metal crushers prior to commencement of operations.
7. The routes for transport, including unusually heavy loads shall be subject to agreement with the appropriate traffic authorities
8. Movement of heavy loads for project purposes shall be done with the concurrence of the concerned authorities and shall be done at non-peak traffic times.
9. Transport, loading and unloading of materials shall be carried out in such a way as not to cause nuisance to the people.
10. To prevent dust blowing from open-topped lorries, it is necessary to ensure that the loads are covered, when transported.
11. During dry periods it is necessary to dampen the exposed areas and the access roads at regular intervals to prevent emission of dust.
12. The measures indicated above 1 to 11 should be included in the contract document, so that the contractor is held responsible for carrying them out during construction, and on completion of the work.

C. Asphalt & Concrete plant operation

1. Necessary approvals shall be obtained from CEA for the asphalt and concrete plants prior to the commencement of operation.
2. Mitigatory measures suggested in subsection 7.2.9 of the EIA report should be implemented.

D. Spoil Disposal

1. Details regarding the areas and locations where the removed material is to be disposed of should be marked in a map of 1:5000 scale map and forwarded to CEA for prior approval.
2. Recommendation given in the subsection 7.2.8 of the EIA report should be implemented.

E. Air Quality and Noise

1. Noise generated form the proposed expressway construction as well as use shall not exceed the maximum permissible values as mentioned in the Gazette Extra Ordinary No. 924/12 dated 23.05.1996 for low, medium and high noise areas and silent zones it will traverse.
2. Recommendation given in sub section 7.3.1 of the EIA report should be implemented.

F Sociological Aspects

1. The final trace should be selected in such a way that it minimizes the relocation of people while maximizing potential development opportunities as well as contributing positively to anticipated further development programmes in the region.
2. A detailed resettlement plan and compensation package should be submitted to the CEA for approval.

3. Acquisition of land should be expedited in order to minimize the uncertainty of people.
4. When acquiring residential land and houses, alternative land should be provided together with sufficient compensation to enable families to build and move into new houses.
5. When providing alternative land, every attempt should be made to give land close to the acquired land, preferably in the same Grama Niladari Division (GND), in order to preserve the social structure of the village.
6. If such land for relocation is not available, land acquired near the interchanges for development should be offered to the displaced people.
7. In payment of compensation for acquired land with structures, particularly dwelling houses, the minimum payment should be the market value.
8. Compensation for non-residential lands should be paid on the basis of the present market value of the property. In estimating the value of cash crops such as tea, rubber and coconut, the potential income within the next ten years should be taken into account.
9. The payment of compensation should not be delayed and should be paid before moving into the alternative land.
10. Usable building materials of the acquired houses should be given to the owners and the value of such materials should not be taken into account in the payment of compensation.
11. In the case of cultivated paddy land coming under the tenant farmer system, compensation should be paid to both the landowner and the tenant farmer.
12. If compensation cannot be paid to those who are residing on crown lands and are displaced an incentive should be given to the displaced families to construct houses. Alternative lands should be made available to these families irrespective of the ownership of the land they occupy at present. Compensation should be paid for the crops in those lands.
13. Overpasses or underpasses should be designed as appropriate at the points where the existing transport links cross the Expressway.
14. Access to village roads (the roads through which people travel to paddy fields, tea estates etc.) should be preserved by designing underpasses.

G. Aesthetic Aspects

1. Qualified professional should be engaged during design and construction stage in order to give due consideration to aesthetic aspects. Town Planners, Architects, Urban Designers, Landscape Architects should be included in the design team. All the structures above the ground should be harnessed with the natural environment and they must enhance the aesthetic quality.
2. Recommendation given in subsection 7.1.2 of the EIA report should be implemented.

H. Road safety aspects

1. The RDA should take necessary action to establish animal crossings in order to avoid accidents wherever necessary
2. Recommendations given in the subsection 7.1.1 and 7.3.2 of the EIA report should be implemented.

I. Archeological, religious and Culturally Important sites

1. Final trace should be designed in such a way that it avoids any damages to the archeological, religious and culturally important sites.

J. Monitoring Programme

1. The RDA shall forward to the CEA an environmental monitoring plan as specified in the Chapter 10 in the EIA report. It should contain the work schedule, parameters to be monitored with intervals /frequencies and the responsible agencies for monitoring each parameter. This plan should be approved by the monitoring committee.

2. Monitoring Programme should be implemented to monitor the parameters suggested in chapter 10 of EIA report as soon as the approval is granted, so as to establish the baseline data for compensation purposes.

3. All costs incurred by the monitoring committee appointed by CEA to oversee implementation of mitigatory measures and the monitoring plan, shall be borne by RDA.

The developer shall comply with any additional conditions that may be communicated from time to time by the CEA during the execution of the project.

T.K.Dassanayake
Chairman
Central Environmental Authority

CC: Secretary, Ministry of Finance
Secretary, Ministry of Forestry & Environment
Director, External Resources
Director, Geological Survey and Mines Bureau

Appendix 2: Summary of Environmental Management Plan.

(Cost estimates are in the table in the section IX of this document)

1. **Environmental concern**	**2. Objectives**	**3. Mitigation Measures recommended**	**4. Proposed timing to implement the Mitigation Measures**	**5. Proposed locations where to implement the Mitigation Measures**	6. **Proposed Party to Implement Mitigation Measures**	7. **Proposed Monitoring Party**
		A. PRE-CONSTRUCTION STAGE				
1. Social Impacts	To ensure that the adverse impacts due to the property acquisition and resettlement are mitigated according to the RIP.	1. **Social Impacts** To ensure that the adverse impacts due to the property acquisition and resettlement are mitigated according to the RIP. Social Preparation basically completed. Impacts are ***NOT LIKELY UNLESS THERE ARE UNFORSEEN CIRCUMSTANCES.*** If unforeseen additional land will be required for Stage 2, the following mitigation measures should be adopted: 2. Acquisition of lands activities to be carried out and expedited in order to minimize the uncertainty of people. 3. To implementation of RIP and hold LARCs to provide compensation and assistance to the APs. 4. When acquiring residential land and houses, alternative land is to be given together with sufficient compensation to enable families to build and move into new houses. If such re-location land is not available, land acquired near the interchanges for development is to be offered to the displaced people or vacant lots in the Resettlement Sites. 5. All the payments/entitlements to be paid according to the Entitlement Matrix, which was prepared according to the RIP. 6. All the impacts identified by the EIA are incorporated in to the RIP and relevant entitlements included into the Entitlement Matrix.	Before the removal of houses and other structures and the APs to be given sufficient time with compensation money and assistance to resettle satisfactorily.	Targeted Families according to the Divisional Secretariats and Grama Sevakas. The Grama Sevaka and The Project Staff will prepare an Inventory of Losses (IOL).	RDA	MC and External Monitors

2. Hydrological Impacts	To minimize hydrological and drainage impacts during constructions.	1. Hydrologic flow in areas where it is sensitive, such as for paddy lands and wetlands was facilitated through provision of permeable base layer in the road base with appropriate drainage structures including bridges and culverts. 2. Redistribution of sheet flows was provided in the design for identified significant impact areas. 3. Design of adequate major and minor drainage facilities was completed. 4. Major wetlands such as Koggala, Bolgoda were avoided in the road trace design. 5. Bridges and drainage structures over various water bodies in the river basins of the Gin Ganga Polwatu Ganga, Nilwala Ganga, Kalu ganga, Benthara Ganga, Welpenna Ganga and Koggala lake have been designed to maintain pre-project flows. *6. Considered to ensure that all unconnected culvert crossings properly connected to the lead away drains to establish drainage continuity and ease flooding.* *7. Considered that the soil dumping should not disturb the existing drainage paths & retention areas.* *8.Considered that the complaints from stakeholders about flooding and drainage congestion should be handled by a committee comprising all relevant line agencies.(DS,GS,Pradesheya Saba, District Irrigation Engineer, Agrarian services etc)* *8. Liaised with the Irrigation Department and obtained approvals for the construction of Bridges across major waterways and other irrigation structures.* *9. Liaised with Provincial Irrigation Engineer and Department of Agrarian Services to resolve issues regarding minor irrigation schemes.* *10.Drainage structure designs were critically evaluated and critical culverts and bridges (e.g.Galle Port access road culvert on Lunuwila Ela and Kaluganga bridge) were enlarged to cater to high return periods and inundation aspects .Considered the necessity of monitoring and recording of rains and water levels at critical water ways and at each drainage structure of project.*	Before the commencement of construction activities/during designing stage 2.	Along the Final Trace, areas along wetlands, paddy lands, water bodies. Considered locations as to be concentrated are in the Drainage Report of STDP. May 2003 (Tables 6.1, 6.3, 6.4, 6.5 pages 120-127)	RDA with the Design Consultant	RDA
3. Impacts on Road Trace design	To ensure that the recommendations given with the conditional approval by the CEA were followed by the design Consultants.	1. The proposed final trace has been designed to avoid Koggala, Madu Ganga and Bolgoda wetlands. 2. Overpasses and underpasses have been designed. 3. Existing irrigation and flood protection schemes have been identified. 4. The impacts related to the aesthetic value of the local environment have been considered and will be included and extended for Stage 2	Before the commencement of construction activities/during design stage.	1. Koggala Madu ganga and Bolgoda Wet lands to be avoided. 2. A list of locations of overpasses was prepared 3. A list of	RDA with the Design Consultant	MC and Supervision Consultant

				agricultural and flood protection schemes was prepared.		
4. Erosion Control (EC) and Temporary Drainage(TD)	To improve mitigation in Stage 2 and comply with CEA conditions. To include preliminary designs for EC and TD in stage 2 Contract.	1. Identify locations for EC and TD along all embankments to be expanded and at all culverts and cross tunnels/metal structures. 2. In contracts/variation order for 4 lane construction specify locations for EC and TD based on Stage 1 experience and complaints and include in contract as a payment milestone(s)	During design stage no later than pre-qualification or tender negotiations. Include in the stage 2 contract/variation.	Locations based on complaints and problems as advised by SC.	RDA with the SC and design consultant.	MC and Supervision Consultant
5. Noise Barriers	To ensure noise impacts are acceptable in operational phase.	1. Conduct detailed acoustic assessment for all residential, school, temples, (other sensitive structures) within 50m of road. Base on best estimate of traffic for 4 lane road in 2025. 2. If noise at sensitive receiver exceeds CEA criterion [E.G.LEQ 67 DB (A)] design and include in stage 2 construction acoustic measures to control noise at source, EG. Earth berm/ solid barrier t attenuate noise to below CEA criterion.	During designing stage no later than pre-qualification or tender negotiations. Include in the new 4 lane Contract /variation.	Noise sensitive locations	RDA with the MC/SC and Design Consultant.	MC and Supervision Consultant.
6. Exploitation handling, transportation and storage of construction materials.	To minimize contamination of the surroundings due to implementation of works, asphalt, concreate and aggregates crushing plants.	In order to minimize and or avoid adverse environmental impacts arising out of construction material exploitation, handling, transportation and storage measures to be taken shall be in consideration of the following EIA/CEA conditions/recommendations; - Conditions that apply for selecting sites for material exploitation - Conditions that apply to timing and use of roads for material transport - Conditions that apply for maintenance of vehicles used in material transport or construction - Conditions that apply for selection of sites for material storage - Conditions that apply for rock blasting and aggregate production	List of borrow areas to be prepared one month prior to stage 2 construction. A list of routes of transport of construction material is to be prepared for the contract and agreed one month prior to stage 2 constructions.	Borrow areas, access roads, transport routs, storage sites, and construction areas.	Contractor and SC to agree	RDA/ ESD

