

Initial Environmental Examination

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SRI: Jaffna and Kilinochchi Water Supply Project – Additional Financing (Supply and Laying of Distribution Network in Jaffna City Area)

Package No: PEIC/JKWSSP/DISTRIBUTION NETWORK/2017/01

Prepared by the Jaffna Kilinochchi Water Supply Project of the National Water Supply and Drainage Board for the Asian Development Bank.

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Implementing Agency
National Water Supply and Drainage Board

Executing Agency
Ministry of Urban Development, Water Supply and Housing Facilities

ABBREVIATIONS

ADB	-	Asian Development Bank
DBO	-	Design Build Operation
DDR	-	Due Diligence Report
DN	-	Distribution Network
DSD	-	Divisional Secretary Division
ET	-	Elevated Tower
GIS	-	Geographical Information System
GND	-	Grama Niladhari Division
GOSL	-	Government of Sri Lanka
JKWSP	-	Jaffna Kilinochchi Water Supply Project
JMC	-	Jaffna Municipal Council
MC	-	Municipal Council
NP	-	Northern Province
NWSDB	-	National Water Supply and Drainage Board
O&M	-	Operation and Maintenance
PEIC	-	Project Engineering and Institutional Consultancy
PMCIU	-	Project Management Coordination and Implementation Unit
PS	-	Pradeshiya Sabha
ROW	-	Right of Way
RDA	-	Road Development Authority
RDD	-	Road Development Department
RP	-	Resettlement Plan
SWRO	-	Sea Water Reverse Osmosis
WRB	-	Water Resources Board

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I. INTRODUCTION

A. Background

1. The people in Jaffna peninsula depend entirely upon the underground aquifers for their water supply in absence of surface water sources. Unfortunately, the aquifers are highly contaminated due to over extraction of water for agricultural irrigation using powerful pumps, applying high doses of chemicals and pesticides for cash crops, improperly constructed latrines in the urban areas, discharging the burnt oil from the power generation plant in the ground without considering the environment safety and mismanaging the water bodies in the Peninsula. Due to bacteriological and chemical contamination and sea water intrusion, a portion of the underground water in peninsula is not suitable for drinking purposes. This condition represents a public health hazard. It was observed that the people in Jaffna are potentially at high risk of waterborne and water related diseases. Therefore, the government of Sri Lanka decided to provide quality safe drinking water for the people in Jaffna and also to enhance the quantity of water available in water scarce Island.

2. The Asian Development Bank (ADB) implemented a Conflict Affected Area Rehabilitation Project (CAARP) in 2003. As a result of this, there was a recommendation to review the water resources in the Jaffna peninsula and the Kilinochchi district. A team of consultants conducted a feasibility study to provide safe and reliable water supply and sanitation for the Jaffna and Kilinochchi districts. The Jaffna-Kilinochchi Water Supply and Sanitation Project was the outcome of this study in 2005 and an agreement was signed by the Farmer Organization to share the water from Iranaimadu Irrigation tank to Jaffna district, inclusive of some GN divisions in the northern part of the Kilinochchi district. But the increased insecurity situation in the Northern Sri Lanka precluded further development of the project until the armed conflict came to an end in May, 2009.

3. After the conflict came to an end, the interest in implementing the project regained importance and the documents were reviewed. The agreement for financial assistance between the Government of Sri Lanka, The Asian Development Bank and the Co-financer Agence Française Development (AFD) was signed and the consultants were recruited. The total cost of the project (PAM 2010) was estimated to be US \$ 164.0 million, funded by ADB, AFD and GOSL (ADB: 90 million USD, AFD: 48 million USD and GOSL: 26.04 million USD) and target date of completion was as scheduled as 2017.

4. Considering the urgent need of water supply facilities to Jaffna Peninsula and its suburbs, a mutual agreement has been reached with ADB to carry out a Rapid Assessment on the feasibility of alternative water sources for JKWSSP mainly focusing on desalination of sea water. As a result of the rapid assessment study and their recommendations, desalination option was found to be a suitable alternative, and changed the raw water source from surface water to seawater. This project developed to install desalination of sea water through the development of seawater reverse osmosis (SWRO) plant for treatment of seawater installation of reverse osmosis (RO) plant of production capacity 24,000 cubic meters (m³) per day was decided. Taking restructuring the production facility, the project met the eligibility criteria for additional financing of approved 120 Mn USD approved by Asian Development Bank for the development of water supply infrastructure facilities.

5. The overall benefit of the project will be improved health and human development in the urban and Pradeshiya Saba areas of Jaffna and Kilinochchi districts. The water supply and sanitation components of the project will respectively benefit an estimated 300,000 and 80,000

people in the Jaffna and Kilinochchi respectively. However, the sanitation part suspended from this project and cabinet approval obtained to implement if separately. For implementation of the Water Supply Component, there are different contract packages, work on 5 packages completed and there are two construction ongoing packages. The elevated towers envisaged in the project has been grouped into three packages namely ET 1, ET 2 and ET 3. These three packages are funded under the original loan. ET 1 & ET2 packages were awarded to Sierra Construction Company based in Colombo and the construction works was completed in 2018. ET 3 package was awarded to M/s. Squiremech Engineering and the construction works are for five numbers towers ongoing in Karaveddy, Pommaiveli, Nainathivu, Analaitivu and Eluvaithivu and nearly 20 % of physical progress achieved. This package is fully covered by the original loan. Transmission Main Packages are fully funded by the Original Loan and total length 183.6 Km pipe laying works has been completed. The transmission pipe laying contracts awarded to JMC (India) Project and the CMEC – BPP – JV contractors and the pipe laying from Puthukkadu Junction to Punguduthivu, Mandaitivu, Kayts and Island has been completed.

6. Supply and Laying of Distribution Network in Jaffna City area is the package originally planned to lay pipes for water supply and sewerage scheme. Due to the major scope change and the cancellation of sewerage scheme, this package cover water supply only existing Jaffna City water supply system is confined to limited to supply, limited hour with quality issues. Three towers such as Old Park, Pommaiveli and the Nallur will supply water to Jaffna City area. The supply zone of each tower was decided taking into account the capacity of the towers, together with other technical and physical conditions and constraints. This due diligence report consist the information and details of the package for supplying and laying of water distribution networks in Jaffna City area based on the final design submitted by consultant.

7. This Package covers 4 distribution zones. These are Nallur, Old Park- 1, Old Park -2 and Pommaiveli distribution zones. Coverage area are as follows:

- (i) Nallur zone is 5.696 Km²
- (ii) Old Park zone - 1 is 8.34 Km²
- (iii) Old Park zone - 2 is 0.86 Km² and
- (iv) Pommaiveli zone is 4.41 Km²

8. Total 283.67 km long pipe laying is under this package. Nallur, Old Park -1, Old Park -2 and Pommaiveli zones consist altogether of 46 GN divisions. The hydraulic design covers all 46 GND. The supply zone of each water tower was determined based on already designed capacities of the towers together with the population to be serviced, distance to the tower, geographical levels and other relevant technical and physical conditions and constantly.

9. It is a usual practice of the NWSDB to set the design horizon for water supply facilities to 20 years from the time of detail design. Applying this concept, the design horizon for the network is set to 2033, which is 20 years from the base year 2013. A feasibility study was conducted in 2006. As numerous administrative, social and environmental changes have taken place in the project area after the end armed conflict (in 2009), and subsequent development have taking place, the feasibility study data is no longer reliable as a base for carrying out the detailed designs. Hence, the population in the area for water supply was assessed, based on the following two methods, using 1.52% annual growth and migrant rate.

- (i) Domestic population based on 2011 Census Department data.

- (ii) Population based on a GIS building Survey, carried out by the Consultant based on the Survey Department, 2012 Building Data, accounting 4.5 persons per household and actual population for non-domestic buildings.
- (iii) The actual population of non-domestic buildings was identified in a field survey. The population of these buildings and domestic population were tabulated into Geographical Information System (GIS) attribute tables.

Table 1: The population computed using the Two methods is presented

Supply Zone	Domestic Population Predicted Based on 2011 Census Dept. Data				Domestic Population Predicted Based on updated GIS Building Data			
	2013	2018	2028	2033	2013	2018	2028	2033
Nallur	17,865	19,264	22,401	24,156	25,285	27,266	31,706	34,190
Old Park-1	29,129	31,411	36,525	39,387	37,542	40,483	47,075	50,763
Old Park-2	11,482	12,382	14,398	15,526	11,825	12,751	14,828	15,989
Pommaiveli	24,100	25,988	30,220	32,587	27,662	29,829	34,686	37,404
Total	82,576	89,045	103,544	111,656	102,314	109,450	124,839	133,623

Table 2: Projected Households with 1.52% (annual growth and migrant rate according to GIS Data

Zone	2013	2033
Nallur	5619	7598
Old Park -1	8342	11,281
Old Park -2	2628	3553
Pommaiveli	6147	8312
Total	22,736	30,744

B. Purpose of the Report

10. The IEE contains an Environmental Management Plan which lists all effects identified in pre-construction, construction and operational phases of each sub-project and describes the recommended migratory measures and allocates responsibility for each action. There is also an Environmental Monitoring Plan set out for conducting monitoring ensure that all parties provide the mitigation that is their responsibility, that the action protects the environment as intended and to determine the long-term effects of each scheme.

11. If all the migratory measures proposed are delivered as recommended in the IEE, all potential negative effects of construction and operation of the sub-projects can be avoided or reduced to acceptable levels and the long-term effects of the schemes should be very positive. This document is the Initial Environmental Examination (IEE) Report. It was prepared and submitted by the feasibility study consultant in 2006 and revised by ADB-appointed consultants from December 2009 to April 2010 to reflect changes in (i) the project; (ii) proposed institutional arrangements; (iii) social and environmental conditions in the project area; and (iv) the ADB Safeguards Policy, in particular the Safeguards Policy Statement of ADB (2009). This IEE report is prepared to reflect further changes in the project and the present conditions on the ground which have changed considerably and includes the available information in terms of describing existing conditions within the study area. This IEE includes an environmental management plan

(EMP) which describes and address the potential impacts and risks identified from the environmental assessment. The EMP included proposed mitigation measures, environmental monitoring and reporting requirements, OHS, emergency response procedures, related institutional or organizational arrangements, capacity development and training activities, implementation schedule, cost estimates, and performance indicators. The IEE and EMP will be included in bidding and contract documents with specific provisions requiring contractors to (i) comply with all other conditions required by ADB, and (ii) to submit a site-specific environmental management plan (SEMP), including proposed sites/locations for construction work camps, storage areas, hauling roads, lay down areas, disposal areas for solid and hazardous wastes; (iii) specific mitigation measures following the approved EMP; (iv) monitoring program as per SEMP; and (v) budget for SEMP implementation. No works can commence unless SEMP is approved by Project Management Coordination and Implementation Unit (PMCIU). Copy of the IEE, EMP, and approved SEMP will be kept on site during the construction and O&M period. This draft IEE will be finalized during design stage and must be reviewed and cleared by ADB prior to civil works.

12. The objective of the proposed project is to provide safe and reliable water supply to people in the Jaffna city area. This IEE study was carried out as an ADB requirement before implementation of the project, in compliance with the Environment Policy (2002) and the Safeguards Policy Statement (2009) and the Environment Safeguards Working Document (2012). The project was identified in order to fulfil the priority needs of the communities in the North to be provided with potable water. The Ministry of Water Supply and Drainage (MWSD) and the Ministry of Local Government and Provincial Councils are the executing agencies responsible for successful project execution. There are ten Divisional Secretariat Divisions consisting of one hundred and ninety Grama Niladari Divisions (GND) in the Jaffna city area, covered by the domestic water supply component of the JKWSSP project.