		- Conditions that apply for handling hazardous or dangerous materials such as oil, explosives and toxic chemicals. - Compile materiel management plan monthly and include in progress report.				
7.Spoil Disposal	To ensure adequate disposal options for unsuitable soils.	Identify sufficient locations for disposal of 1,000,000m3 spoil (or best estimate) In contracts/variation order for 4 lane construction, specify locations for disposal at unit rates for re-measurement. Designate disposal sites in the contract and cost unit disposal rates according to distance.	During designing stage no later than pre-qualification or tender negotiations. Include in the new 4 lane contract/variation	Locations approved by CEA, authorities and CSC.	RDA with the Design Consultant.	MC with the Supervision Consultant
		B. CONSTRUCTION STAGE				
1. Hydrology and Drainage Aspects	To ensure the proper implementation of activities mentioned in CEA conditional approval letter in relation to Hydrology of the project. To avoid deterioration of water quality, sedimentation, temporary flooding, creation of stagnant water bodies and effects on ground water level and quality.	1. Preparation and implementation of a thorough plan (hydrology and drainage) including its review and updating. Plan should be approved by CSC one month before construction and reviewed and or updated for implementation during construction. 2. Use of extensive erosion and sedimentation control measures at all construction sites (e.g. geotextiles, silt fencing, benching of cuts, sediment basins and sediment traps, filter fabric fences, straw bale barriers etc). 3. Provision of proper drainage systems at all construction, material exploitation; and storage sites prior to their use. Stockpiles should also be covered before heavy rains and should not be located within 20 m of water causes. There should be an intervening vegetated buffer to control any unexpected run-off. 4. Consideration of weather conditions when particular construction activities such as cut operations are undertaken. 5. Limitations on excavation depths in use of recharge areas for material exploitation or spoil disposal. 6. Use of landscaping as an integrated component of construction activity as an erosion control measure. 7. Minimizing the removal of vegetative cover as much as possible and providing for it s restoration where construction sites have been cleared of such areas. 8. Some other mitigatory measures recommended in Drainage Report of STDP to be followed. (Section 11, page 169)Contractor's Emergency Flood Mitigation Plan and CEA conditional approval letter.	A Proper timetable prepared in consideration with the climatic conditions of each area, the different construction activities mentioned here to be guided.	1. Locations of each construction activity to be listed by the Engineer. 2. Possible flood sensitive area as mentioned by the Drainage Report are as follows; (ADB section) 7+440,10+700 11+600 to 12+100 13+200 to 13+900 14+620,17+950 18+300 to 18+700 18+800 to 19+200 29+600,42+500 45+340,45+941 46+650,47+00 50+980,52+953 54+100,59+000 to end 2. Special locations are identified along the pilot road by the Contractor to minimize	1.Contractor 2. Relevant locations are in the Contractor's Manual including Emergency flood mitigation plan.	RDA/ MC

		9. *Ensure connectivity of all lead way drainage paths. This should be systematically recorded.* *10. Ensure sufficient crossings and openings in the service road to avoid short term inundation.* *11. Examine critical culverts and if necessary further increase the opening size to cater to a higher return period.* *12. Systematic collection and analysis of the stakeholder complaints regarding drainage.* *13. Liaise with Irrigation Department, SLLRDE, etc. to obtain approvals for drainage structures.*		disturbances to rainwater runoff and floodwater and provided with causeways and structures; this list is in their manual. 3. A list of locations of flood sensitive areas of the ROW is also in the manual. 4. Construction sites of road bridges and river bridges, which will be affected to drainage/flood, are defined in a map. 5. A list of locations of culverts is with the Contractor 6. A list of locations of weather stations of the contractor is available.		
2.Soil Erosion/Surface Run-off	To minimize soil erosion due to the construction activities of highway. To prevent adverse water quality impacts due to negligence. To ensure unavoidable impacts are managed effectively.	1. Preparation of TEMPORERY EROSION CONTROL PLAN one month before commencement of works and to be reviewed monthly. 2. Planning of cut and fill, land reclamation etc.while considering climatic conditions. The area can be subject to heavy rain. 3. Proper installation of TD and EC before works within 50 m of water bodies. 4. Meaningful water quality monitoring up and downstream at all bridges during construction. Rapid reporting and feedback to SC. 5. Back-fill should be compacted properly in accordance with design standards and graded to original contours where possible. 6. Cut areas should be treated against flow acceleration while filled areas should be carefully designed to avoid improper drainage.	During construction (cut and fill, land reclamation etc.) while considering the climatic conditions.	1. A List of sensitive areas during construction to be prepared by the Engineer in consideration with the cut and fill, land reclamation, borrow areas etc. 2. Locations of culverts for the pilot road and Highway are available.	Contractor to implement . Engineer should ensure that the Contractor implements relevant activities successfully.	RDA/ MC

		7. Stockpiles should not be formed within such distances behind excavated or natural slopes that would reduce the stability of the slopes. 8. In the short-term, either temporary or permanent drainage works shall protect all areas susceptible to erosion. 9. Measures shall be taken to prevent ponding of surface water and scouring of slopes. Newly eroded channels shall be backfilled and restored to natural contours. 10. The Contractor should arrange to adopt suitable measures to minimize soil erosion during the construction period. The Contractor should consult Ag. Societies, Ag. Authorities in the area before deciding mitigation measures. 11. Surface protection measures such as turfing to be carried out as early as possible. The protection shall be applied in completed portions of surfaces, if such is possible without waiting for the entire section to be completed. 12. Clearing of green surface cover to be minimized during site clearing. 13. Replanting trees to be done with appropriate trees to ensure interception of rainwater and the deceleration of surface run-off. 14. Large scale nurseries should be located with access to good supply of water for the care and storage of appropriate vegetation to be re-used on site. *15. Use of temporary or permanent drainage systems to collect water coming to the slope and drain out without causing soil erosion.* *16.. Avoid cut and fill operations and other works such as vegetation clearing and soil excavation during rainy days unless silt traps and interceptor drains are incorporated in the construction sites as much as possible to prevent erosion and subsequent siltation of near by water bodies.* *17. Proper protection methods for soil dump (covers etc.)to avoid erosion.* *18. Prepare a plan to commence and complete slope protection work prior getting affected by rain etc.*			
3. Water quality	To prevent adverse water quality impacts due to negligence and ensure unavoidable impacts are managed effectively. To ensure adverse impacts on water quality caused by construction	1. Preparation of temporary drainage management plan; one month before commencement of works. 2. Proper installation of TD and EC before works within 50m of water bodies. 2. Meaningful water quality monitoring up and downstream at all bridges during construction within 100m of rivers. 3. Proper construction of TD and EC measures maintenance and management including training of operators and other workers to avoid pollution of water bodies by the operation of construction machinery and equipment. 4. Storage of lubricants, fuels and other hydrocarbons in self-contained	Timing will depend on the construction timetable and climatic conditions of the area.	1. Relevant locations are in the Drainage Report of STDP 2003. 2. Also these locations (Ground water/Surface water) are in the Contractor's manual.	1.Contractor 2. Contractor has to check water quality with the NBRO/ITI and report to RDA	RDA/ MC Review results

	activities are minimized.	enclosures. *Provision of oil and grease traps to curtail run-off carrying them to water bodies (if asphalt and concrete plants are to be located in the vicinity of water bodies)* 5. Proper disposal of solid waste from construction activities and labour camps. 6. Cover the construction material and spoil stockpiles with a suitable material to reduce material loss and sedimentation. 7. Avoiding stockpiling to water bodies. 8. Stripped material shall not be stored where natural drainage will be disrupted. 9. Borrow sites should not be close to sources of drinking water. 10.*Planned and quantified vegetation clearing and deforestation* *11. Regulations and enforcement in washing construction vehicles, equipment and machinery.* *12. Regulations and enforcement in the use of the weedisides containing hazardous materials that are highly toxic and could bioaccumulate.* *13. Regulations and the enforcement in the use of weedicides (not containing hazardous materials that could bioaccumulate) during rainy periods.* *14. Treatment of wastewater from asphalt or concrete plants using pH correction and physicochemical treatment to the CEA standards for inland surface waters.*			and CEA 3. Engineer and MC should ensure Contractor is following instructions; Engineer supervises activities regularly.	
4. Ground water quality	*To ensure adverse impact on ground water quality caused by construction activities are minimized.*	*1. Regular and proper maintenance of machinery, construction vehicles and equipment to prevent oil spills* *2. Heavy restrictions on oil storage (except in self-contained cans placed in sheds) to prevent spills.* *3. Avoid heavy deforestation and excessive vegetation clearing as much as possible.* *4. Prohibitation in the use of weedicides containing hazardous materials that could bioacumulate.* *5. Regulate the dumping of waste material and other wastes.*	*During implementation of environmentally critical/effective construction activities*	*Relevant locations with environmentally effective / critical construction activities*	*Contractor* *Engineer supervises relevant activities to ensure Contractor's successful implementation.*	*RDA with MC*
5.Irrigation Impacts	*Identify impacts during construction and provide mitigation measures to*	*1. As determined by the Engineer and requests from farmers and relevant authorities , mitigatory measures to be decided and implemented (In general)* *2. Monitoring/Supervising Contractor's construction activities using a map of*	*Before/during constriction*	*Locations are shown in the map and to prepare lists*	*Contractor*	*RDA with MC*

	minimize damages and cultivation losses.	*existing irrigation structures/schemes in the area close to ROW with close coordination with farmer organizations and relevant authorities to control possible disturbances for them to be carried out by the Contractor.* *At the same time Necessary instructions as mitigatory measures to be given to the Contractor and implementation of mitigatory measures to protect irrigation systems/agricultural lands or compensate cultivation losses to be done by the Contractor.*		*of protected regions.*	*Engineer supervises relevant activities to ensure Contractor's successful implement ation*	
6. Salinization	To minimize salinization caused by using sea sand To avoid/minimize adverse impacts of salinity increase on ecosystem To minimize deep excavations, which extend below the mean sea level and which alter the water table create situation of salinisation	1. Offshore sand mining will require an environmental impact assessment additionally. 2. If sand is mined from offshore deposits this sand should be stockpiled on the shore and proper arrangements will be made to desalinate before being transported to the project site. 3. Since this would be a costly operation possibility of substituting sand with crushed aggregates of suitable size should be explored. 4. Provision of drainage for the seepage water removing from interception of ground water table in deep cuts, and stabilization of the side slopes. (Drainage Report) 5. Deforestation must be discouraged to retard the process of salinization. 6. The proper design of hydraulic and irrigation structures should be adopted to curtail formation of stagnant water bodies, which may cause elevated levels of salinity. *7. Avoid deep cuts and excavations unless alternative foundation techniques such as sheet piling and injected bentonite walls are considered*	During Construction	A list of possible actual locations is with the Contractor. As stated the EIA, higher salinities have been observed in the Galle deviation particularly during dry season.	Contractor to be implement ed. Engineer should ensure that the Contractor implement s relevant activities successful ly.	RDA/ MC
7. Air quality	To minimize the airborne particulate matter released to the atmosphere.	1. All heavy equipment and machinery shall be fitted in full compliance with the national and local regulations.(Relevant regulations are in the Motor Traffic Act, Highway Act) 2. Stockpiled soil and sand shall be slightly wetted before loading, particularly in windy conditions. Control all dusty materials at source. Plan to minimize the dust within the vicinity of tea lands. 3. Fuel-efficient and well-maintained haulage trucks shall be employed to minimize exhaust emissions. 4. Vehicles transporting soil, sand and other construction materials shall be covered. Limitations to speeds of such vehicles necessary. Transport through densely populated area should be avoided.	During construction Section B11 of CEA conditional approval to be followed.	1. A list of locations is in the Base line data prepared by ITI (March, 2003) and other sensitive areas currently identified by the Engineer/RDA/MC along the ROW. 2. Most sensitive locations are in the	The Contractor should maintain the accepted standards (With the assistance of NBRO/ITI) Engineer	RDA/ MC

		5. To plan to minimize the dust within the vicinity of tea lands. 6. Spraying of bare areas with water. 7. Concrete plants. asphalt, metal crusher activities to be controlled (e.g. asphalt hot-mix plants should not be close downwind of sensitive receptors such as schools and hospitals). *8. Care should be taken in stockpiling construction material with adequate coverage against wind, sun and rain.* *9. Care should be taken to avoid spillage of construction material and dust emissions during unloading of construction material to the project site.* *10. Regular and proper maintenance of construction vehicles and machinery to avoid smoke emissions.*		Contractor's Manual. (2+500,4+900, 9+500, 17+500, 26+200, 42+300,47+150,48+400,50+200,57+100) 3.Concrete plant 14+000,50+000 Crushing plant. 4+600,20+400 4.The schedule of spraying water is available	should supervise relevant activities to ensure that the Contractor implements relevant activities successfully.	
8. Noise / Ground Vibration	To minimize noise level increases and ground vibrations during construction operations.	Mitigation shall be strictly implemented. The following requisite measures shall be installed, maintained and monitored per contract. 1. All heavy equipment and machinery shall be fitted in full compliance with the national and local regulations. .(Relevant regulations are in the Motor Traffic Act, Highway Act) 2. As a rule, the operation of heavy equipment shall be conducted in daylight hours. 3. Hammer-type pile driving operations shall be avoided during night time. 4. Construction equipment, which generates excessive noise, shall be enclosed. 5. Well-maintained haulage trucks will be used with speed controls. 6. Borrow sites should not be close to residential areas. 7. Blasting activities to be controlled (e.g. daytime hours only, and with advance notification to nearby residents). 8. Blasting should be done at regular intervals and people should be informed. Reasonable compensation to be paid to those houses that are damaged by blasting effects. Condition surveys/crack surveys on all structures close to blasting/compaction/piling sites to be conducted before commencement og activities. 9. Contractor shall take adequate measures to minimize noise nuisance in the vicinity of construction sites by way of adopting available acoustic methods. - Contractor may obtain guidelines for noise reduction from ISO/TR11688-1:1995(E), which enumerates methods by which air-borne, liquid – borne and structure-borne noise sources may be curtailed with suitable design criteria.	During construction It is mentioned in the Gazette Extra ordinaryNO.924/12 dated23.5.96 for low, medium and high noise areas and silent zones. Maximum allowable noise levels are in the EIA table 6.6, page 6/15.	**Locations to be updated monthly.** **1. Rock Blasting Locations. (ADB Section**) 1+700, 1+900, 3+400 4+000,8+000,9+200 9+900 11+670to 12+220 12+500 to 13+300 13+300 to 13+800 16+500,17+500 17+500,18+200 19+200,19+800 **(JBIC section**. 26+000,28+000 30+000,31+000 34+000,48+000 51+000, 53+000 55+000, 57+000 62+000, 63+000 64+000,66+000	The Contractor should maintain the accepted standards with the assistance of NBRO/ITI Engineer should ensure that the Contractor implements relevant activities successfully.	RDA/ MC

		(Summary of design is in the Annex of EIA) *10. Regular and proper maintenance of construction vehicles and machinery to avoid undue noise including irritating hums.* *11. Intensive monitoring of noise levels specially in near by noise sensitive areas such as residences and schools and if predicted noise levels are excessive, then provision of noise barriers.* *12. Limitation of the use of explosives and mode of blasting for rock blasting activities where feasible.* 13. Detonators to be selected according to sensitivity of the site. 14. Maximum blasting amount/specifications to be reduced based on monitoring of impacts. 15. Cover against fly rocks shall be used following adequate standards (weight, durability)		68+000 These locations shall be monitored during construction. **2.** Potential noise impact locations in ADB and JBIC sections have been already identified, in Jan.2001. A report has been prepared with the operational monitoring plan. Those locations have been defined for the operational stage. (List is in Appendix.03) During construction stage, the most sensitive locations need special attention.		
9. Slope stability	*To ensure that manmade slopes are stable and have an adequate factor of safety against failure.*	*1. Variation of the subsurface condition encountered during construction and assumed during the design stage should be noted and designs reviewed accordingly.* *2. Monitoring of the phreatic surface within critical slopes during the wet season.* *3. Minimization of surface water infiltration in to the slope by providing cutoff drain and a proper drainage system within the slope.* *4. Planting of suitable types of vegetation on the slope surface to increase to stability and reduce erosion.*	*Before and during construction*	*A list of critical cut slopes is available*	*Contractor to implement and Engineer to supervise*.	RDA/ MC
10. Settlement and ground subsidence	*To minimize the post constructional settlement and subsidence of the road surface.*	*1. Suitable quality assurance scheme to be devised and implemented during ground implementation stage.* *2. Monitoring of the settlement of the pre-loaded sections to make sure that sufficient settlement has taken place before removal of the preload and placing the road surface.*	During Construction	As indicated in the SGS plan	*Contractor to implement and Engineer to supervise.*	RDA/ MC

11. Damage to properties from blasting	*To ensure adverse damages are mitigated*	*1. Crack surveys prior to activities* *2. Assessment and payment compensation* *3. Assessment and deploying of monitoring personnel according to an agreed plan* *4. Planning a suitable monitoring mechanism and personnel* 5. Adjusting the blasting plan according to the sensitivity of the site.	During construction	All blasting locations	*Contractor to implement and Engineer to supervise.*	RDA/ MC
12. Impact on Wetlands	To ensure that damage to wetlands and its ecosystem is minimized during construction.	1. Avoid disposal of wash water, solid waste and discarded packing etc. on wetlands. 2. Piling up of loose material should be done in protected areas to arrest washing out of soil. In addition, these materials should not be tipped or stockpiled near wetlands. 3. Leftovers from concrete plants should not be dumped close to wetlands. 4. Avoid temporary structures or stockpiling on wetlands 5. Application of pesticides during the period of rain should be totally stopped. Use of fertilizers should be minimized. 6. Review of other studies on impacts on wetlands.	During Construction	1.The adjoined areas close to wetlands like Koggala Madu ganga, Bolgoda Lake. (The major wetlands have been avoided by the final trace) 2. Study reports will be useful.	Contractor to implement. Engineer shall ensure that the Contractor implements relevant activities successfully.	RDA/ MC
13. Exploitation Handling, Transportation and Storage of Construction materials	To minimize contamination of the surroundings (Due to Implementation of works, asphalt, concrete and metal crushing plants)	*1. Conditions described in the EIA report and also in the subsequent EA by proponent in relation to selecting sites for material exploitation, to timing and use of roads for material transport, for maintenance of vehicles used in material transport or construction for selection of sites for material storage, for rock blasting and aggregate production, and for handling hazardous or dangerous materials such as oil, explosives and toxic chemicals.* *2. Excavation of the material from the borrow pits should be carried out without creating unsuitable surfaces of excavation such as near vertical slopes.* A list of borrow areas to be prepared one month prior to stage 2 construction. A list of routes of transport of construction materials is to be prepared for the contract and agreed one month prior to stage 2 constructions. In case substantial additional materials will be required and will be sourced from wooden sites, replacement of trees and woodland at a ration 3:1 and include in progress report. *3. Avoid, as much as possible, excavation and transportation of soil during rainy weather conditions.* *4. When excavated material within the trace are used as fill material, proper planning and management of cut and fill operations to minimize distance of*	Before and During construction	1. A list of borrow areas is available 2.A list of routes of transport of construction material is available 3. The report of vehicle conditions is available 4. A Map of locations of storage has been prepared by the Contractor. 5. An	The Contractor to implement with agreements on activities with the Engineer	RDA/ MC

		transport and temporary storage. *(i) Before the beginning of the construction, marking of the cut sections and the corresponding fill sections on a map for the entire trace considering distance of transport, easiness of transport, construction process etc.* *(ii) Regular revision of the map depending on the progress of construction.* *(iii) As much as possible, direct transportation of the exploited construction material from generated location to the fill section should be practice without keeping the exploited material in temporary storage.* *5. Maintaining and inventory of the volume of exploited material in temporary storage and revision of the construction sequence to minimize the volume in temporary storage.* 6.Update material management plan monthly and include in progress report		environmental accident checklist and a list of banned substances are included in the Contractor's Manual.		
14. Construction Waste Disposal	To minimize the impacts from the disposal of construction waste.	1. Preparation and implementation of waste management plan to be submitted to the SC and approved by PMU one month prior to starting stage 2 works ,to be updated once a month. 2. Estimating the amounts of construction waste to be generated by the project. 3. Investigating whether the waste can be reused in the project or by other interested parties. 4. Identifying potential safe disposal sites close to the project. 5. Investigating the environmental conditions of the disposal sites and recommendation of most suitable and safest sites. 6. Proper drainage paths and or drainage facilities to be established. 7. Piling up of loose material should be done in protected areas to arrest washing out of soil. Debris shall not be left where it may be carried by water to down stream flood plains, dams, lagoons etc. 8. Used oil and lubricants shall be recovered and reused or removed from the site in full compliance with the national and local regulations. Oil wasted must not be burned. 9. Machinery should be properly maintained to minimize oil spill during the construction. 10. Solid waste should be disposed at an approved solid waste facility or incinerated. *13. All scrap materials such as cables, metal structures, steel wires, insulators involved in power line construction needs to be removed after the construction works. Incorporate attempts to evaluate the recycling potential of such material.*	Before and during construction	1. A list of waste reconfirm dumping areas is available 2. A list of temporary dumping areas to be prepared at the contract stage for agreement.	Contractor to implement . Engineer to supervise and take actions to instruct Contractor 's relevant activities according to environmental standards.	RDA/ MC