Table 3: List of Grama Niladhari Divisions covered under this package

Distribution Zone	GND Divisions	GND ID	Service Tower
Nallur	Ariyalai North West Ariyalai Centre North Ariyalai Centre Ariyalai Centre South Kantharmadam North West Kantharmadam North East Kantharmadam South West Kantharmadam South East Nallur North Nallur Centre Nallur South	J/91 J/94 J/95 J/96 J/102 J/103 J/104 J/105 J/106 J/107 J/108	Nallur Tower
Old Park- 1	Nedunkulam Columbuthurai East Columbuthurai West Passaiyoor East Passaiyoor West Eachchamoddai Thirunagar Small Bazaar Jaffna Town West Jaffna Town East Chundikuli South Chundikuli North	J/61 J/62 J/63 J/64 J/65 J/66 J/67 J/72 J/73 J/74 J/75 J/76	Old Park Tower

	Maruthady Attiaddy Sirambiady Grand Bazaar Ariyalai West Ariyalai S. W. (East)	J/77 J/78 J/79 J/80 J/92 J/93	
Old Park- 2	Reclamation East Reclamation West Gurunagar East Gurunagar West	J/68 J/69 J/70 J/71	Old Park Tower
Pommaiveli	Fort Vannarpannai Koddady Navanthurai Navanthurai North Moor Street South Moor Street North New Moor Street Iyanar Kovilady Vannarpannai N.W. (North) Vannarpannai N.W. (West) Vannarpannai N.W. (North) Vannarpannai N.E. (South)	J/81 J/82 J/83 J/84 J/85 J/86 J/87 J/88 J/97 J/98 J/99 J/100 J/101	Pommaiveli Tower

C. Nature, Size and Location of the Project

13. Water quality studies have shown enhanced levels of nitrate pollution, EC, Chloride and Fecal contamination in domestic wells situated in the more densely polluted municipal areas of the peninsula. Nitrate pollution results from high use of agro-chemicals as well as due to disposal of sewage effluent from pit-latrines soak ways and septic tanks; the latter also causes bacterial contamination of the groundwater. Bacterial pollution from pit-latrines soak ways is also reported in the peninsula. The district of Jaffna has a very thin sandy soil layer, in many places approximately one meter deep and the groundwater is easily contaminated with surface source pollutants. Water-borne diseases such as diarrhea, dysentery, typhoid and hepatitis are now common in Jaffna, mainly as a result of groundwater contamination. Today all areas in the peninsula suffer from preventable intestinal diseases, with typhoid and diarrhea emerging as major public health challenges. As such, safe methods of sewerage and wastewater disposal have become imperative. A requirement for sewerage facilities and a treatment plant for the densely populated Jaffna Municipality area were also identified by the post-conflict needs assessment study of 2003.

14. Spatial and temporal distribution maps of various water quality parameters were produced based on a systematic study by Sivathanan et al. (2014). Wells located in the Jaffna Municipal area are with high values of fecal contamination as E. coli, electrical conductivity (EC), chloride and sulphate. Since, most of the farm wells are located inland; their water quality is generally superior to domestic and public wells. However, farm wells contain nitrate- N levels that are above acceptable levels for drinking purposes. The geo-chemical composition of the soils and rocks heavily influence the properties of groundwater. A study carried out in early 1980s reveals that the Northern coastal region is subject to saltwater intrusion.

15. Over-extraction from the shallow groundwater which forms mounds or lenses floating over the saline water results in entering of the underlying brackish water into the freshwater.

Intense urban development and agricultural activity in the densely populated Western part of the Jaffna Peninsula have resulted in groundwater overdraft far in excess of replenishment. Some areas of the peninsula are experiencing high chloride concentrations. The serious implications of these trends in a peninsula essentially devoid of sufficient freshwater, at least in the dry season, require restrictions on new wells including careful regulation of size, diameter and the distance between wells.

II. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

A. ADB Policy

16. ADB's Environment Policy requires consideration of environmental issues in all aspects of the ADB's operations. The requirements are defined in the Safeguards Policy Statement (2009) and the Environment Safeguards Working Document (2012) which covers issues of environment, involuntary resettlement and indigenous peoples and supersedes former policies in these areas. The new safeguard policy affirms that the ADB considers environmental and social sustainability as a cornerstone of economic growth and poverty reduction in Asia and the Pacific and is committed to ensuring the social and environmental sustainability of the projects it supports.

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

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

18. To help borrowers and clients and their projects achieve the desired outcomes, ADB adopts a set of specific safeguard requirements that borrowers and clients are required to meet in addressing environmental and social impacts and risks. These safeguard requirements are as follows:

- (i) Safeguard Requirements 1: Environment (Appendix 1 of SPS);
- (ii) Safeguard Requirements 2: Involuntary Resettlement (Appendix 2 of SPS);
- (iii) Safeguard Requirements 3: Indigenous Peoples (Appendix 3 of SPS); and
- (iv) Safeguard Requirements 4: Special Requirements for Different Finance Modalities (Appendix 4 of SPS)

19. In addition, ADB does not finance activities on the prohibited investment activities list (Appendix 5 of SPS). Furthermore, ADB does not finance projects that do not comply with its safeguard policy statement, nor does it finance projects that do not comply with the host country's social and environmental laws and regulations, including those laws implementing host country obligations under international law.

20. In the field of environment, the principal tool for achieving these aims is environmental assessment, which is a generic term for the process of environmental analysis and planning to

avoid or reduce the environmental effects and risks associated with a project. The nature of the assessment required for a project depends on the significance of its environmental effects, which are related to the type and location of the project, the sensitivity, scale, nature and magnitude of its potential effects and the availability of cost-effective mitigation measures. Projects are screened for their expected environmental effects and are assigned to one of the following categories:

- (i) **Category A:** Projects likely to have significant adverse environmental effects, which are irreversible, diverse or unprecedented and may affect an area larger than the location subject to physical works. An Environmental Impact Assessment (EIA) is required.
- (ii) **Category B:** Projects with adverse environmental effects that are less significant than those of category A projects, are site-specific, generally not irreversible and in most cases can be mitigated more readily than for category A projects. An IEE is required.
- (iii) **Category C:** Projects likely to have minimal or no adverse environmental effects. No environmental assessment is required, although environmental implications are reviewed.

21. For the project, based on the ADB's rapid environmental assessment checklist (Appendix 1), the project is categorized as Category B. Most of the anticipated negative effects on location, design, construction or operation are expected to be minor; and avoidance, mitigation or compensation for negative effects should be relatively straightforward. An IEE was therefore conducted and the results are presented in this document. During the design, construction, and operation of the project, the PMCIU will apply pollution prevention and control technologies and practices consistent with international good practice, as reflected in internationally recognized standards such as the World Bank Group's Environment, Health and Safety Guidelines. These standards contain performance levels and measures that are normally acceptable and applicable to projects. When Government of Sri Lanka regulations differ from these levels and measures, the PMCIU will achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the PMCIU will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS.

B. Environmental, Health, and Safety (EHS) Guidelines of International Finance Corporation (World Bank Group)

22. The project will develop mitigation and preventive measures consistent with the IFC's EHS Guidelines hazards and risks established for our project on the basis of the results of an environmental assessment in which site-specific variables, such as country context, the assimilative capacity of the environment, and other project factors, are taken into account. The EHS Guidelines for Water and Sanitation include information relevant to the operation and maintenance of Potable water treatment, Treated water Transmission main and distribution systems of our project. The EHS Guidelines contain the information as follows:

- (i) Environmental
- (ii) Occupational Health and Safety
- (iii) Community Health and Safety
- (iv) Construction and Decommissioning

C. National Law

23. The requirement for Environmental Assessment in Sri Lanka was established by the National Environment Act (1980), and the procedures are defined in the EIA Regulations (1993). The regulations specify activities for which environmental assessment is mandatory, and those that could occur within this project are as follows:

- (i) A Water Treatment Plant with a capacity of over 500,000 m³/day (the Central Environment Authority is considering a proposal to lower this limit to 500 m³/day);
- (ii) Laying more than 1 km of pipes for transporting liquid (excluding water); and
- (iii) Projects that fall within sensitive area(s).

24. Sensitive areas as defined in the EIA Regulations include:

- (i) Any erodible area declared under the Soil Conservation Act (1951, 1953);
- (ii) Any Flood Area declared under the Flood Protection Ordinance (1924, 1955) and any Flood Protection Area declared under the Sri Lanka Land Reclamation and Development Corporation Act (1968, 1982);
- (iii) Any reservation beyond the Full Supply Level of a reservoir;
- (iv) Any archaeological reserve, ancient or protected monument as defined or declared under the Antiquities Ordinance (1965);
- (v) Any area declared under the Botanic Gardens Ordinance (1928, 1973);
- (vi) Areas within or less than 100 m from the boundaries of any area declared under the National Heritage and Wilderness Act (1988): the Forest Ordinance;
- (vii) Areas within or less than 100m from the boundaries of any area declared as a Sanctuary under the Fauna and Flora Protection Ordinance (1937);
- (viii) Areas within or less than 100m from the high flood level contour of a public lake as defined by the Crown Lands Ordinance (1947, 1949, 1956) including those declared under Section 71 of the Ordinance; and
- (ix) Areas 60 m or less from the bank of a public stream as defined in the Crown Lands Ordinance with a width of more than 25 m at any point.

25. The requirement for EIA and the level of study required are determined by the CEA after submission by the proponent of a Project Information Document (PID) plus supporting information if relevant. There are two possible outcomes:

- (i) **Categorical Exclusion:** the activity is not on the list of prescribed projects in the EIA regulations, is not in or near a sensitive area, has not been the subject of public protest and it is clear from the PID and supporting information that the project will have no significant environmental effects. Environmental Clearance is granted (with or without conditions) and the project may proceed; and
- (ii) All other projects require Environmental Assessment and the CEA establishes a Scoping Committee to decide on the level of study (IEE or EIA) and prepare the Terms of Reference (TOR). Alternatively, if the project lies wholly within the jurisdiction of a single Government Agency (e.g. the UDA) the CEA may refer the project to this authority (as the Project Approving Agency) to administer the EIA process. A Technical Review Committee reviews the completed IEE or EIA report and recommends whether Environmental Clearance should be granted; the final decision is made by the CEA. The CEA informed these project activities do not require Environmental Clearance from CEA under the Gazette

Extraordinary No: 772/22, dated 24th June 1993 under National Environmental Act No.47 of 1980 and its amendments.

26. For the project the Central Environmental Authority indicated that activities for laying distribution network do not require an Environmental Clearance (Appendix 2).