14a.Spoil (unsuitable soil) Waste Disposal	To minimize the environmental impacts arising from generation of spoil waste.	1. Estimating the amounts and types of spoil and construction waste to be generated by the project. 2. Investigating whether the waste can be reused in the project or by other interested parties .(earth berms,noise barriers,amenity planting at intersections) *3. Planning of disposal sites and to avoid disposal in retention areas, paddy areas etc.* Identifying potential safe disposal sites close to the project. *4. Excavated peat should be (i) dumped in approved locations provided adequate drainage and precautionary facilities are provided or (i) traded off to fuel making sector or agricultural and horticulture industry.* 5. Use designated spoil disposal areas where specially instructed(paid by unit/distance rate) 6. Investigating the environmental conditions of the disposal sites and recommendation of most suitable and safest sites. 7. Proper drainage paths and or drainage facilities to be established. 8. Piling up of loose materials should be done in protected areas to arrest washing out of soil. Debris shall not be left where it may be carried out by water to down stream flood plains, dams lagoons etc. 9. Used oil and lubricants shall be recovered and reused or removed from the site in full compliance with the national and local regulations. Oil wasted must not be burned. 10. Machinery should be properly maintained to minimize oil spill during the construction. 11. Adopt all approval conditions from CEA including drainage plans before disposal commences.	During construction and after completion of construction works.	1. A list of waste RECONFIRM dumping areas is available. 2. A list of temporary dumping areas to be prepared at the contract stage for agreement.	1. Contractor . 2. Engineer shall supervise and take actions to instruct Contractor 's relevant activities according to environmental standards.	
15. Work Camp Operation and Location	To ensure that the operation of work camps does not adversely affect the surrounding environment and residents in the area.	1. Identify location of work camps in consultation with Grama Niladharies (GNs). The location shall be subject to approval by the RDA. If possible, camps shall not be located near settlements or near drinking water supply intakes. 2. Cutting of trees shall be avoided and removal of vegetation shall be minimized. 3. Water and sanitary facilities shall be provided for employees. 4. Solid waste and sewage shall be managed according to the national and local regulations. As a rule, solid waste must not be dumped, buried or burned	During construction and after completion of work	Location Map is prepared by the Contractor.	Contractor to implement . Engineer shall instruct the Contractor to	RDA/ MC

		at or near the project site, but shall be disposed of to the nearest sanitary landfill or site having and complying with the necessary permits. 5. The Contractor shall organize and maintain a waste separation, collection and transport system. 6. The Contractor shall document that all liquid and solid hazardous and non-hazardous waste are separated, collected and disposed of according to the given requirements and regulations. 7. At the conclusion of the project, all debris and waste shall be removed. All temporary structures, including office buildings, shelters and toilets shall be removed. 8. Exposed areas shall be planted with suitable vegetation. 9. The RDA and Supervising Engineer shall inspect and report that the camp has been vacated and restored to pre-project conditions. *10. Avoid, as much as possible, use of sloping lands for work camps to avoid removal of vegetation cover on sloping lands to minimize soil erosion and slope stability problems.*			implement relevant activities successfully.	
16. Loss of Vegetation Cover of the Areas for Temporary Work-space	To avoid several negative impacts due to removing of green surface.	1. Clearing of green surface cover for construction, for borrow or for development, cutting trees and other important vegetation during construction should be minimized. 2. Landscaping and road verges. 3. Planting of trees/shrubs/ornamental plants to contribute to the aesthetic value of the area and compensate for the lost capability of the area to absorb carbon dioxide. 4. At conclusion of the project, all debris and waste shall be removed 5. All temporary structures, including office buildings, shelters and toilets shall be removed	During construction of relevant activities	A list of Locations with a Map is available.	Contractor to implement. Engineer shall instruct the Contractor implements relevant activities successfully.	RDA/ MC
17. Safety Precautions for the Workers	To ensure safety of workers	1. Providing adequate warning signs 2. Providing workers with skull guard or hard hat 3. The Contractor shall instruct his workers in health and safety matters, and require the workers to use the provided safety equipment. 4. Establish all relevant safety measures as required by law and good engineering practices. 5. Provide emergency vehicles with adequate first aid facilities.	During construction	Relevant plans of the program are available.	Contractor to implement. Engineer shall ensure that the Contractor implements relevant activities successfully.	RDA/ MC

18. Traffic Condition	To minimize disturbances of vehicular traffic and pedestrians during haulage of construction materials, spoil and equipment and machinery, blocking access roads during blasting of rocks, damages/maintenance problems for roads and bridges used by the haulage trucks, dust nuisance to school and hospitals.	1. Formulation and implementation of a construction related traffic management plan one month prior to start of stage 2 construction, implement during construction. 2. Vicinity of schools and hospitals to be considered. Installation of traffic warning signs, and enforcing traffic regulations during transportation of materials and equipment and machinery. Conditions of roads and bridges to be surveyed and documented prior to activities. 3. Conducting awareness programs on safety and proper traffic behavior in densely populated areas near the construction sites. 4. Assign traffic control personnel *where construction and associated traffic has created significant impacts*.	Before and during construction	The most important locations to be identified and listed. Relevant plans of the Contractor on traffic arrangements are available.	Contractor to implement. Engineer shall ensure that the Contractor implements relevant activities successfully.	RDA/ MC
19. Institutional Strengthening and capacity Building	To ensure that RDA and PMU officials are trained to understand and to appreciate EMP	1.Setting up of a Environmental Management Unit (EMU) within RDA 2. Development of a strengthening plan for the EMU 3.Maintaining sufficient environmental expertise in PMU for implementation, supervision and monitoring of the EMP activities *4. Planning and implementation actions to strengthen liaising activities with line agencies related to flood, drainage, irrigation etc.* *5. Capacity building of proponent staff on environmental needs related to road construction.*	Initiate at preconstruction and continue beyond project completion	All senior staff in RDA at senior engineer level and above in PMU and related units.	RDA	RDA/ ESD / MC
20. Orientation for Contractor, and Workers	To ensure that the Contractor and workers understand the Environmental requirements and implementation of mitigation measures.	1. Conducting special briefing and / or on-site training for the contractors and workers on the environmental requirement of the project. 2. Agreement on critical areas to be considered and necessary mitigation measures, among all parties who are involved in project activities. *3. Liaising with line agencies (Dept of Irrigation, Dept. of Agrarian Services, SLLRDC, Provincial Irrigation Engineer, DS, GS, and Pradesheeya Saba) in drainage issues related stakeholder complaints.* 4. Continuous progress review sessions to be followed	At early stages of constructions and during construction as necessary.	All staff members in all categories.	Contractor to implement. Engineer shall ensure that the Contractor implements relevant activities successfully.	RDA

21. Social Impacts	To ensure minimum impacts from construction labour force. To ensure minimum impacts on public health. To ensure minimum effects of indirect impacts of construction to the people who are living close to the boundaries of ROW; Dust, Noise, Vibration and Rock blasting effects etc. To minimize access problems for local population during construction	1. Potential for spread of vector borne and communicable diseases from labour camps shall be avoided (worker awareness orientation and appropriate sanitation should be maintained). 2. Claims/complaints of the people on construction nuisance/damages close to ROW to be considered and responded to promptly by the Contractor. Condition surveys or crack surveys on structures/agricultural plots and properties close to construction sites to be conducted by the Contractor before commencement of construction activities specially in environmentally sensitive areas such as rock blasting/compaction, piling etc. 3. Contractor should organize temporary means of access to avoid such short-term negative impacts.	Claims of APs to be solved as soon as possible Necessary evacuations to be carried out as when necessary	Location vise communication system with the general public close to critical construction sites to be maintained by the Contractor. Lists of names of property owners with conditions of those structures which are close to construction sites such as rock blasting sites, compaction and cut slope areas etc to be kept with the Contractor. A list on agricultural plots close to ROW to be kept with the Contractor. A list to be prepared and included here on the Locations of irrigation systems.	Contractor to implement. Engineer should ensure that the Contractor implements relevant activities successfully.	RDA/ MC

		C. OPERATIONAL STAGE			
Environmental Concern	**Objectives**	**Mitigatory measures recommended**	**Proposed timing**	**Proposed locations**	**Responsibility**
1. Air Quality	To minimize air pollution from road usage. (Air pollution due to increased levels in PM10, NO, NO2, CO, SO2 and Ozone.)	1. Law enforcement on vehicles conditions. Other National measures due to regulations on fuel type and purification of exhaust gases. 2. Promoting mass transport and traffic management. Establishing vehicle emission regulations and standards. Strict enforcement of the regulations subsequent to an awareness program. 3. Provision of a vegetative barrier to arrest the spread of air borne particles to residential areas where necessary. *4. Provision of a vegetative barrier to arrest the spread of air borne particles to residential areas.* *5. Mechanisms to carryout random monitoring of vehicular exhaust emissions and implementation of heavy fines or penalties for vehicles not meting standards.*	During operation	Along the highway	Expressway Authority following CEA standards.
2. Noise	To minimize the noise level resulting from road traffic. To control noise pollution from exceeding tolerable levels on embankment sections taking in to account the increases in traffic volume.	1. Establishing standards and regulations for noise levels emanating from vehicles. 2. Strict enforcement of regulations, subsequent to an awareness programme. 3. Establishing a national policy on vehicle imports – noise levels, increase with age of vehicles. 4. In sensitive areas such as schools, places of worship, hospitals and libraries, sound barriers including tree linings will have to be employed. *5. Any development of cracks in noise barriers such as high walls should be monitored and such cracks or damages should be immediately repaired.* *6. Relocation of APs and improvement of house structures , if/when appropriate* *7. Appropriate building limits to the expressway to be established in consultation with the UDA and MOH* *8.Noise levels for residential and other areas prepared by CEA to be applied* *9. Noise mapping for different estimated levels of traffic and definition of types and locations of noise barriers and other mitigation measures to be carried out with immediate effect*	- Determination of critical sites and methods of mitigation during the operational period - Within 100m corridor on both sides as potential sites where mitigation measures may become necessary.	Selected most important locations from the list in attachment 03. These locations have been determined within 100-meter corridor on both sides as potential sites where mitigation measures may become necessary. (Relevant locations are in the	Expressway Authority following CEA standards.

				Appendix.03)	
3. Water quality	To monitor impacts from traffic particulates in run off	Track concentrations of indicator chemicals in tea, soil and water at specific locations. Design appropriate mitigation measures. Establish 'safety zones'	During operation, once per year until concentrations become negligible Twice per year if concentrations equal trigger concentrations.	Identified locations	Expressway Authority following CEA standards.
4. Land slides and soil erosion	To minimize land slides due to excessive erosion of slopes and water ways with corresponding silting of the eroded soil.	1. Maintaining proper vegetation cover and erosion protection. 2. Constant surveillance as part of routine maintenance. *3. Provision of adequate drainage facilities.* *4. Identification of sections of the road with critical slopes and monitoring of those sections especially during rainy seasons for indications of landslides such as cracking, toe ripples, seeping spring etc.* *5. Monitoring of the new constructions outside the ROW that may cause slope instability.*	During operation and rainy seasons.	Sensitive locations to be listed.	Supervision Consultants/Maintenance Contractor under the Expressway Authority following CEA standards.
5. Crops and vegetation	To monitor impacts from traffic emissions	Track concentrations of indicator chemicals in tea, soil and water at specific locations.	During operation, once per three years until concentrations become negligible. Twice per year if concentrations exceed baseline concentrations	Specific locations are established in EIA.	Expressway Authority following CEA standards.

			established in EIA 100%		
6. Road Accidents	To control serious and fatal accidents on the expressway due to high speed and increased number of accidents on access roads	1. Road user information/ education, traffic signs and road markings. 2. Law enforcement 3. Emergency services 4. Establishment of accident review committee *5. Use of appropriate traffic control staff with suitable attire.* *6.Traffic guidance* *7. Safe maintenance of vehicles.*	During operation	The whole expressway with special concentration on sensitive and accident prone areas.	Expressway Authority with Police motor traffic and Maintenance Contractor.
7. Garbage disposal	To control garbage disposal by road users creating pollution and aesthetic discomfort.	1. Information campaigns. 2. Fines against littering. 3. Regular cleaning of the roadsides. 4. Placing garbage bins in rest areas etc. along the roadsides with signboards Collaborative work with NGOs *5. Planning and provision of large bins and containers lined with biodegradable bags and having lids to prevent access to dogs, cats, flies and birds. Bins to be provided shall be of different colours with clear instructions and figures in brief for the purpose of separation of perishable wastes from recyclables.* *6. Plans and programmes for regular collection of garbage from the bins.*	During operation	Selected locations (outside the ROW) for placing garbage collection	Expressway Authority following CEA standards.
8. Transportation of dangerous chemicals.	To control transportation of dangerous chemicals and substances this may create environmental hazards to air and water quality.	1. Timely attendance to accidents and warning the public on environmental hazards. 2. Warning signs on vehicles. 3. Licensing of transport of dangerous goods 4. Implementation of stringent laws and policies pertaining to the safe storage and transport of prescribed wastes and other hazardous materials. 5. Issuing of waste transport certificates by the CEA for waste transporters and tracking down prescribed wastes from it s production to final disposal or treatment.	Relevant Rules and Regulations of Highway/Motor traffic acts to be reviewed/amended according to new requirements.	Along the highway	Expressway Authority following CEA standards.
9. Maintenance construction works	*To minimize surface and ground water quality and air quality deterioration and generation of high noise levels associated with highway maintenance construction works.*	*ALL RELEVANT REGULATIONS FOR CONSTRUCTION STAGE (B) APPLY AND IN PRACTICE* *1. Implementation of proper solid waste management techniques and the mitigatory measures applicable for the construction phase with reference to minimization or prevention of surface and ground water quality deterioration, air pollution and generation of high noise levels where deemed necessary.*	*During relevant activities*	*Locations which activities are placed*	Maintenance Contractor under Expressway Authority.

		2. Monitoring surface and ground water quality, air quality and noise levels during the entire period of the maintenance construction works and depending on the location and complaints made by the local people at their premises.			
10. Road side development activities	*To control any negative adverse impacts on water bodies, ground water quality and air quality due to development or expansion of secondary roadside activities (e.g. industries and commercial enterprises)*	*1. Implementation of strict land use control.* *2. Monitoring and controlling of changes to land use in project and designated area.* *3. Land use zoning by the UDA.* *4. Land use zoning proposed by the proponent.*	*Before and during operation of the highway*	*Both sides of the highway from Godagama to Makumbura*	UDA with Expressway Authority.
11. Visual Intrusion	*To minimize visual intrusion and thereby to maintain the nature of the landscape as much as possible.*	*1. Plantation with thick and tall native trees to reduce noise, arrest gaseous pollutants and dust, intercepts rain and decelerate urban run-off while improving the aesthetics of the landscape.* *2. Identification of critical locations to be incorporated with mitigating measures.* *3. Prepare a detailed plan of mitigation of visual impacts.*	*Before and during operation of the highway*	*Both sides of the highway from Godagama to Makumbura*	RDA/Supervision Consultant under Expressway Authority
12. Social Impacts	- To ensure that the people in surrounding area will not be affected due to traffic nuisance such as dust, noise and vibrations. - To ensure that there will not be any cultural problems (caste, racial, drugs, prostitution, and illegal businesses etc.) among re-settlers or with host communities, in new locations such as new urban centers at interchanges.	1. Controlling/management systems of vehicle speed, noise and quality of vehicles to be undertaken properly. Necessary awareness building programmes for general public to be implemented by RDA/Expressway Authority 2. Necessary signboards with limits of noise and speed of vehicles to be placed properly. 3. The services of Social Services Officers who are attached to Divisional Secretariats to be utilized to identify and plan necessary mitigatory activities to minimize cultural problems. The services from NGOs to be taken by UDA to assist new urban communities to organize by themselves. *4. Provision of medical advice and services within the project area.* *5. Maintenance of registry of personnel working and visiting construction sites.* *6. Closely liaise with village headmen (Grama Niladhari) to keep track of employment, illicit activities etc*	- Continuous monitoring to be carried out along the expressway and the interchange areas. - According to programmes to be prepared by UDA..	Locations to be listed by UDA and other Local Authorities	Expressway Authority following CEA standards RDA and relevant Local Authority

Approximate Site Specific Locations of Noise Sensitive Receptors on the Left Side of the Colombo-Matara Expressway - Kurudugahahetepma to Matara

Receptor ID	Distance to the Receptor (in km)		Length of Receptor in meters	Type of Receptor	Terrain Condition
	Start	End			
1	1.72	2.32	600	Residential	slope down
2	2.44	2.64	200	Residential	flat
3	4.64	4.74	100	Residential	flat
4	5.70	5.74	40	Residential	slope down
5	7.10	7.36	260	Residential	incline/decline
6	7.84	7.90	60	School	incline/decline
7	8.46	8.50	40	Residential	flat
8	8.82	8.88	60	Residential	flat
9	9.28	9.42	140	Residential	incline/decline
10	9.50	9.58	80	Residential & School	flat
11	10.30	10.33	30	Residential	slope up
12	10.35	10.38	30	Residential	slope up
13	10.52	10.60	80	Residential	slope up
14	10.89	10.91	20	Residential	slope up
15	11.20	11.26	60	Temple	slope up
16	11.34	11.40	60	School	slope up
17	12.38	12.39	10	Residential	flat
18	14.31	14.34	30	Residential	flat
19	14.44	14.46	20	Residential	incline/decline
20	14.77	14.79	20	Residential	incline/decline
21	14.88	14.90	20	Residential	incline/decline
22	15.56	15.62	60	Residential	incline/decline
23	15.64	15.66	20	Residential	slope up
24	15.68	15.70	20	Residential	hill
25	13.40	13.64	70	Residential	slope down
26	13.75	13.77	20	Residential	slope down
27	14.70	14.72	20	Residential	flat
28	14.85	14.82	20	Residential	flat
29	14.88	14.90	20	Residential	flat
30	15.52	15.63	10	Residential	slope down
31	16.38	16.35	20	Residential	incline/decline
32	16.82	16.88	60	Residential	slope down
33	17.28	17.30	20	Residential	flat
34	17.43	17.46	30	Residential	incline/decline
35	17.60	17.62	20	Residential	slope down
36	17.71	17.72	10	Residential	incline/decline
37	18.40	18.42	20	Residential	slope down
38	18.95	18.94	10	Residential	flat up
39	19.44	19.47	30	Residential	incline/decline
40	21.16	21.18	20	Residential	slope down
41	21.74	21.82	80	Residential	slope down
42	21.88	21.90	20	Residential	slope down
43	21.96	22.01	50	Residential	slope down

44	22.09	22.10	10	Residential	incline/decline
45	22.60	22.62	20	Residential	slope down
46	22.65	22.67	20	Residential	flat
47	23.09	23.18	90	Residential	slope down
48	23.22	23.24	20	Residential	flat
49	23.42	23.51	90	Residential	flat
50	23.60	23.61	10	Residential	flat
51	23.67	23.72	50	Residential	flat
52	23.76	23.96	200	Residential	flat
53	24.22	24.25	30	Residential	flat
54	24.32	24.34	20	Residential	flat
55	24.39	24.40	10	Residential	flat
56	24.43	24.71	280	Residential	flat
57	24.74	24.76	20	Residential	slope down
58	24.81	24.92	110	Residential	slope down
59	25.40	25.42	20	Residential	flat
60	25.48	25.52	40	Residential	slope down
61	25.58	25.63	50	Residential	slope down
62	25.65	25.69	40	Residential	flat
63	26.12	26.13	10	Residential	flat
64	26.55	26.57	20	Residential	incline/decline
65	27.07	27.16	90	Residential	slope up
66	27.50	27.51	10	Residential	slope up
67	27.87	27.94	70	Residential	slope up
68	28.05	28.06	10	Residential	slope up
69	28.30	28.32	20	Residential	slope up
70	28.66	28.76	100	Residential	slope up
71	28.84	28.86	20	Residential	slope up
72	29.14	29.18	40	Residential	slope down
73	29.43	29.45	20	Residential	flat
74	29.72	29.74	20	Residential	flat
75	29.96	30.00	40	Residential	incline/decline
76	30.28	30.42	140	Residential	flat
77	30.68	30.70	20	Residential	incline/decline
78	30.99	31.01	20	Residential	flat
79	32.60	32.66	60	Residential	flat
80	33.06	33.09	30	Residential	flat
81	33.36	33.37	10	Residential	hill
82	33.72	33.76	40	Residential	hill
83	33.93	34.00	20	Residential	flat
84	34.05	34.07	20	Residential	flat
85	43.92	43.93	10	Residential	flat
86	44.03	44.09	60	Residential	flat
87	45.54	45.56	20	Residential	flat
88	46.76	46.78	20	Residential	hill
89	47.13	47.14	10	Residential	flat
90	47.23	47.24	10	Residential	incline/decline
91	49.22	49.23	10	Residential	slope up
92	49.58	49.68	100	School	flat
93	49.93	49.97	40	Residential	flat