Table 4: Summary of Procedure for Obtaining Main Environmental Clearance / Permits Required from the Government of Sri Lanka

Legislation	Regulatory Authority	Summary of the Procedure	Time Required
1. CEA - EIA/IEE Clearance			
National Environmental Act No. 47 of 1980 and amended Act No. 56 of 1988; Government Gazette No. 772/22 of 24th June 1993 and No. 859/14 of 23rd February 1995	CEA of Sri Lanka	1. Submit Preliminary Information to CEA	During feasibility stage 36 days
		2. Designate PAA by CEA	
		3. Scoping; Issue of Terms of Reference for EIA/IEE by PAA	
		4. Conduct the IEE/EIA study and submit the report to PAA	About 60 to 90 days
		5. Check for adequacy by PAA	14 days
		6. Open for public comments (only for EIA)	30 days
		7. Review by TEC appointed by CEA	
		8. Issuance of approval by PAA/ CEA	36 days
2. Coast Conservation Department Permit			
Under Section 5, 14, 15 and 16 of Coast Conservation Act No. 57 of 1981	Coast Conservation Authority of Sri Lanka	1. Submit application to CCD	During feasibility stage About 14 days
		2. Issue of TOR for EIA / IEE by CCD	
		3. Conduct the IEE / EIA study and submit the report to CCD	About 60 to 90 days
		4. (i) Invite Coast Conservation Advisory Council for comments (only for EIA); and (ii) Open for public comments (only for EIA)	120 days (maximum)
		5. Review of comments	
		6. Issuance of permit by CCD	

3. Archeological Impact Assessment Survey			
Under Section 47 read with Section 43(b) of Antiquities(Amendment) Act No. 24 of 1998; Gazette Notification No. 1152/14 dated 4 October 2010	Department of Archaeology Sri Lanka	1. Submit application to the Department	During feasibility stage About 30 days
		2. Conduct a Preliminary Observation by Regional Office and submit the report to the Department	
		3. (i) If there are no antiquities according to the recommendation and observation report, land will be released for the project	About 30 days
		(ii) If the preliminary observation report has proposed to carry out an AIA survey, steps will be taken to conduct the survey	
		4. Call for quotations for AIA from registered agencies by the Department and award the survey	
		5. Conduct the AIA survey by the selected agency and submit the report to the Department	42 days
		6. Submit AIA report to Minister in charge for approval	About 30 days
		7. Issuance of permit by the Department	

AIA = Archaeological Impact Assessment, CCD = Coast Conservation Department, CEA = Central Environment Authority, EIA = Environment Impact Assessment, EPL = Environmental Protection License, IEE = Initial Environmental Examination, PAA = Project Approving Agency, TEC = Technical Evaluation Committee, TOR = Terms of Reference.

D. Approvals Needed

Table 5: Clearances that may be required during Different Stages of Project implementation, the Relevant Legislation and Responsible Supervisory Institutions

Construction Activity	Statutes under which Clearance is Required	Statutory Authority	Responsibility	
			Implementation	Supervision
Excavation/ exposure of water table	The Water Resources Board Act No.29 of 1964 Municipal Councils Ordinance No.29 of 1947 Pradeshia Sabha Act No. 15 of 1987 Provincial Councils Act No. 42 of 1987	Water Resources Board RDA Municipal Council Pradeshia Sabha Provincial Road Development Department of the Northern Provincial Council	Contractor	WRB RDA Municipal Council Pradeshia Sabha Provincial Road Development Department of the Northern Provincial Council
Unearthing artifacts etc.	Antiquities Ordinance (Chap. 188) Convention for the Protection of the World Culture Heritage and National Heritage (1972)	Department of Archaeology	Contractor	Department of Archaeology
Trenching in General triggering soil erosion	Soil Conservation Act No.25 of 1951 Municipal Councils Ordinance No.29 of 1947 Pradeshia Sabha Act No. 15 of 1987	Department of Agriculture NBRO RDA Municipal Council Pradeshia Sabha Provincial Road	Contractor	Department of Agriculture NBRO RDA Municipal Council Pradeshia Sabha Provincial Road Development

Construction Activity	Statutes under which Clearance is Required	Statutory Authority	Responsibility	
			Implementation	Supervision
				Department of the Northern Provincial Council
	Provincial Councils Act No. 42 of 1987	Development Department of the Northern Provincial Council		
Tree felling	Clearances from authorities as per the Fauna and Flora Protection No. 38 of 1949 Felling of Trees (Control) Act No. 9 of 1951 as amended by Act No. 30 of 1953 Municipal Councils Ordinance No.29 of 1947 Pradeshiya Sabha Act No. 15 of 1987 Provincial Councils Act No. 42 of 1987	Forest Department RDA Works Division of the Municipal Council Works Division of the Pradeshiya Sabha Northern Provincial Council	Contractor Divisional Forestry Officer	Divisional Forestry Officer RDA Works Division of the Municipal Council Works Division of the Pradeshiya Sabha Northern Provincial Council
Discharges from construction activities to natural /stormwater drains	National Environmental (Protection and Quality) Regulations No.1 of 2008 Municipal Councils Ordinance No.29 of 1947 (Chap 576) Pradeshiya Sabha Act No. 15 of 1987 Provincial Councils Act No. 42 of 1987	CEA RDA Drainage Division of the Municipal Council Drainage Division of the Pradeshiya Sabha Northern Provincial Council	Contractor	CEA RDA Drainage Division of the Municipal Council Drainage Division of the Pradeshiya Sabha Northern Provincial Council

Construction Activity	Statutes under which Clearance is Required	Statutory Authority	Responsibility	
			Implementation	Supervision
Groundwater pumping from trenches/ excavation	Water Resources Board Act 1964 Municipal Councils Ordinance No.29 of 1947 Pradeshiya Sabha Act No. 15 of 1987 Provincial Councils Act No. 42 of 1987	Water Resources Board RDA Drainage Division of the Municipal Council Drainage Division of the Pradeshiya Sabha Northern Provincial Council	Contractor	WRB RDA Drainage Division of the Municipal Council Division of the Pradeshiya Sabha Northern Provincial Council
Dismantling the road surface	Road Development Authority Act No.73 of 1981 Municipal Councils Ordinance No.29 of 1947 (Chap 576) Pradeshiya Sabha Act No. 15 of 1987 Provincial Councils Act No. 42 of 1987	RDA Traffic Design and Road Safety Division of the Municipal Council Traffic Design and Road Safety Division of the Pradeshiya Sabha Provincial Road Development Department of the Northern Provincial Council	Contractor	RDA Traffic Design and Road Safety Division of the Municipal Council Traffic Design and Road Safety Division of the Pradeshiya Sabha Provincial Road Development Department of the Northern Provincial Council
Dismantling/disturbance to culverts	Road Development Authority Act No.73 of 1981 Municipal Councils Ordinance No.29 of 1947 (Chap 576) Pradeshiya	RDA Traffic Design and Road Safety Division of the Municipal Council Traffic Design and Road Safety Division of the	Contractor	RDA Traffic Design and Road Safety Division of the Municipal Council Traffic Design and Road Safety Division of the

Construction Activity	Statutes under which Clearance is Required	Statutory Authority	Responsibility	
			Implementation	Supervision
	Sabha Act No. 15 of 1987 Provincial Councils Act No. 42 of 1987	Pradeshia Sabha Provincial Road Development Department of the Northern Provincial Council		Pradeshia Sabha Provincial Road Development Department of the Northern Provincial Council
Construction of ducts or culvert under railway line to accommodate waterline	Railways Ordinance	Department of Railways	Contractor	Department of Railways
Construction of duct or culvert under road to accommodate waterline	Road Development Authority Act No.73 of 1981 Municipal Councils Ordinance No.29 of 1947 (Chap 576) Pradeshia Sabha Act No. 15 of 1987 Provincial Councils Act No. 42 of 1987	RDA Traffic Design and Road Safety Division of the Municipal Council Traffic Design and Road Safety Division of the Pradeshia Sabha Provincial Road Development Department of the Northern Provincial Council	Contractor	RDA Traffic Design and Road Safety Division of the Municipal Council Traffic Design and Road Safety Division of the Pradeshia Sabha Provincial Road Development Department of the Northern Provincial Council
Disposal of bituminous waste	National Environmental (Protection and Quality) Regulations No.1 of 1 2008 Municipal Councils Ordinance No.29 of 1947 Pradeshia Sabha Act No.	CEA Solid Waste Management Division of the Municipal Council Solid Waste Management Division of the	Contractor	CEA Solid Waste Management Division of the Municipal Council Solid Waste Management Division of the

Construction Activity	Statutes under which Clearance is Required	Statutory Authority	Responsibility	
			Implementation	Supervision
				Pradeshiya Sabha
Disposal of non-bituminous waste	National Environmental (Protection and Quality) Regulations No.1 of 1 2008 Municipal Councils Ordinance No.29 of 1947 Pradeshiya Sabha Act No. 15 of 1987	CEA Solid Waste Management Division of the Municipal Council Solid Waste Management Division of the Pradeshiya Sabha	Contractor	CEA Solid Waste Management Division of the Municipal Council Solid Waste Management Division of the Pradeshiya Sabha
Noise generation due to construction activities	National Environmental (Noise Control) Regulations No.1 of 1996	CEA	Contractor	CEA
Temporary closure of roads	Motor Traffic Act No.14 of 1951 Municipal Councils Ordinance No.29 of 1947 Pradeshiya Sabha Act No. 15 of 1987 Provincial Councils Act No. 42 of 1987 Police Ordinance	Department of Motor Traffic RDA Traffic Design and Road Safety Division of the Municipal Council Traffic Design and Road Safety Division of the Pradeshiya Sabha Provincial Road Development Department of the Northern Provincial Council	Contractor	Department of Motor Traffic RDA Traffic Design and Road Safety Division of the Municipal Council Traffic Design and Road Safety Division of the Pradeshiya Sabha Provincial Road Development Department of the Northern Provincial Council Sri- Lanka Police

Construction Activity	Statutes under which Clearance is Required	Statutory Authority	Responsibility	
			Implementation	Supervision
		Sri- Lanka Police		
Temporary traffic diversion measures	Motor Traffic Act No.14 of 1951 Municipal Councils Ordinance No.29 of 1947 Pradeshiya Sabha Act No. 15 of 1987 Provincial Councils Act No. 42 of 1987 Police Ordinance	Department of Motor Traffic RDA Traffic Design and Road Safety Division of the Municipal Council Traffic Design and Road Safety Division of the Pradeshiya Sabha Provincial Road Development Department of the Northern Provincial Council Sri- Lanka Police	Contractor	Department of Motor Traffic RDA Traffic Design and Road Safety Division of the Municipal Council Traffic Design and Road Safety Division of the Pradeshiya Sabha Provincial Road Development Department of the Northern Provincial Council Sri- Lanka Police

E. Labour Inspection Structure and Organization

27. The Ministry of Labour and Labour Relations is responsible for labour standards and enforcement, industrial peace and social protection.

F. Labour Inspection Structure and Organization

28. The Ministry of Labour and Labour Relations is responsible for labour standards and enforcement, industrial peace and social protection.

G. Department(s) responsible for Labour Inspection

29. The Department of Labour (DoL) within the Ministry of Labour and Labour Relations has functional responsibilities in many different areas including enforcement of labour laws through its inspection services including with respect to working time, wages, employee provident fund, working conditions and the working environment (including occupational safety and health). The DoL is divided into 13 divisions, including those with responsibility over law enforcement, namely: the Labour Standards Division (enforces the labour law in shops and offices), the Occupational Hygiene Division and the Industrial Safety Division which enforces the Factories Ordinance to ensure the safety, health & welfare of workers in factories (www.labourdept.gov.lk). The National Institute of Occupational Safety and Health also carries out inspections on OSH and provides advisory services to employers.

H. Law that covers organization and functional composition

- (i) Factories Ordinance No. 45 of 1942
- (ii) Shop and Office Employees Ordinance No. 19 of 1954
- (iii) Industrial Disputes Act No. 43 of 1950
- (iv) National Institute of Occupational Safety and Health Act No. 38 of 2009

I. Scope of labour inspection

30. Aside from their enforcement functions, labour inspectors are also involved in conciliation work and assist in the collection of contributions to the Employees Provident Fund which is the main social security scheme in the private sector. These labor standards will be strictly implemented and followed during project implementation.

J. International Agreements

31. Sri Lanka has acceded to or ratified around 40 Multilateral Environmental Agreements, and those that are relevant to this project are shown in the following table. The project will ensure that these agreements will be considered and strictly followed during the construction and operation phases of the project.

Table 6: Project-related international agreements to which Sri Lanka is a party

Agreement	Ratification Date	Objectives
Atmosphere		
Vienna Convention for the Protection of the Ozone Layer	15 December 1989	Protection of the Ozone Layer through international cooperation in the areas of scientific research, monitoring and information exchange

Agreement	Ratification Date	Objectives
(1985)		
Montreal Protocol on Substances That Deplete the Ozone Layer (1987)	12 December 1989	Reduction and the eventual elimination of the consumption and production of Un-anthropogenic Ozone Depleting Substances
United Nations Framework Convention on Climate Change (UNFCCC-1992)	23 November 1993	Stabilization of greenhouse gas (GHG) concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climatic systems
Kyoto Protocol (1997)	3 October 2002	The Annex 1 parties (Developed Countries) to reduce their collective emissions of greenhouse gases by at least 5% of the 1990 level by the period 2008 –2012
Biodiversity		
International Plant Protection Convention (1951)	12 February 1952	To maintain and increase international co-operation in controlling pests and diseases of plants and plant products, and in preventing their introduction and spread across national boundaries
Plant Protection Agreement for Asia and Pacific Region (1956)	27 February 1956	To prevent the introduction into and spread within the region of destructive plants
Convention on Fishing and Conservation of the living resources of the high seas (1958)		To solve the problems involved in the conservation of the living resources of the high seas through international co-operation considering that through the development of modern techniques some of these resources are in danger of being over-exploited
Convention concerning the protection of the World Cultural and Natural Heritage (1972)	6 June 1980	To establish an effective system of collective protection of the cultural and natural heritage of outstanding universal value organized on a permanent basis and in accordance with modern scientific methods
CITES - Convention on International Trade in Endangered Species of Wild Fauna & Flora (1973)	4 May 1979	To protect certain endangered species from being over-exploited by adopting a system of import/export permits, for regarding the procedure
Convention on the Conservation of Migratory Species (1979)	6 June 1990	To protect those species of wild animals which migrate across or outside national boundaries
Convention on Biological Diversity (CBD-1992)	23 March 1994	Conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including appropriate access to genetic resources and by appropriate transfer of relevant technologies and appropriate funding
Agreement to implement the provisions of the United Nations Convention on Law of the Seas relating to the conservation and management of straddling and migratory fish stocks	24 October 1996	To ensure long-term conservation and sustainable use of straddling fish stocks and highly migratory fish stocks through effective implementation of the relevant provisions of the United Nations Convention on the Law of the Sea

Agreement	Ratification Date	Objectives
(1995)		
Land		
United Nations Convention to Combat Desertification (UNCCD- 1994)	9 December 1998	To combat desertification and to mitigate the effects of drought in countries experiencing serious droughts and/ or desertification with the final aim being to prevent land degradation in the hyper arid, arid, and semi-arid, dry sub humid areas in the countries that are parties of the Convention
Chemicals		
International Convention for the Prevention on Pollution from Ships (MARPOL 1973)	24 June 1997	To preserve the marine environment by achieving complete elimination of international pollution by oil and other harmful substances and the minimization of accidental discharge of such substances
Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and Their Disposal (1989)	28 August 1992	To reduce trans boundary movements of hazardous waste; to dispose of hazardous and other waste as close as possible to the source; to minimize the generation of hazardous waste; to prohibit shipments of hazardous waste to countries lacking the legal, administrative and technical capacity to manage & dispose of them in an environmentally sound manner; to assist developing countries in environmentally sound management of the hazardous waste they generate
Rotterdam Convention (1998)	19 January 2006	To promote shared responsibility and cooperative efforts in the international trade of certain hazardous chemicals, to protect human health and the environment; to contribute to the environmentally sound use of those hazardous chemicals by facilitating information exchange, providing for a national decision making process on their import/export
Stockholm Convention on Persistent Organic Pollutants (POPs) (2001)	22 December 2005	To protect human health and the environment from persistent organic pollutants (POPs)
Marine and Coastal		
Convention on the Continental Shelf (1958)		To define and delimit the rights of States to explore and exploit the natural resources of the continental shelf
Convention on the High Seas (1958)		To codify the rules of international law relating to the high seas
United Nations Convention on the Law of the Sea (1982)	19 July 1994	To protect the economic, environmental, and national security concerns of coastal states and strengthen state sovereignty over enforcement of environmental regulations up to 200 miles offshore (the Exclusive Economic Zone, EEZ). To protect the marine environment, promote the maintenance of international peace and security, protect the freedom of navigation on the high seas as well as the right of innocent passage, including non-wartime activities of military ships

Agreement	Ratification Date	Objectives
Agreement relating to implementation of part XI of the United Nations Convention on the Law of the Sea (1994)	28 July 1995	To provide for revised modalities for the implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982, in particular the International Seabed Authority

III. DESCRIPTION OF THE PROJECT

A. Need and Justification for the Project

26. The only freshwater resource in the Jaffna Peninsula is groundwater. Its vulnerability to saline intrusion from below and contaminant leachate from above is such that without an integrated approach for protection of water resources, sustainable use from this source cannot be guaranteed. Open wells are the common source of domestic water but these are generally contaminated with fecal pollution from septic tanks and soakage pits located close to wells. However, the quality of water is generally not satisfactory due to the widespread presence of chlorides and pathogenic organisms. Water supply to the Jaffna Municipal Council (JMC) is provided by two schemes which draw water from underground aquifers. Production of these two wells is about 1,100 m³/day.

27. The Jaffna Peninsula which sits on a porous limestone base, depends on groundwater. After the end of a 30-year war there has been a revival in agricultural activities in Jaffna and Kilinochchi. Resettlement of people, development in the area is also picking up. Studies carried out over the last few years in surveying groundwater have shown signs of pollution and over-extraction of particularly the groundwater source for agricultural purposes. In the highly populated Jaffna Municipal Council Area and the Nallur Pradeshiya Sabha area, it is common for every household to have a well due to limited supply or non-availability of pipe-borne water. Due to very small land parcels, the septic tanks or latrines and the wells exist in close proximity to one another (3-6 m separation in most cases). At present, wastewater from each property infiltrate through septic tanks, soak pits or via storm water drains and the underlying geology consisting of limestone and sand conveys pollutants easily. As a result, well-water used by the occupants is polluted both biologically and chemically (Sivathasan S, 2016). With improvements in water supply, the generation of increased quantities of wastewater would almost certainly aggravate the existing problem. Considering all the factors that cause ground water pollution and the concomitant health hazards, the introduction of a comprehensive sewerage system is clearly a priority for the high-density population areas of Jaffna Municipal Council and the University of Jaffna areas. From the Nallur sump, there are three branches to the water main. The first branch pumps water up to the Nallur elevated tower, the second pumps water towards the Kallundai sump to fill the sump and the third pumps water towards Old Park and the JMC elevated towers are in-line booster pumps at some elevated towers, sometimes inside the elevated tower itself to pump treated water up to the elevated tower. There is no distribution from sumps. The distribution is from the elevated towers only and under gravity.

28. Water demand for the network design was agreed with the NWSDB Project staff and O&M staff to be 100 lpcd for the domestic demand. The water demand of other institutions was tabulated as 230 lpcd per hospital bed, 30 lpcd per school student/teacher and 25 lpcd per office person. The projected water demand based on this criteria is presented in Table 7. Also 15% none-revenue-water (NRW) is considered. At peak time, 544 m³/day fire flow is included.

Table 7: Projected Water Demand

Supply Zone	2033 Water Demand based on Census Department Data (m3/day)	2033 Water Demand based on Updated GIS Building Data (m3/day)
Nallur	3115	5246
Old Park-1	4756	10669
Old Park-2	1875	2322
Pommaiveli	4055	5714

29. A considerable discrepancy in total water demands exist between the two methodologies, especially in Old Park zone, as illustrated in Table 7 above. This is due to the low population count during 2011 census and the large number of new business ventures that has started during last few years. Abandoned houses, as a result of 30 years long civil war, is a common sight. At the field visits conducted the period in 2016, the consultant team noticed that people now are slowly moving into the abandoned houses and also that a considerable number of new houses are seen in the above-mentioned areas. Also, the markets, shops and the cultural buildings constructed in the period of 2016 – 2019.

30. Furthermore, new commercial ventures like hotels, offices, education institutes and financing institutes are rapidly increasing in Jaffna City. Jet wing Hotel, Cargill building, Jaffna Railway station, Indian Cultural Centre, Valampuri Hotel, and nearby hotels are examples. With these developments, it should be expected that those abandoned houses will be re-occupied due to the restoration of peace in the areas. Likewise, should be anticipated the effect of migration likely to occur, following the development of infrastructure in addition to water supply (Roads/Electricity/Railway/Health). Also new institutes are planned. In order to satisfy these conditions, the distribution network model was created to accommodate water demand, based on updated GIS building data. Table 8 presents the capacities of the water towers, which already has been designed and being constructed at present.

Table 8: Water tower details

Supply Zone	Water Tower Capacity (m3)	Water Tower Height (to the Outlet Pipe) (MSL)
Nallur	1200	27.61
Old Park- 1 & 2	1800	29.39
Pommaiveli	1800	27.00

31. The distribution networks were analyzed using Water Gems V8i (SELECT Series 6) modeling software. The model was built using the spatial data base developed with the ArcGIS 10.3 software. The total length of the distribution network connected to each water tower is shown in the table below.

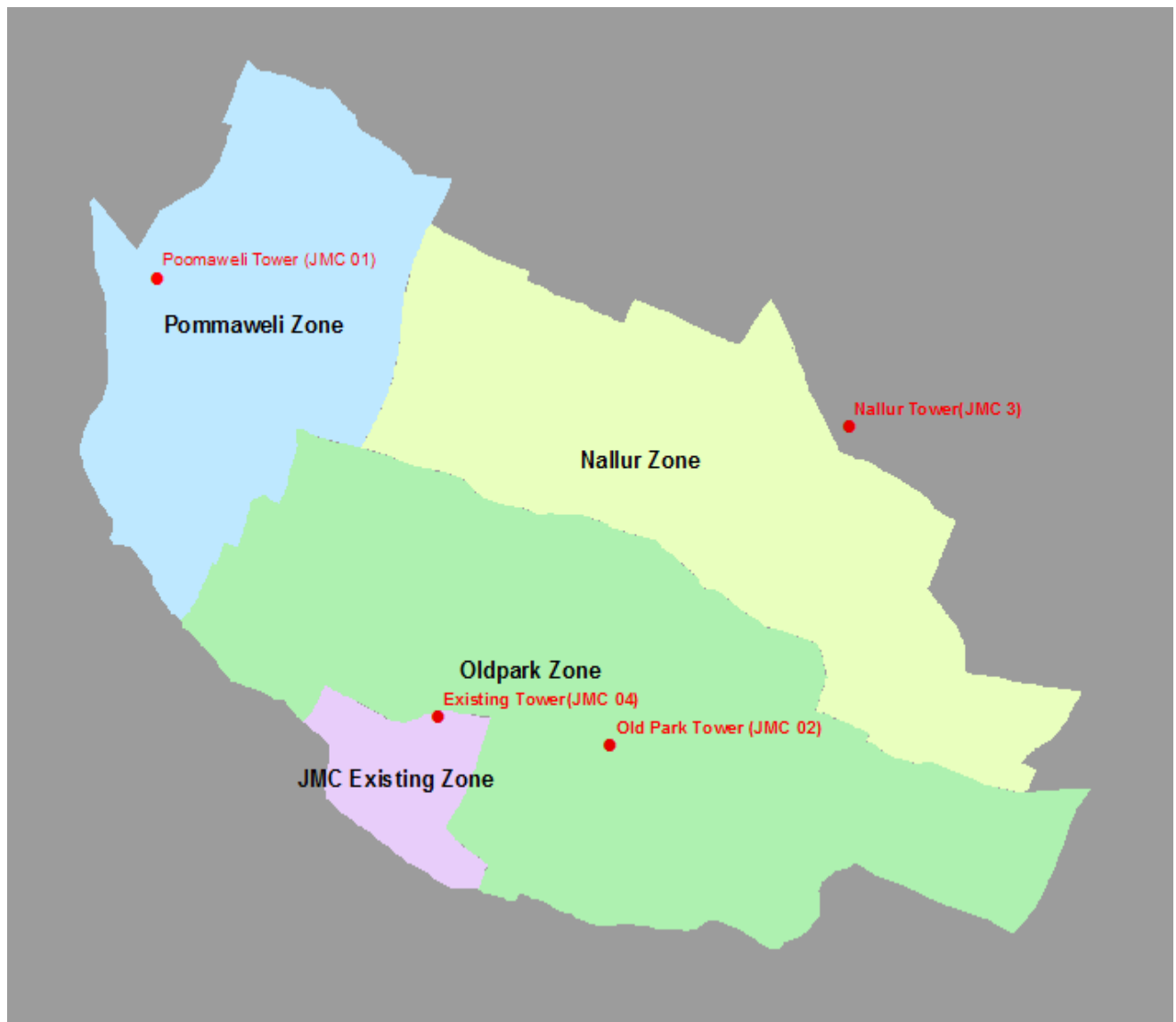
Table 9: Distribution length

Supply Zone	Length of distribution network (km)
Nallur	74
Old Park -1	113
Old Park -2	21.67
Pommaiveli	75
Total	283.67