94	50.29	50.33	40	Residential	slope up
95	50.52	50.54	20	Residential	slope up
96	50.88	50.90	20	Residential	hill
97	51.61	51.63	20	Residential	flat
98	51.35	51.88	30	Residential	flat
99	52.16	52.17	10	Residential	slope up
100	52.26	52.27	10	Residential	slope up
101	53.89	53.91	20	Residential	incline/decline
102	53.98	54.00	20	Residential	flat
103	54.08	54.10	20	Residential	incline/decline
104	56.73	56.74	10	Residential	incline/decline
105	56.98	57.00	20	Residential	flat
106	57.16	57.18	20	Residential	slope down
107	57.34	57.36	20	Residential	hill
108	57.52	57.53	10	Residential	flat
109	57.89	57.90	10	Residential	flat
110	59.01	59.00	60	Residential	hill
111	59.31	59.33	20	Residential	hill
112	59.38	59.40	20	Residential	hill

Approximate Site Specific Locations of Noise Sensitive Receptors on the Right Side of the Colombo-Matara Expressway - Kurudugahahetepma to Matara

Receptor ID	Distance to the Receptor (in km)		Length of Receptor in meters	Type of Receptor	Terrain Condition
	Start	End			
1	4.73	4.78	50	Residential	slope up
2	6.24	6.30	60	Residential	flat
3	7.16	7.19	30	Residential	flat
4	7.24	7.28	40	Residential	flat
5	8.76	8.77	10	Residential	flat
6	9.34	9.35	10	Residential	flat
7	9.48	9.50	20	Residential	slope down
8	9.62	9.63	10	Residential	slope up
9	9.67	9.69	20	Residential	incline/decline
10	10.72	10.73	10	Residential	flat
11	10.78	10.79	10	Residential	up
12	10.85	10.86	10	Residential	up
13	10.92	10.94	20	Residential	flat
14	10.99	11.00	10	Residential	flat
15	11.08	11.10	20	Residential	slope up
16	11.49	11.51	20	Residential	hill
17	11.76	11.78	20	Residential	slope down
18	11.81	11.83	20	Residential	slope down
19	11.85	11.87	20	Residential	slope down
20	12.06	12.08	20	Residential	slope down
21	12.15	12.17	20	Residential	slope down
22	12.72	12.74	20	Residential	incline/decline
23	12.81	12.83	20	Residential	slope down
24	13.18	13.19	10	Residential	slope down
25	15.93	15.94	10	Residential	up
26	16.18	16.22	40	Residential	incline/decline
27	16.46	16.48	20	Residential	flat
28	16.85	16.87	20	Residential	flat
29	16.95	16.97	20	Residential	flat
30	17.50	17.51	10	Residential	slope up
31	17.54	17.55	10	Residential	slope up
32	17.70	17.74	40	Residential	slope up
33	18.70	18.72	20	Residential	slope up
34	19.28	19.30	20	Residential	slope up
35	19.38	19.39	10	Residential	slope up
36	19.47	19.49	20	Residential	slope up
37	20.81	20.91	100	Residential	slope down
38	24.00	24.02	20	Residential	flat
39	24.96	24.97	10	Residential	flat
40	25.08	25.10	20	Residential	hill
41	25.31	25.34	30	Residential	incline/decline
42	26.35	26.38	30	Residential	hill
43	26.55	26.57	20	Residential	flat

44	26.95	26.99	40	Residential	hill
45	29.21	29.23	20	Residential	flat/hill
46	30.28	30.30	20	Residential	flat
47	30.44	30.49	50	Residential	incline/decline
48	30.66	30.80	140	Residential	flat
49	31.82	31.84	20	Residential	flat/hill
50	32.52	32.54	20	Residential	flat
51	33.70	33.71	10	Residential	flat
52	33.74	33.75	10	Residential	flat
53	34.14	34.16	20	Residential	incline/decline
54	34.45	34.47	20	Residential	slope up
55	34.62	34.64	20	Residential	slope up
56	34.74	34.78	40	School	incline/decline
57	34.84	34.85	10	Residential	slope up
58	34.98	35.00	20	Residential	slope up
59	35.03	35.04	10	Residential	slope up
60	35.29	35.31	20	Residential	flat
61	35.40	35.42	20	Residential	hill
62	35.62	35.64	20	Residential	slope up
63	35.78	35.83	50	Residential	slope up
64	36.90	36.92	20	Residential	slope up
65	37.14	37.16	20	Residential	slope up
66	38.57	38.59	20	Residential	slope up
67	39.14	39.16	20	Residential	flat
68	39.28	39.30	20	Residential	flat
69	39.69	39.70	10	Residential	hill
70	39.76	39.78	20	Residential	hill/flat
71	39.82	39.85	30	Residential	slope down
72	39.97	40.04	70	Residential	incline/decline
73	40.09	40.11	20	Residential	slope up
74	40.19	40.20	10	Residential	slope up
75	40.23	40.24	10	Residential	slope up
76	40.35	40.36	10	Residential	slope up
77	40.42	40.43	10	Residential	slope up
78	41.47	41.18	10	Residential	slope down
79	41.78	41.80	20	Residential	incline/decline
80	42.16	42.20	40	Residential	flat
81	42.68	42.70	20	Residential	flat
82	42.92	42.96	40	Residential	slope down
83	42.98	43.04	60	Residential	slope down
84	43.09	43.11	20	Residential	flat
85	34.19	34.20	10	Residential	flat
86	35.22	35.24	20	Residential	flat
87	35.45	35.46	10	Residential	incline/decline
88	35.60	35.66	60	Residential	slope up
89	35.70	35.83	130	Residential	slope up
90	35.86	35.88	20	Residential	flat
91	36.00	36.02	20	Residential	incline/decline
92	37.07	37.08	10	Residential	up
93	37.71	37.73	20	Residential	slope down

94	38.14	38.16	20	Residential	slope up
95	38.20	38.22	20	Residential	slope up
96	39.70	39.71	10	Residential	hill
97	39.78	39.80	20	Residential	hill
98	40.02	40.04	20	Residential	slope down
99	40.08	40.10	20	Residential	slope down
100	40.26	40.28	20	Residential	slope down
101	40.47	40.48	10	Residential	incline/decline
102	40.52	40.54	20	Residential	hill
103	40.66	40.68	20	Residential	incline/decline
104	41.22	41.28	60	School	slope up
105	41.56	41.58	20	Residential	slope up
106	41.78	41.80	20	Residential	incline/decline
107	42.30	42.40	100	Residential	flat
108	43.22	43.24	20	Residential	slope up
109	43.34	43.40	60	Residential	slope up
110	43.54	43.56	20	Residential	slope up
111	43.60	43.94	340	Residential	slope up
112	44.00	44.06	60	Residential	slope up
113	44.12	44.14	20	Residential	slope up
114	44.26	44.30	40	Residential	flat
115	44.88	44.40	20	Residential	flat
116	44.49	44.54	50	Residential	flat
117	44.59	44.60	10	Residential	flat
118	47.10	47.22	120	Temple and School	flat
119	48.58	48.70	120	Residential	slope down
120	48.76	48.78	20	Residential	slope down
121	49.02	49.04	20	Residential	incline/decline
122	49.30	49.36	60	Residential	slope down
123	49.90	49.94	40	Residential	incline/decline
124	50.42	50.58	160	Residential	slope up
125	50.72	50.76	40	Residential	incline/decline
126	51.62	51.66	40	Residential	incline/decline
127	51.80	51.92	120	Residential	slope up
128	51.84	51.96	20	Residential	flat
129	52.94	52.06	20	Residential	slope down
130	53.88	53.91	30	Residential	slope down
131	54.00	54.28	40	Residential	flat
132	56.94	57.06	120	Residential	hill
133	57.40	57.42	20	Residential	flat
134	57.66	57.69	30	Residential	flat
135	58.25	58.97	20	Residential	incline/decline
136	60.10	60.15	50	Residential	flat

Approximate Site Specific Locations of Noise Sensitive Receptors on the Right Side of the Colombo-Matara Expressway -Kottawa to Kurudugahahetekma

Receptor ID	Distance along the trace to start and end the Receptors (in km)		Length of the Receptor in meters	Type of the Land use Receptor	Terrain Condition
	Start	End			
1	-0.40	-0.26	140	Residential	Flat
2	-0.26	-0.14	120	Residential	Flat
3	0.11	0.35	240	Residential	Flat
4	0.46	0.52	60	Residential	Flat
5	0.80	1.04	240	Residential	Flat
6	1.12	1.24	120	Temple	Flat
7	1.32	1.38	60	Residential	Flat
8	1.44	1.51	70	Residential	Flat
9	1.70	1.88	180	Residential	Flat
10	2.20	2.72	520	Residential	Flat
11	2.88	2.98	100	Residential	Flat
12	3.26	3.30	40	Residential	Flat
13	3.42	3.58	160	Residential	Flat
14	3.72	3.76	40	Residential	Flat
15	3.90	3.94	40	Residential	Flat
16	4.32	4.50	180	Residential	Flat
17	4.50	4.68	180	Residential	Flat
18	5.86	5.90	40	Residential	Flat
19	6.42	6.46	40	Residential	Flat
20	6.52	6.58	60	Residential	Flat
21	6.92	7.00	80	Residential	incline/decline
22	7.08	7.11	30	Residential	incline/decline
23	7.18	7.28	100	Residential	incline/decline
24	7.48	7.52	40	Residential	incline/decline
25	8.81	8.94	130	Residential	incline/decline
26	8.97	9.40	70	Residential	Flat
27	9.74	9.82	80	Residential	incline/decline
28	9.86	9.91	50	Residential	incline/decline
29	10.10	10.24	140	Residential	incline/decline
30	10.42	10.46	40	Residential	incline/decline
31	10.67	10.79	120	Residential	incline/decline
32	11.69	11.79	100	Residential	incline/decline
33	11.82	11.84	20	Residential	Flat
34	12.12	12.20	80	Residential	incline/decline
35	12.41	12.44	30	Residential	incline/decline
36	13.12	13.18	60	Residential	incline/decline
37	13.32	13.38	60	Residential	incline/decline
38	13.56	13.60	40	Residential	incline/decline
39	13.60	13.62	20	Residential	incline/decline
40	13.73	13.76	30	Residential	incline/decline
41	14.18	14.22	40	Residential	incline/decline