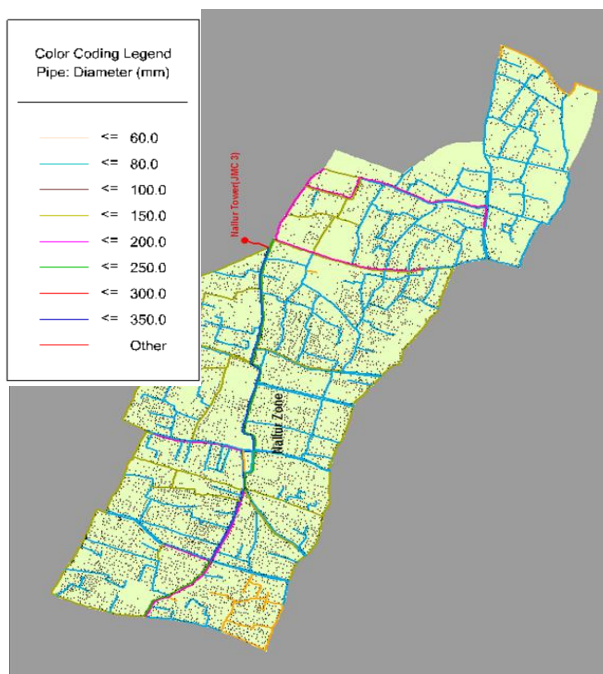
32. The above distribution system was designed to cater for the peak demand of the distribution area using a peak factor of 1.5 for the daily average demand. Nearest-node method was used to assign the water demand in the model from the GIS shape file. T-REX command was used to assign the topo survey results to the respective nodes. The network was simulated for hourly demand fluctuation, using the demand pattern. Hazen – Williams Formula was used for calculating friction losses of pipes. PE pipes were used for Distribution network. The system was modelled with a C value of 130. Anticipating higher rise buildings will come to the JMC area within next 20 years, minimum residual pressure was maintained at 15 m H₂O at peak demand. Maximum Pressure at the system is below 32 m H₂O. A maximum velocity of 1.55 m/s is used.

B. Location of the Subproject

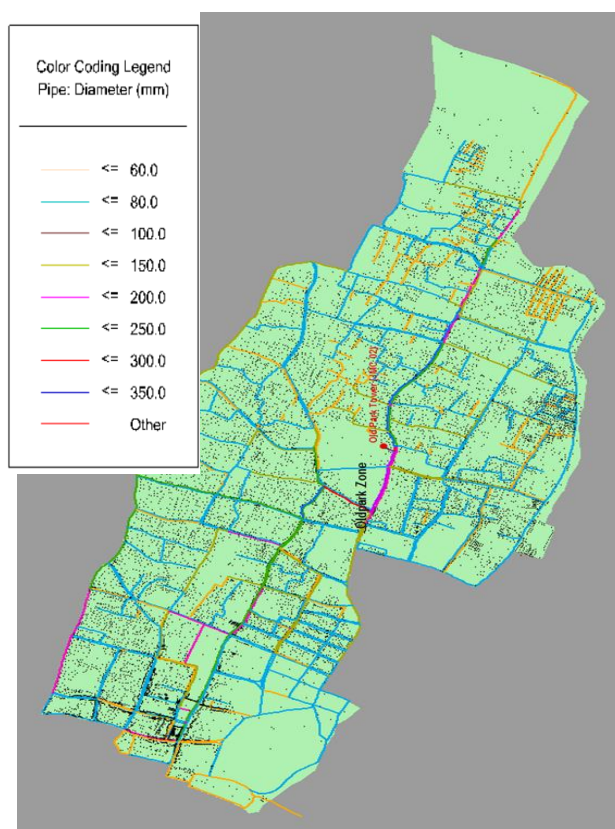
Key Map for Supplying and Laying of Distribution Network in Jaffna City Area



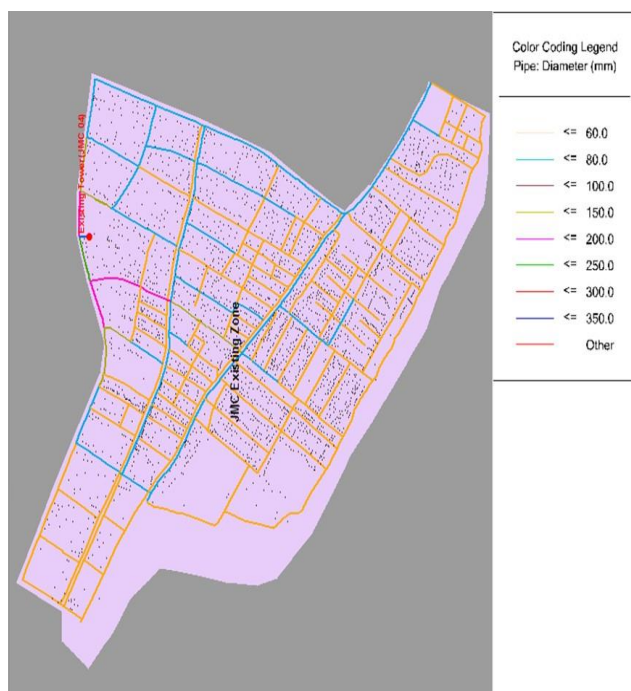
33. Nallur Zone Distribution Layout



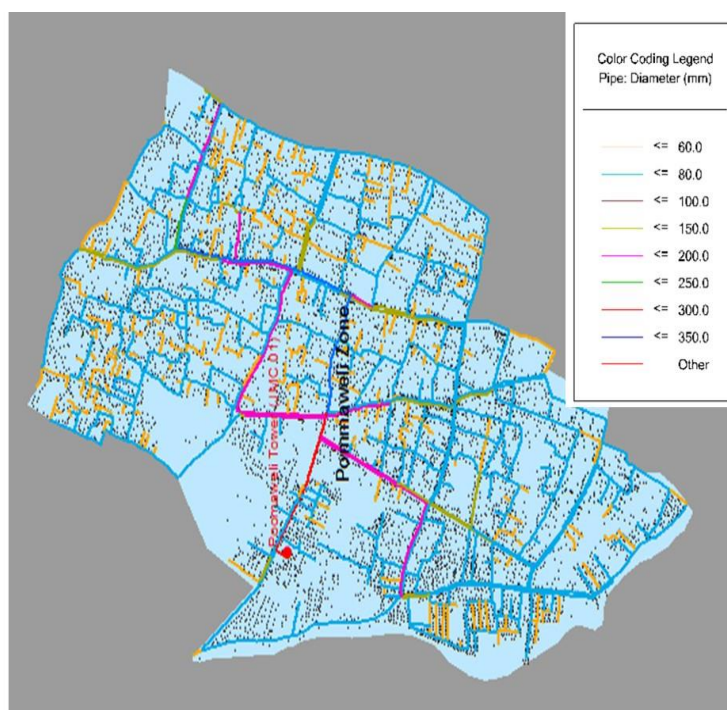
34. Old Park - 1 Zone Distribution Layout



35. Old Park - 2 Zone Distribution Layout



36. Pommaiveli Zone Distribution Layout



IV. DESCRIPTION OF THE ENVIRONMENT

A. Physical Resources

1. Climate

37. The climate of Jaffna is determined by the monsoon that forms a wet and dry season in the District. The major rainy season occurs during the North East monsoons from October to December and the minor rainy season occurs during the South West monsoon in April and May. The period between the South West Monsoon and the North East Monsoon is the dry season extending from June to September.

38. According to the annual total rainfall, Sri Lanka can be divided into 3 regions, namely the wet zone (total rainfall > 2,500 mm), the intermediate zone (total rainfall is in between 1,750 mm and 2,500mm) and the dry zone (total rainfall <1,250 mm). The dry zone is most vulnerable to the drought conditions.

39. Jaffna District is in Sri Lanka's dry zone. The average temperature is 29.3°C. Peak rainfall occurs during the periods of October to January with the Northeast Monsoon producing about 75% of total annual rains. Scattered rains are experienced during April to May when the inter-monsoon rain is uncertain. The dry season in the region extends from June to September. Monthly average wind speed varies from 13.0 to 7.0 km/h and the highest level is recorded in August and lowest in December (wind finder, 2014).

Table 10: Mean Annual and Monthly Air Temperature 2010-2011

	2010			2011		
	Minimum	Average	Maximum	Minimum	Average	Maximum
Mean Annual Air Temperature (°C)	25.50	28.60	31.70	25.14	28.18	31.22

Source: Department of Meteorology, Thirunelvely

Table 11: Mean Annual Rainfall 2010-2011

	2010	2011
Annual Total (mm)	1,466.4	1,470.7

Source: Department of Meteorology

2. Wind Patterns

40. Wind statistics for Jaffna based on observations taken between November 2010 and February 2014 daily from 7am to 7pm local time are presented in table below.

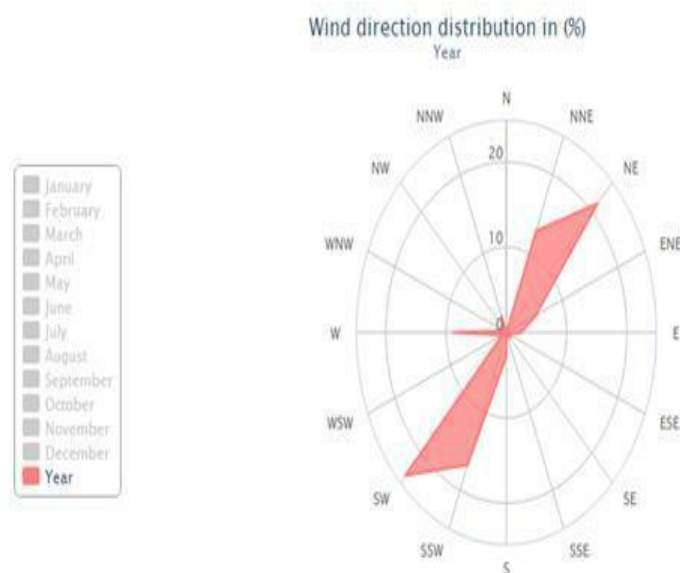
Table 12: Wind Statistics for Jaffna

Month	January	February	March	April	May	June	July	August	September	October	November	December	Year
Dominant Wind Direction	SW	SW	NE	W	W	W	E	NE	NE	NE	SW	SW	NE
Average Wind Speed (kts)	6	5	N/A	N/A	N/A	N/A	6	7	7	6	5	4	5
Average Air Temperature (°C)	27	29	30	31	30	30	31	30	30	29	28	27	29

Source: http://www.windfinder.com/windstatistics/jaffna_yazhpanam

Note: kts-denotes knots which is a unit of speed equal to one nautical mile. One knot is 1.852 kilometers per hour.

Figure 6: Wind Statistics for Jaffna



Source: http://www.windfinder.com/windstatistics/jaffna_yazhpanam

41. From Figure 2, it can be observed that the dominant wind direction is towards the North East. However, the wind direction is towards the South West during parts of the year.

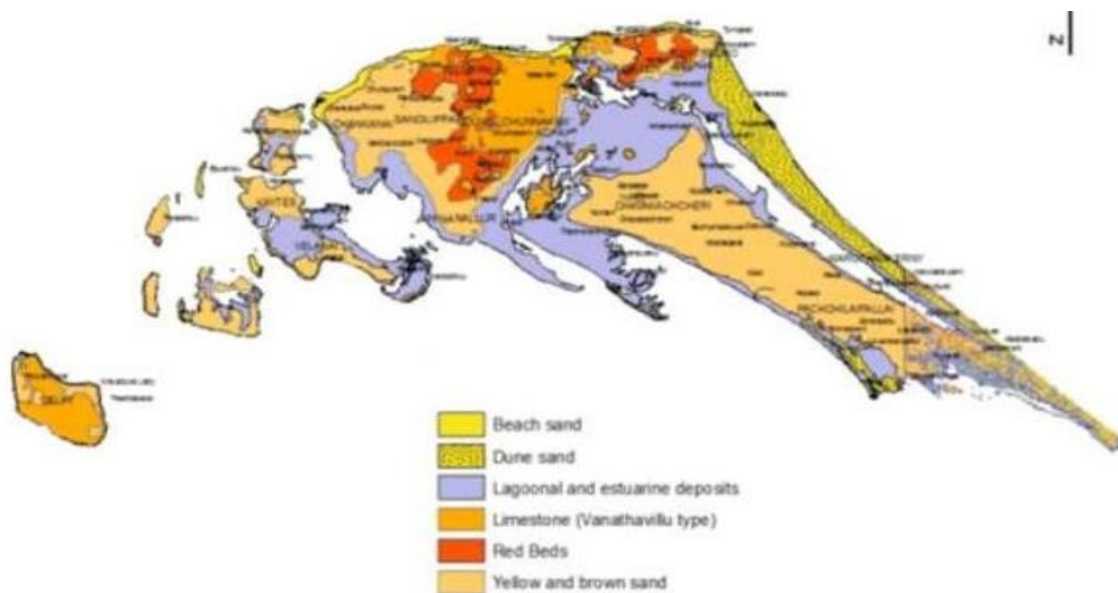
3. Air Quality

42. Monitoring carried out on-site has shown that all air quality parameters are well below National Ambient Air quality Standards. These parameters include Particulate Matter of less than 10 μm (PM_{10}), Particulate Matter of less than 2.5 μm ($\text{PM}_{2.5}$), Carbon Monoxide (CO), Sulphur Dioxide (SO_2), Nitrogen Dioxide (NO_2) and Ozone (O_3) with their concentrations being low. Major contributors of the pollutants CO , SO_2 and NO_x are mobile sources such as vehicles. Considering the project area, where no highly polluting industries exist and the number of vehicles is much less than in other areas, except in Jaffna town, the ambient air quality is within the National Ambient Air Quality Standards. Moreover, with most of the project area being coastal, the potential to attenuate any air pollutants is very high due to wind movement between the land and the sea. Please refer to the attached Appendix 2 as Environmental Condition includes an air quality level assessment carried out on-site. This includes measured baseline ambient air quality levels.

4. Topography and Soils

43. The area of the Jaffna Peninsula landmass is 1,129.9 square kilometers (km^2) of which lagoons occupy 45.7 km^2 . The project area lies in the lowest peneplain, which is a gently undulating to rolling, mantled plain stretching down to the coast. The highest ground level is 11 m above mean sea level (AMSL). The land forms include floodplains, coastal plains, sand dunes and beaches. The Jaffna Peninsula consists of coastal plain type II and limestone plateau physiographic regions.

Figure 7: Geology of the Jaffna Peninsula



44. The soil is sandy along the coast but sandy clay or clayey sand in the interior with high infiltration rates. The peninsula overburden mantle is covered with three different types of soils classified according to agricultural suitability. They are:

- (i) Calcic Red Yellow Latosols;
- (ii) Solodized Solonetz and Solonchaks; and
- (iii) Regosols on recent beach sands

5. Surface Water and quality

45. There are 47 ponds in Jaffna area and they are extremely important for recharging the groundwater table and controlling the stormwater of the area. Among these 47 ponds, 45 ponds are located within JMC area and 2 ponds are located in the Nallur Pradeshiyaa Sabha (Local Authority) area. The canals and ponds have been de-silted and maintained as drainage and detention devices and more importantly as sources of groundwater recharge.

46. Surface water in ponds is not considered acceptable to the Jaffna population as a source of drinking water because it is used for bathing and washing clothes, watering livestock etc. and is frequently polluted from catchment areas. Dug wells in close proximity to the ponds are however accepted as sources of drinking water. Ponds hold in storage part of the water that would have escaped to the sea. Occasionally the ponds are used for lift irrigation.

6. Groundwater and quality

47. The whole of the Jaffna peninsula is underlain by Miocene limestone formations, which are generally 100 to 150 m thick, distinctly bedded, well-jointed and are highly karstified. The

shallow aquifer of the peninsula occurs in the channels and cavities (karsts) of this Miocene limestone. All the shallow groundwater found within the karstic cavities originates from the infiltration of rainfall. This shallow groundwater forms mounds or lenses floating over the saline water. These water mounds or lenses reach their peak during the monsoon rains of November and December. The aquifer boundary expands and contracts through the wet and seasons, respectively. This aquifer becomes fully re-charged by the November to December rains of the North East monsoon.

7. Geology

48. Jaffna Limestone is of Miocene age coral reef formation and the easily soluble limestone also gives rise to a number of underground solution caverns. The upper surface of the limestone slopes gently to the South East from the relatively high areas in the North West where it forms the land surface in the general vicinity of Chunnakam. To the East of the Uppu Aru Lagoon, the limestone is generally obscured by younger formations.

8. Noise

49. The Regulations cited as the National Environmental (Noise Control) Regulations No.1 1996 suggests the maximum permissible noise levels at the boundary of the land in which any source of noise is located shall not exceed the limits set out in the Schedules cited. It should be ensured that the noise level at the boundary during any construction phase does not exceed a maximum level of 75 dB between 6.00am-6.00pm and does not exceed a maximum level of 50 dB between 6.00pm-6.00am.

Schedule I

Table 13: Maximum Permissible Noise Levels at Boundaries in Laeq' T as a Background Level

Area	Laeq'T	
	Daytime	Night Time
Low Noise	55	45
Medium Noise	63*	50
High Noise	70	60
Silent Zone	50	45

* Provided that the noise level should not exceed 60 dB (A) inside existing houses, during daytime

Schedule II

50. The following noise levels will be allowed where the background noise level exceeds or is marginal to the given levels in Schedule II:

- (i) For low noise areas in which the background noise level exceed or is marginal to the given level Measured Background Noise Level +3dB (A)
- (ii) For medium noise areas in which the background noise level exceeds or is marginal to the given level Measured Background Noise Level +3dB (A)
- (iii) For silent zone in which the background noise level exceeds or is marginal to the given level Measured Background Noise Level +3 dB(A)
- (iv) For high noise areas in which the background noise level exceeds or is marginal to the given level

- (a) For daytime: Measured Background Noise Level +5 dB (A)
- (b) For night time: Measured Background Noise Level +3 dB (A)
- (c) The above maximum noise levels should be maintained inside the boundary of the land, in which the source noise is located.

51. For the purposes of Schedules I and II: -“Low Noise Area” means an area located within any Pradeshiya Sabha area, “Medium Noise Area” means an area located within any Municipal Council or Urban Council area, “High Noise Area” means any export processing zone established by the Board of Investment or industrial estates approved under Part IV C of the National Environmental Act. “Silent Zone” means the area covered by a distance of 100 meters from the boundary of a courthouse, hospital, public library, school, zoo, sacred areas and areas set apart for recreation or environmental purposes. Please refer to the attached Appendix 9 as Environmental Condition includes a noise level assessment carried out on-site. This includes measured baseline noise levels.

9. Vibration

52. There are no national vibration standards gazette in Sri Lanka. Only an interim vibration standard proposed by the Central Environmental Authority of Sri Lanka is used as a guideline. Please refer to the attached Appendix 9 as Environmental Condition includes a vibration level assessment carried out on-site. This includes measured baseline vibration levels.

B. Ecological Resources

53. The natural vegetation on islands is generally characterized by tropical semi-arid vegetation, dominated by Palmyra palms, coconut palms, dry shrubs and scrublands. Although project components extend over significant part of the Jaffna city area. Hence, most of the habitats which are in the immediate impact zone of the project are highly anthropogenic habitats. Field investigations identified several ecologically important habitats. These include salt marshes, freshwater marshes/paddy fields, freshwater ponds and canals, mixed thorn scrub jungles, sandy seashore vegetation, abandoned remote home gardens, and urban/sub-urban home gardens.

C. Infrastructure Facilities

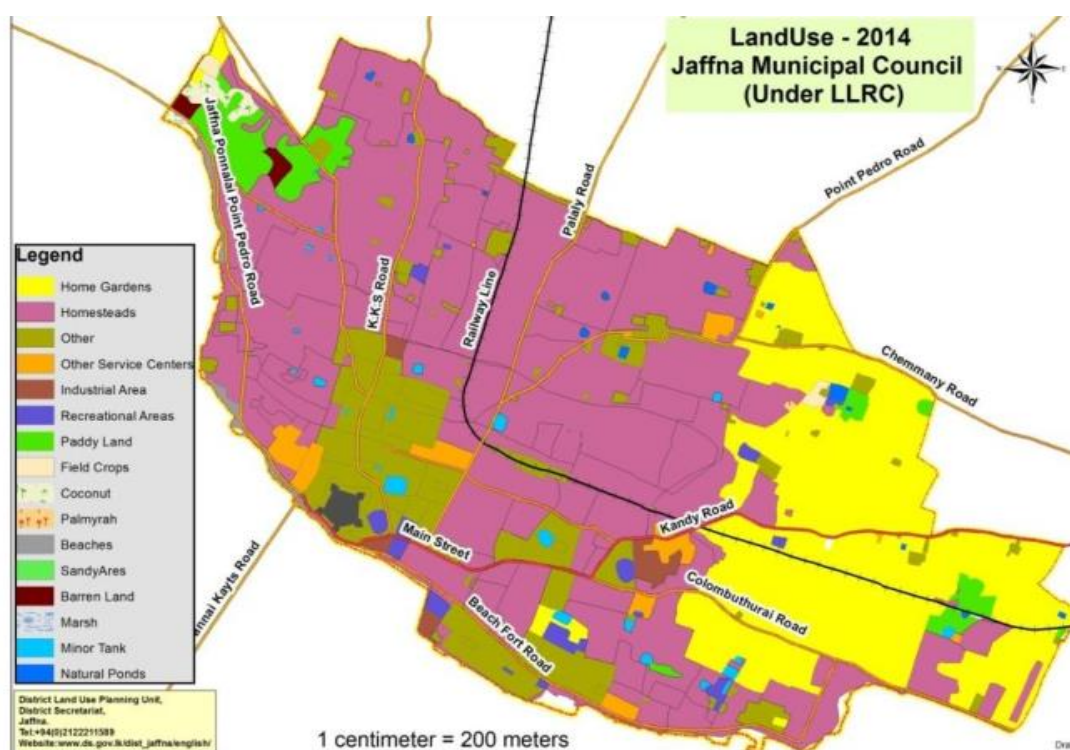
54. **Land use pattern of the city:** The existing land use pattern is shown in the figure. Concerning the land use pattern in Jaffna city there is no more fertile land available for agriculture as 50.9 ha are being paddy cultivated. 243.71ha are being utilized for construction of roads. In general, in the Jaffna peninsula the land use for agricultural purposes, for crops like paddy, Vegetables, fruits, coconut and Palmyra has declined over the past 20 years. 27 A noticeable extent in land use of the city is for residential. However, housing development in the future will give priority to intensive development with high rise housing schemes. Allocation of additional land for commercial and mixed development in the city is expected to come from land that has become available due to relocation of activities and limited lands being allocated for housing development in the city.