42	14.27	14.30	30	Residential	incline/decline
43	14.39	14.41	20	Residential	incline/decline
44	14.52	14.54	20	Residential	incline/decline
45	14.90	15.00	100	Residential	incline/decline
46	15.00	15.05	50	Residential	incline/decline
47	15.09	15.20	110	Residential	incline/decline
48	15.41	15.47	60	Residential	incline/decline
49	15.59	15.64	50	Residential	incline/decline
50	16.94	16.99	50	Residential	Flat
51	18.24	18.30	60	Residential	incline/decline
52	18.32	18.41	90	Residential	incline/decline
53	18.68	17.74	60	Residential	incline/decline
54	18.77	18.81	40	Residential	incline/decline
55	18.85	18.94	90	Residential	incline/decline
56	19.13	19.16	30	Residential	incline/decline
57	19.49	19.52	30	Residential	incline/decline
58	21.28	21.30	20	Residential	incline/decline
59	21.58	21.76	180	Residential	incline/decline
60	21.76	21.84	80	School	slope up
61	22.20	22.22	20	Residential	incline/decline
62	22.50	22.56	60	Residential	slope down
63	22.88	22.90	20	Residential	Flat
64	23.00	23.02	20	Residential	Flat
65	23.04	23.05	10	Residential	Flat
66	23.52	23.55	30	Residential	slope down
67	23.80	23.83	30	Residential	slope down
68	24.02	24.12	100	Residential	slope down
69	24.20	24.22	20	Residential	slope down
70	24.42	24.43	10	Residential	slope down
71	24.45	24.47	20	Residential	slope down
72	24.48	24.50	20	Residential	slope down
73	25.16	25.18	20	Residential	slope down
74	25.26	25.28	20	Residential	slope down
75	37.29	37.54	250	Residential	
76	38.66	38.68	20	Residential	slope up
77	38.70	38.72	20	Residential	slope up
78	38.89	39.06	170	Residential	slope down
79	39.11	39.16	50	Residential	slope down
80	39.22	39.25	30	Residential	incline/decline
81	39.34	39.36	20	Residential	slope down
82	39.68	39.76	80	Residential	incline/decline
83	40.00	40.04	40	Residential	slope up
84	40.53	40.56	30	Residential	slope down
85	40.63	40.65	20	Residential	slope down
86	40.72	40.76	40	Residential	slope down
87	40.84	40.85	10	Residential	slope up
88	40.86	40.90	40	Residential	slope up
89	40.93	40.95	20	Residential	slope up
90	40.98	41.02	40	Residential	slope up
91	41.04	41.09	50	Residential	slope down

92	41.14	41.15	10	Residential	slope down
93	41.52	41.54	20	Residential	Flat
94	41.57	41.58	10	Residential	slope down
95	42.14	42.15	10	Residential	Flat
96	42.26	42.28	20	Residential	incline/decline
97	42.57	42.59	20	Residential	slope down
98	42.71	42.72	10	Residential	slope down
99	43.86	43.94	80	Residential	slope down
100	44.36	44.38	20	Residential	slope up
101	44.70	44.74	40	Residential	slope up
102	45.07	45.09	20	Residential	slope down
103	45.98	46.12	140	Residential	slope down
104	47.01	47.02	10	Residential	slope down
105	47.40	47.41	10	Residential	slope up
106	47.42	47.44	20	Residential	slope up
107	47.80	47.82	20	Residential	slope down
108	47.91	47.92	10	Residential	slope down
109	48.04	48.07	30	Residential	slope down
110	48.09	48.10	10	Residential	slope down
111	48.20	48.27	70	Residential	slope up
112	48.54	48.56	20	Residential	slope down
113	48.64	48.66	20	Residential	Flat
114	49.24	49.26	20	Residential	slope down
115	49.26	49.28	20	Residential	slope down
116	49.34	49.43	90	Residential	slope up
117	49.58	49.64	60	Residential	slope up
118	49.71	49.84	130	Residential	Flat
119	49.92	49.99	70	Residential	slope down
120	50.60	50.62	20	Residential	slope up
121	50.68	50.72	40	Residential	slope up
122	50.79	50.80	10	Residential	slope up
123	50.87	50.96	90	Residential	slope up
124	50.99	51.00	10	Residential	slope up
125	51.02	51.04	20	Residential	slope up
126	51.05	51.06	10	Residential	slope up
127	51.08	51.10	20	Residential	slope up
128	51.13	51.15	20	Residential	slope up
129	51.25	51.29	40	Residential	slope up
130	52.47	52.48	10	Residential	slope down
131	52.70	52.72	20	Residential	slope up
132	54.62	54.64	20	Residential	slope down
133	54.72	54.73	10	Residential	slope up
134	54.80	54.90	100	Residential	slope up
135	54.94	54.95	10	Residential	slope up
136	55.00	55.02	20	Residential	slope up
137	55.46	55.48	20	Residential	slope up
138	55.50	55.51	10	Residential	slope up
139	55.60	55.62	20	Residential	slope up
140	55.69	55.70	10	Residential	slope up
141	56.36	56.38	20	Residential	slope up

142	57.01	57.05	40	Residential	slope up
143	57.33	57.35	20	Residential	slope down
144	57.55	57.58	30	Residential	slope up
145	57.63	57.64	10	Residential	slope up
146	57.66	57.68	20	Residential	slope up
147	57.71	57.73	20	Residential	slope up
148	57.77	57.79	20	Residential	slope up
149	57.83	57.85	20	Residential	slope up
150	57.94	57.96	20	Residential	slope up
151	57.98	57.99	10	Residential	incline/decline
152	58.01	58.02	10	Residential	incline/decline
153	58.04	58.06	20	Residential	incline/decline
154	58.09	58.14	50	Residential	Flat
155	58.33	58.36	30	Residential	slope down
156	59.58	59.61	30	Residential	slope up
157	60.56	60.57	10	Residential	slope up
158	60.65	60.67	20	Residential	incline/decline
159	60.79	60.83	40	Residential	Flat
160	60.93	60.95	20	Residential	Flat
161	61.02	61.04	20	Residential	Flat
162	61.06	61.07	10	Residential	slope down
163	61.21	61.23	20	Residential	slope down
164	61.44	61.56	120	Residential	slope down
165	61.61	61.76	150	Residential	slope down
166	61.84	61.88	40	Residential	incline/decline
167	61.90	61.92	20	Residential	incline/decline
168	61.93	61.95	20	Residential	incline/decline
169	61.98	61.99	10	Residential	slope down
170	62.06	62.08	20	Residential	slope up
171	62.24	62.25	10	Residential	incline/decline
172	62.27	62.28	10	Residential	incline/decline
173	62.34	62.42	80	Residential	incline/decline
174	62.54	62.55	10	Residential	Flat
175	62.71	62.76	50	Residential	Flat
176	62.91	62.98	70	Residential	Flat
177	63.16	63.17	10	Residential	slope down
178	63.21	63.23	20	Residential	slope down
179	63.28	63.30	20	Residential	incline/decline
180	63.33	63.34	10	Residential	incline/decline
181	63.37	63.38	10	Residential	incline/decline
182	63.43	63.44	10	Residential	Flat
183	63.46	63.49	30	Residential	Flat
184	63.57	63.58	10	Residential	Flat
185	63.69	63.71	20	Residential	slope down
186	63.72	63.73	10	Residential	slope up
187	64.54	64.55	10	Residential	slope up
188	64.56	64.57	10	Residential	slope up
189	65.00	65.01	10	Residential	slope up
190	65.05	65.06	10	Residential	slope up
191	65.22	65.23	10	Residential	slope down

192	65.40	65.42	20	Residential	Flat
193	65.46	65.48	20	Residential	slope up
194	65.66	65.68	20	Residential	slope up
195	65.75	65.76	10	Residential	slope up
196	65.86	65.87	10	Residential	incline/decline
197	65.90	65.92	20	Residential	incline/decline
198	65.97	65.98	10	Residential	slope down
199	66.06	66.07	10	Residential	slope down

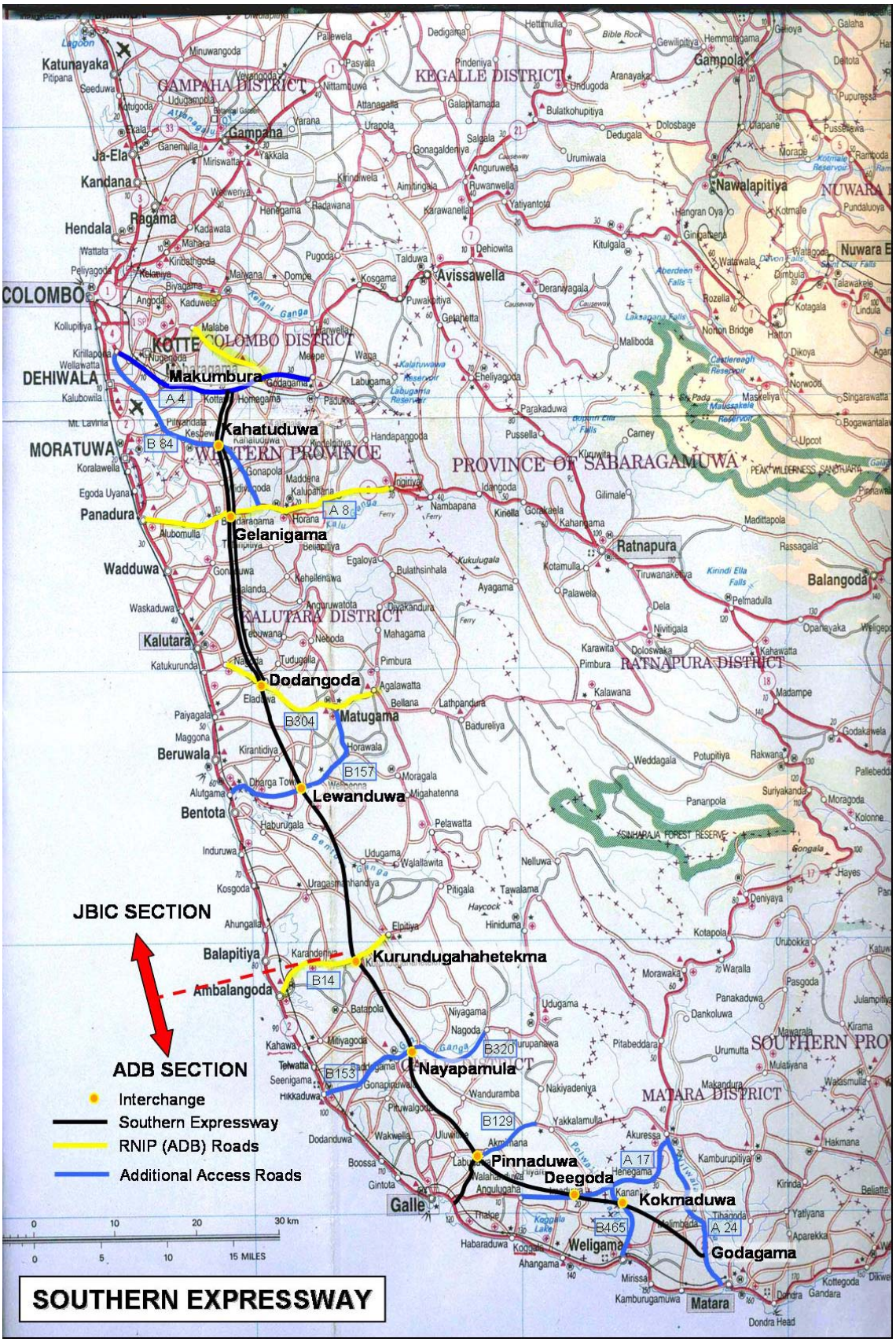
Approximate Site Specific Locations of Noise Sensitive Receptors on theLeft Side of the Colombo-Matara Expressway -Kottawa to Kurudugahahetekma