Table 14. Land use pattern in the Jaffna City

Activity	Extent (ha)
Residential	1231.94
Commercial	75.83

Public	56.05
Utilities	5.76
Religious	29.39
Playground	6.83
Open space	41.99
Cemetery	10.80
Paddy	50.19
Jaffna Fort	13.97
Water bodies	33.82
Roads	243.71
Railway	5.81

Source: UDA



Source: Land use planning Unit, District secretariat, Jaffna.

55. **Water Supply:** At present approximately half of the municipal council area only benefit from the piped water supply. The Town Water Supply Scheme is supplied from the Kondavil well filled through the town supply main up to the town overhead tank. From this tank the supply network covers the Jaffna Division (D.S) and serves approximately half of the population of Jaffna Municipal Council. The Gurunagar Water Supply Scheme is supplied from the Thirunelvay Well field through a supply main to the Gurunagar Over Head Tank. The supply network of Gurunagar and adjacent areas are supplied from them. From this supply the Jaffna Teaching hospital receives water. The overhead tank of the hospital is directly connected to the Thirunelvay supply main. Additionally, the market will be supplied from this main. The supply times for both schemes are only 1.5 hours per day from 6.30 a.m to 7.15 a.m and from 4.45 p.m to 5.30 p.m.

56. According to the recent water test it can be verified that this supply scheme is placed in the area where the ground water from the traditional well is the worst in the area. The quality of the water in the Nallur part of JMC is a little better than in the other area. It was therefore recommended to extend the water supply scheme to Nallur to cover the entire Municipal Council. Due to the water quality 6 Mini Water Supply Schemes (MWSS) have been set up. Each MWSS is facilitated with a well, pump, overhead tank, supply network and stand post. Out of the 6 schemes only two are still operational. Pipe born water supplied to residents through stand pipes only for half the population of dwellers, due to inadequacy of yield from the supply wells at Thirunelvely and Kondavil. Pipe borne water supply is restricted to Southern part of the city and Gurunagar area, the Northern part of the city being dependent on domestic common wells. Attempts to spread city water supply to areas not catered so far have been frustrated due to shortage of water at existing and potential sources.

57. There are two Major Schemes and six Mini Water Supply Schemes within the Municipal Area and this covers nearly 40 % of the Area. These Schemes cover mostly the needed Coastal and Town Area. 40,000 people are benefited by these schemes. When the people are resettled within the Water Supply Coverage Area, there will be improvements to the distribution system and erection of additional stand posts to collect water in time. Due to continued armed conflict, the ponds contour and exclusion bunds are not maintained, and the ground water is not recharged, as a result most of the drinking water wells in Jaffna have become saline. There is high demand for drinking water within JMC area. Please refer to Appendix 12 file as Water Quality Reports of water quality test done in 2015.

D. Coastal Resources

58. The coastal resources in the project area include near-shore and lagoon fisheries, minerals resources such as Miocene limestone, cement raw material, silica sands etc. Places of scenic beauty constitute places that provide aesthetically appealing views of the beach with uninterrupted vistas of seascape and landscape.

59. Project area is mostly confined to Municipal area environments. Hence, most of the habitats which are in the immediate impact zone of the project are highly anthropogenic habitats. Field investigations identified several ecologically important habitats. These include salt marshes, freshwater ponds and canals, remote home gardens, and urban/ sub-urban home gardens.

60. **Salt Marshes:** The salt marsh at Kallundai can be identified as a low- marsh, which is slightly above sea level. A berm constructed by the Provincial Irrigation Department to prevent saltwater intrusion can be observed facing the lagoon. The site is predominantly a coastal mud flat with some sandy areas. An adjacent land is used as an open-dump by the Jaffna Municipal Council; hence faunal species associated with the dump site, especially the avifauna, are also found. Vegetation mainly consists of salt tolerant species such as *Sesuvium portulacastrum*, *Halosarcia indica*, *Suaeda maritima*, *Cressa cretica*, *Volkameria inermis*, *Pedaliium murex* and *Sauropus bacciformis*.

61. **Urban Home Gardens:** Urban home gardens are the vegetation type found immediately around homesteads in towns. These have been subjected to long-term human manipulation. Urban home gardens are characterized by open lands dominated by grasses and weeds such as *Lantana camara*, *Triumfetta pentandra* and *Stachytarpheta urticifolia*. Multi-purpose tree species such as *Azadirachta indica*, *Artocarpus heterophyllus*, *Cocos nucifera*, *Borassus*

flabellifer are occasionally found towards edges of such lands. These provide valuable habitats for urban wildlife.

62. **Remote/ Sub-urban Home Gardens:** Abandoned remote/ sub-urban home gardens in contrast have substantial tree cover comprising of multi-purpose trees such as *Azadirachta indica*, *Artocarpus heterophyllus*, *Cocos nucifer* and *Borassus flabellifer*. Some of them show signs of a well-developed multi-story home garden structure which existed prior to abandonment. Major Coastal Ecosystems in Jaffna The thin edge where the land meets the sea is rich in natural resources and supports critical habitats, but also attracts a disproportionately high human use. The valuable, but vulnerable nature of these near-shore marine and estuarine areas makes them an important focus in marine ecological studies. Despite the extent and importance of shallow water habitats within Jaffna, these areas remain poorly inventoried and mapped. While geophysical and habitat mapping are an integral part of the resource management framework for terrestrial portions of these natural areas, comparatively little mapping has been completed of these submerged lands. The Northwestern maritime region of the island consists of numerous coastal and marine ecosystems and habitats. These include coral reefs, sea grass beds, mangroves, salt marshes, tidal flats, lagoons, estuaries, sand bars and beach vegetation.

63. **Jaffna Lagoon:** The Jaffna Peninsula, is about 45,000ha in extent and approximately 40miles long and 4-8 miles wide. On its Western and Northern sides, it is bounded by the Palk Strait, on the East and South sides, it is hemmed in by the Bay of Bengal and the Jaffna Lagoon respectively. The Jaffna Peninsula is a vast limestone block, the history of which dates back to the Miocene period, when the entire island lay submerged. The Jaffna Lagoon is a semi-enclosed water body connected to the Palk Bay. It is surrounded by a dry zone land mass and due to being more greatly influenced by freshwater input, has different physical conditions to that of the larger Palk Bay. The lagoon opens into the Northeastern part of Palk Bay by way of three narrow openings and one wide opening, and is also influenced by tides in the bay. The lagoon is long and narrow, extending from Elephant Pass in the Southeast to Kayts in the Northwest. The lagoon is relatively shallow with the maximum depth being less than 3m. The shoreline is composed mostly of sandy soil while the bottom is mostly mud. The salinity in the lagoon is greatly influenced by rainfall and freshwater run-off from surrounding areas. The lagoon plays a role in flood control during times of heavy rainfall. Being part of the larger Palk Bay area, it plays an important role in regimenting tidal movements, currents and salinity in surrounding water bodies. The lagoon is surrounded by a dry zone land mass dominated by sandy areas and dry zone scrubland. The lagoon contains extensive inter-tidal mudflats while mangroves are found along the shores of the lagoon. The shallow depths and muddy substrate harbors prawns, crabs and small fish species such as Leiognathids, engraulids and clupeids. The blue swimming crab (*Portunus pelagicus*), is a tropical marine crustacean that occurs in large shoals in shallow coastal waters overlying sandy or muddy substrates. Fishery has been an important economic activity of coastal communities and many are engaged in small scale fisheries using traditional methods such as cages, traps and cast nets. The Jaffna Lagoon contains a diversity of species and a variety of coastal habitats including, mangroves, salt marshes, sea grass beds and mud flats.

64. **Sea grass Meadows:** The Jaffna Lagoon contains extensive sea grass beds. These habitats are very productive and support a rich diversity of commercially important fish species as well as a large number of other marine organisms. Sea grass communities recorded were Tape Seagrass (*Enhalus acoroides*), Sickie Sea grass (*Thalassia hemprichii*, *Halodule uninervis*), Noodle Sea grass (*Syringodium isoetifolium*, *Cymodocea rotundata*), and *Halophila ovalis*. Dense patches of sea grass *Waattala* (*Enhalus acoroides*) were observed spanning over a large

area of the lagoon. In addition, several species of seaweed were also encountered. Sea grass meadows in the shallow areas of the lagoon were a very significant observation in the study. Sea grass was seen growing either homogeneously or heterogeneously in mixed populations forming thick and dense meadows on muddy, sandy, clay soil of the lagoon.

65. **Mud Flats:** Mudflats are sedimentary inter-tidal habitats created by mud deposition in low energy coastal environments, particularly in sheltered areas during the low tidal season. These sediments consist mostly of silts and clays with a high organic content and are associated with sea grass meadows. Mudflats are found scattered around Jaffna. These mud flats are important in processing nutrients for the ecosystem and in providing feeding areas for fish at high tide and for birds, especially migratory birds, at low tide. Mudflat habitats commonly appear in the natural sequence of habitats between sub-tidal areas and terrestrial inland vegetation.

66. **Historical and Cultural Importance of Jaffna:** While the most ancient records of the history of Jaffna are much debated on by historians and archeologists. The city has a rich share of historical and cultural monuments dating back to an ancient kingdom as well as a colonial era located within the municipal area. Jaffna was occupied by the Portuguese (1617 to 1658) and the Dutch (1658 to 1795) until the British conquest. In the project area, most of the high priority archaeological, historical and cultural sites are located within the coastal zone. Sites that carry an archaeological value in the Jaffna region were abandoned due to the conflict. Maintenance was not carried out due to the access constraints which arose with security concerns. Some of the sites were damaged and the Archaeological Department of Sri Lanka has taken initiatives in restoration of the sites through its regional office in Jaffna. Currently a project on conservation and restoration of the ancient Fort in Jaffna is in progress with funds received from the Government of the Netherlands. The Jaffna Fort is recognized by its characteristic shape of a star depicted by the moat surrounding the Fort. High priority archeological, historical, religious and cultural sites within the Coastal Zone were identified in 1989 and updated in 2002 by the Coastal Zone Management Plan of 2004 (GoSL, 2004). Within the study area, Jaffna Fort is included in the list of high priority archeological, historical, religious and cultural sites. Historic places of interest within the Jaffna and Nallur DS Division within which the study areas are placed is given in Table below. We should be strictly avoid this area during pipe laying because our pipe line only affected RDA and PS/ PRDA roads.