Receptor ID	Distance along the trace to start and end the Receptors (in km)		Length of the Receptor in meters	Type of the Land use Receptor	Terrain Condition
	Start	End			
1	0.16	0.22	60	Residential	Flat
2	0.54	0.60	60	Residential	Flat
3	0.83	0.85	20	Residential	Flat
4	2.18	2.19	10	Residential	Flat
5	2.90	2.96	60	Residential	Flat
6	5.25	5.29	40	Residential	Flat
7	5.90	5.98	80	Residential	Flat
8	6.85	6.89	40	Residential	incline/decline
9	6.94	7.02	80	Residential	incline/decline
10	7.18	7.25	70	Residential	incline/decline
11	7.40	7.46	60	Residential	incline/decline
12	7.98	8.00	20	Residential	incline/decline
13	8.12	8.19	70	Residential	incline/decline
14	8.44	8.53	90	Residential	incline/decline
15	8.94	9.14	200	Residential	incline/decline
16	9.62	9.74	120	Residential	incline/decline
17	10.00	10.08	80	Residential	incline/decline
18	10.22	10.25	30	Residential	incline/decline
19	10.44	10.48	40	Residential	incline/decline
20	10.50	10.53	30	Residential	incline/decline
21	11.01	11.07	60	Residential	incline/decline
22	12.00	12.06	60	Residential	incline/decline
23	12.10	12.20	100	Residential	incline/decline
24	12.20	12.22	20	Residential	incline/decline
25	12.58	12.68	100	Residential	incline/decline
26	12.94	12.96	20	Residential	incline/decline
27	12.99	13.09	90	Residential	incline/decline
28	13.26	13.30	40	Residential	incline/decline
29	13.36	13.41	50	Residential	incline/decline
30	13.78	14.12	340	Residential	incline/decline
31	14.85	14.95	110	Residential	incline/decline
32	14.70	15.00	30	Residential	incline/decline
33	15.00	15.10	100	Residential	incline/decline
34	15.13	15.16	30	Residential	incline/decline
35	15.18	15.29	110	Residential	incline/decline
36	15.39	15.46	70	Residential	incline/decline
37	15.68	15.70	20	Residential	incline/decline
38	15.70	15.79	90	Residential	incline/decline
39	17.83	17.88	50	Residential	incline/decline
40	18.65	18.68	30	Residential	incline/decline

41	18.68	18.70	20	Residential	incline/decline
42	19.10	19.17	70	Residential	incline/decline
43	19.60	19.64	40	Residential	incline/decline
44	19.86	19.90	40	Residential	incline/decline
45	22.00	22.02	20	Residential	slope up
46	22.34	22.36	20	Residential	slope up
47	22.42	22.48	60	Residential	slope up
48	22.66	22.68	20	Residential	slope down
49	22.69	22.70	10	Residential	slope down
50	22.74	23.06	320	Residential	incline/decline
51	23.30	23.38	80	School	slope down
52	23.38	23.46	80	Residential	slope down
53	23.83	23.87	40	Residential	slope down
54	24.02	24.22	200	Residential	slope down
55	24.28	24.30	20	Residential	slope down
56	24.33	24.35	20	Residential	slope down
57	24.44	24.45	10	Residential	slope down
58	24.46	24.48	20	Residential	slope down
59	24.49	24.51	20	Residential	slope down
60	25.14	25.20	60	Residential	slope down
61	25.24	25.26	20	Residential	slope down
62	37.39	37.56	170	Residential	slope up
63	38.82	39.02	200	Residential	slope down
64	39.60	39.64	40	Residential	slope up
65	39.81	39.88	70	Residential	incline/decline
66	40.54	40.56	20	Residential	slope down
67	40.58	40.59	10	Residential	slope down
68	40.74	40.92	180	Residential	incline/decline
69	41.26	41.28	20	Residential	incline/decline
70	41.29	41.30	10	Residential	slope down
71	41.32	41.33	10	Residential	slope down
72	41.50	41.60	100	Temple	incline/decline
73	41.68	41.71	30	Residential	slope down
74	42.64	42.66	20	Residential	slope down
75	42.97	42.99	20	Residential	slope up
76	43.02	43.04	20	Residential	slope up
77	43.10	43.12	20	Residential	incline/decline
78	43.14	43.16	20	Residential	incline/decline
79	44.29	44.31	20	Residential	slope up
80	44.33	44.35	20	Residential	slope up
81	44.36	44.38	20	Residential	slope up
82	44.76	44.78	20	Residential	slope down
83	45.04	45.06	20	Residential	slope down
84	45.10	45.12	20	Residential	slope down
85	45.14	45.16	20	Residential	incline/decline
86	45.17	45.18	10	Residential	incline/decline
87	45.19	45.20	10	Residential	incline/decline
88	45.59	45.61	20	Residential	slope down
89	45.62	45.63	10	Residential	slope down
90	46.71	46.73	20	Residential	slope up

91	46.85	46.87	20	Residential	slope down
92	46.89	46.91	20	Residential	slope down
93	46.94	46.95	10	Residential	slope up
94	47.20	47.22	20	Residential	slope up
95	47.30	47.32	20	Residential	slope up
96	47.40	47.42	20	Residential	incline/decline
97	47.52	47.54	20	Residential	slope down
98	47.94	47.96	20	Residential	slope down
99	48.28	48.29	10	Residential	incline/decline
100	48.44	48.46	20	Residential	slope up
101	48.59	48.60	10	Residential	slope up
102	49.20	49.21	10	Residential	slope up
103	49.24	49.27	30	Residential	incline/decline
104	49.49	49.51	20	Residential	slope up
105	49.58	49.60	20	Residential	slope up
106	49.65	49.66	10	Residential	slope up
107	49.96	49.98	20	Residential	slope down
108	50.08	50.17	90	Residential	slope down
109	50.96	50.98	20	Residential	slope up
110	51.35	51.38	30	Residential	incline/decline
111	51.48	51.49	10	Residential	slope down
112	51.57	51.67	100	Residential	Flat
113	52.46	52.67	210	Residential	slope down
114	51.50	51.52	20	Residential	slope up
115	52.76	52.78	20	Residential	slope up
116	54.39	54.40	10	Residential	slope down
117	54.83	54.84	10	Residential	slope up
118	54.90	54.92	20	Residential	slope up
119	54.94	54.96	20	Residential	slope up
120	54.97	54.99	20	Residential	slope up
121	55.02	55.04	20	Residential	slope up
122	55.14	55.15	10	Residential	Flat
123	55.21	55.23	20	Residential	slope up
124	55.32	55.34	20	Residential	slope up
125	55.44	55.45	10	Residential	slope up
126	55.69	55.71	20	Residential	slope up
127	55.72	55.73	10	Residential	slope up
128	57.09	57.12	30	Residential	incline/decline
129	57.32	57.35	30	Residential	slope up
130	57.37	57.39	20	Residential	Flat
131	57.57	57.58	10	Residential	slope up
132	57.68	57.69	10	Residential	slope up
133	57.78	57.81	30	Residential	slope up
134	57.86	57.88	20	Residential	slope up
135	57.95	57.96	10	Residential	slope up
136	58.11	58.13	20	Residential	slope up
137	58.28	58.30	20	Residential	slope down
138	58.53	58.54	10	Residential	slope down
139	58.55	58.57	20	Residential	slope down
140	59.11	59.13	20	Residential	slope down

141	59.47	59.49	20	Residential	slope down
142	59.68	59.71	30	Residential	slope down
143	60.92	60.94	20	Residential	slope up
144	60.81	60.82	10	Residential	slope down
145	60.90	60.96	60	Residential	slope up
146	61.10	61.11	10	Residential	slope down
147	61.64	61.65	10	Residential	slope up
148	61.71	61.72	10	Residential	slope up
149	61.83	61.86	30	Residential	slope down
150	61.88	61.89	10	Residential	slope down
151	62.27	62.29	20	Residential	slope up
152	62.36	62.37	10	Residential	incline/decline
153	62.57	62.58	10	Residential	slope up
154	62.62	62.65	30	Residential	slope up
155	62.71	62.73	20	Residential	slope up
156	62.76	92.82	60	Residential	slope up
157	62.84	62.85	10	Residential	slope up
158	62.88	62.90	20	Residential	slope up
159	63.10	63.11	10	Residential	slope up
160	63.16	63.18	20	Residential	slope down
161	63.18	63.20	20	Residential	slope down
162	63.41	63.50	90	Residential	slope down
163	63.61	63.63	20	Residential	slope down
164	63.70	63.72	20	Residential	Flat
165	63.90	63.91	10	Residential	slope up
166	64.22	64.23	10	Residential	slope down
167	64.80	64.89	90	Residential	slope up
168	65.16	65.17	10	Residential	slope up
169	65.68	65.70	20	Residential	slope down
170	65.76	65.77	10	Residential	slope up
171	65.80	65.81	10	Residential	slope down
172	65.96	65.97	10	Residential	slope down
173	65.99	66.00	10	Residential	slope down
174	66.07	66.09	20	Residential	slope down
175	66.13	66.26	130	Residential+School	slope down


JBIC SECTION
ADB SECTION
Interchange
Southern Expressway
RNIP (ADB) Roads
Additional Access Roads
SOUTHERN EXPRESSWAY
Kahatuduwa
Gelanigama
Makumbura
Dodangoda
Matugama
Lewanduwa
Kurundugahahetekma
Nayapamula
Pinnaduwa
Deegoda
Kokmaduwa
Godagama
Balapitiya
Ambalangoda
Panadura
Kalutara
Beruwala
Bentota
Wadduwa
Galle
Weligama
Matara
Avissawella
Nawalapitiya
Gampola
Ratnapura
Balangoda
COLOMBO
DEHIWALA
MORATUWA
Katunayaka
Gampaha
Ja-Ela
Kandana
Ragama
Hendala
KEGALLE DISTRICT
GAMPAHA DISTRICT
COLOMBO DISTRICT
WESTERN PROVINCE
SABARAGAMUWA PROVINCE
KALUTARA DISTRICT
RATNAPURA DISTRICT
MATARA DISTRICT
SOUTHERN PROVINCE
A 4
A 8
B 84
B304
B157
B14
B320
B153
B129
A 17
B465
A 24