Figure 9: Historical and Cultural Importance of the Jaffna city area

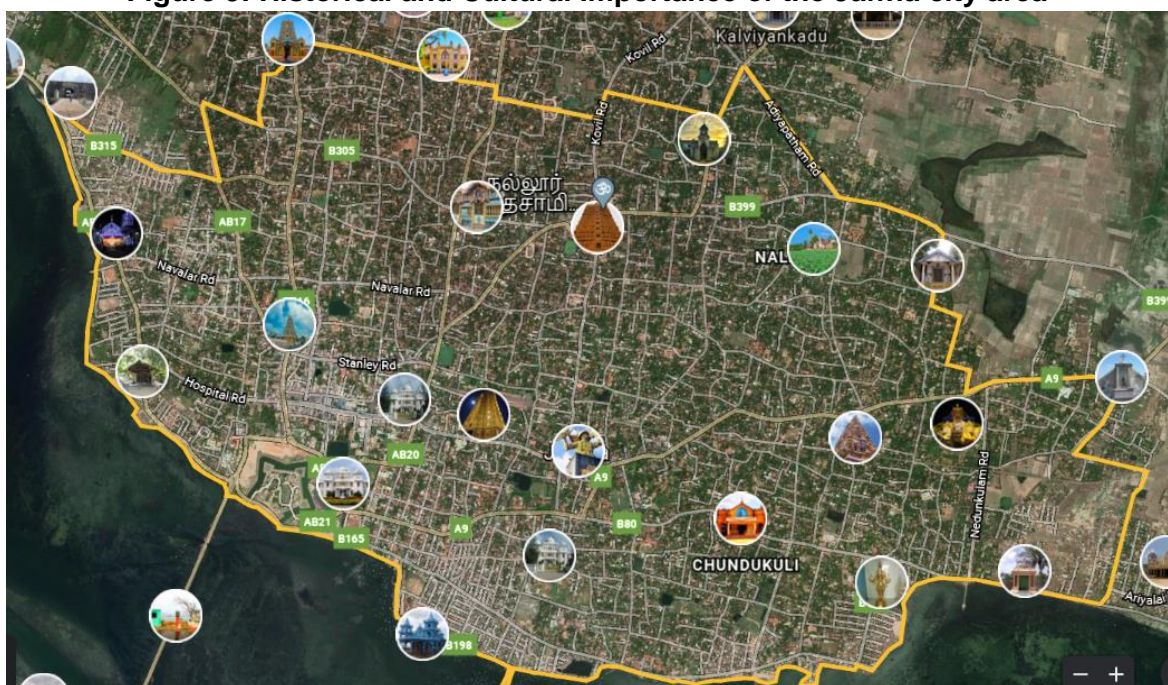


Table 15. Land use pattern in the Jaffna City for Historical and Cultural Importance of Jaffna

Divisions	Place	GN Division
Jaffna	Public Library, Jaffna	Fort
	Jaffna Fort	Fort
	Sri Naga Viharaya- Jaffna	Sirampiadu
	Navalar Archaeological Museum, Jaffna	Aththiyady
	Six Pillars Choultry	New Moor Street
Nallur	Sangilian Thoppu	Sangilian Thoppu
	Manthirimanai (King's Place)	Nallur
	Jamuna Eri (Pond)	Sagilian Thoppu
	Nallur Skandan Temple	Nallur
	St. James Church	Nallur

V. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

A. Construction Effects

67. Effects of the construction process will mainly be those normally associated with the activities described above, which include the following:

- (i) Soil erosion and sediment-laden runoff during rainfall at excavation sites;
- (ii) Changes in hydrology if rainfall or groundwater collects in excavated areas;
- (iii) Pollution of streams, ponds, lagoons, aquifers, etc., (depending on location) by sediments from soil erosion or spills of oil, grease, fuel, etc. used on site;

- (iv) Pollution due to improper disposal of excess material, spoil and waste including materials from equipment yards and labour camps;
- (v) Effects on the landscape from vegetation clearance, quarrying and the use of quarries as sources of material;
- (vi) Health risks from an increase in mosquitoes and other disease vectors if water accumulates in quarries from which construction materials are dug;
- (vii) Effects of transportation of material and equipment (noise, dust, vehicle emissions along haulage routes);
- (viii) Health hazards and nuisance due to dust and noise (affecting workers and people who live and work near the construction sites);
- (ix) Inadequate site safety (for workers, visitors and local residents);
- (x) Encroachment into archaeologically, historically or culturally important sites and places of recreational value or scenic beauty;
- (xi) Accidental effects on public/ private utilities or damage due to vibration;
- (xii) Conflicts with other on-going or proposed projects in the area;
- (xiii) Environmental and social effects (on workers and local communities) if workers are brought from outside the project area and housed in accommodation camps;
- (xiv) Terrestrial flora and fauna-habitat loss and degradation;
- (xv) Effects on threatened and endangered species;
- (xvi) Spread of invasive species;
- (xvii) Excessive clearing or trimming of vegetation causing damage to habitat or threatened species.

68. The significance of such effects depend to a large extent on the sensitivity of the specific location and as explained above, many effects have already been avoided by selecting sites and pipeline routes that are away from areas that are known to be important for ecology/biodiversity, culture/heritage. It is not possible however to avoid all sensitive locations, particularly those relating to the human and the built environment, because the distribution network will be located in densely populated areas in order to supply water to a maximum numbers of people.

69. The main effects of construction in municipal areas tend to be those caused by the physical presence of workers, machinery and vehicles and the emissions caused by the work itself. People living and working in the proximity of construction sites can thus be disturbed by noise and dust and by the visual presence of construction activities and these effects can extend along transportation routes if heavy trucks are used to carry large amounts of materials. The normal activities of residents can be disrupted by the presence of the sites, particularly if traffic has to be re-routed and if access to shops, temples, places of work etc., is restricted by the works. Businesses can also be affected if access limitations cause them to lose customers. There are however many well-known methods for reducing the extent and significance of such effects. Amongst the most effective are simple expedients of informing communities in advance when work is likely to be conducted in their neighborhood, the nature of the activities involved and of completing the work in the minimum practicable time.

70. Effects from transportation of construction materials are more of an issue for projects in Jaffna as the Peninsula is composed mainly of coralline limestone and there is very little hard stone and gravel and no sources that are suitable for construction use. Such materials therefore have to be brought from the mainland, which increases the financial and environmental cost of the operation. Effects include increased noise, dust and vehicle emissions along transportation routes; disturbance to residents and transport; and reduced road safety from the increased presence of heavy vehicles. There are also wider concerns regarding vehicle emissions which

include greenhouse gases and contributions to global warming, which is of particular concern in low-lying coastal regions, of which there are many in Sri Lanka. Effects are exacerbated in a project like this, which involves major excavation, as there are further large volumes of heavy traffic carrying waste material for disposal. Clearly the project should take action to reduce these effects as far as possible and this should involve such measures as:

- (i) A thorough examination of potential sources of all construction material in the design stage to identify sources that are as close to the project area as possible;
- (ii) Use of alternative materials, such as rubble from war-damaged buildings, which may be suitable as rip-rap or as an aggregate substitute after crushing; and
- (iii) Reduction of waste by re-using materials wherever as possible if found suitable after testing (e.g. excavated soil may be used for the tank bund; demolished concrete may be used for rip-rap, etc.) or by providing material for other projects (e.g. several current road projects in the North).

71. contractors will be required to spray site roads during dry weather to reduce dust, ensure that toxic materials are stored securely in areas protected by concrete bunds and implement other similar measures that are now standard precautions at most construction sites. The health and safety of workers is another area where practices have changed over the past few decades, and it is now very much the norm for construction contracts to require contractors to prepare and operate a Health and Safety Plan to protect their workers, site visitors and local residents. This is another key recommendation of the mitigation strategy for this project outlined below.

B. Mitigation of Environmental Effects

1. Pre- Construction

72. Discussions were carried out with design engineers about technical solutions to mitigate environmental impacts arising during implementation period of the subproject. Subsequently the subproject was looked at in the light of environmental concerns and construction methodologies complying with CEA and ADB. Although there are some potential adverse environmental impacts, they are mostly temporary and localized. In addition, the design will be consistent with the applicable national guidelines and all permits and clearances will be secured prior to civil works.

2. Construction

73. Based on the REA Checklist, the subproject is unlikely to cause significant adverse impacts because: (i) only pipe laying along roads will be carried as major construction activities (ii) predicted impacts during construction are localized and likely to be associated with the construction process and are produced because the process is invasive, involving excavation; and (iii) areas where civil construction activities are to go have no specific biodiversity impacts as only few smaller trees will be uprooted. Most of these effects could occur at any of the construction sites used in this project and their significance would generally be greater in inhabited areas around Jaffna and elsewhere (noise, dust, safety risks, traffic disruption etc.). Because these effects are a risk at most construction sites, there are well known methods for their mitigation, which are routinely adopted by contractors worldwide. Additional mitigation is included for certain effects that could be of greater significance because of particular circumstances relating to this project, for example effects of transporting construction materials.

Table 16: Measures Recommended to Mitigate Effects of Construction Activities

Potential Negative Effects	Mitigation Measures
1. Erosion of soil during rainfall at excavation sites and drainage of sediment-laden runoff into ponds, lagoons, wetlands and tanks causing water quality problems and sedimentation	Careful planning of construction schedules to conduct excavation in the dry season, avoiding the heavy rainfall period of the N-E monsoon in October-December;
	Clearing vegetation only to the required working width to avoid unnecessary exposure of soil and minimize erosion;
	Design slopes to maintain stability of cut or filled surfaces
	Protection of exposed surfaces with geo-textile fabric if heavy rainfall is expected;
	Adequate compaction of filled surfaces on completion and seeding with grass where possible to reduce erosion;
	Protection of drainage channels with berms (i.e. ridge or embankment bordering channel) to prevent overspill;
	Use of sedimentation ponds to reduce suspended solids before water is discharged to water bodies, particularly in areas where soil is stockpiled.
2. Changes in hydrology/ drainage: if rain or groundwater collects in excavated areas	Avoid excavating in the rainy season as suggested above;
	Re-fill trenches and build reinforced cement concrete components quickly in dug areas so that voids are only open for short periods.
3. Pollution of surface and groundwater by spillage of oil, grease, fuel and other toxins used on-site	Careful site selection to avoid locating facilities near sensitive areas such as tanks, ponds, wetlands, conservation zones and places of scenic beauty or recreational value;

Potential Negative Effects	Mitigation Measures
	<p>Ensure contractors apply effective pollution prevention and abatement measures at construction sites, including: storage of fuel, oil and other toxic liquids in leak-proof areas with concrete floors and bunds; and not storing such materials near water bodies or other sensitive sites;</p> <p>Require contractors to implement good site practices to avoid accidental spills and prepare and implement contingency plans for immediate removal of any spill.</p>
4. Visual and chemical pollution from inappropriate disposal of waste material from worksites and labour camps (if used)	<p>Require contractors to collect and recycle or dispose of safely (to designated sites approved by the appropriate Pradeshiya Sabha) all used lubricants, oil drums etc.</p> <p>Dispose of excess spoil and waste to designated areas in an appropriate manner as stipulated by the responsible authority without causing visual pollution, water pollution from leachate or hazards to other site users.</p>
5. Landscape impaired by scars left by burrow pits; vegetation clearance and creation of large new water storage tanks	<p>Careful selection of burrow pits where the burrow pit owner avoids excavation and creation of large voids where scenery would be spoiled;</p> <p>Ensure that construction materials are only sourced from licensed burrow pits and prohibit creation of new burrow pits</p> <p>Limit vegetation clearance prior to laying pipelines to the minimum possible and replant disfigured surfaces quickly after construction.</p> <p>Construct RCC structures rapidly so that large voids created in order to construct the water storage tanks do not remain for long</p>
6. Health risks from mosquitoes and other disease vectors if stagnant water bodies are created in burrow pits from which construction materials are obtained	Require contractors to source materials from licensed burrow pits only prohibit creation of new burrow pits;

Potential Negative Effects	Mitigation Measures
	Source material from burrow pits where the burrow pit owners use waste from excavated areas to re-fill cavities created by removal of material at the burrow pit sites;
	Source material from burrow pits where the burrow pit owners incorporate drainage into any unfilled cavities to avoid creating new aquatic habitats.
7. Effects of transportation of material and equipment (noise, dust and vehicle emissions along haulage routes)	When sourcing material, give priority to locations that are close to construction sites;
	Plan haulage routes carefully to avoid densely populated areas as much as possible;
	Validate identified routes considering condition of roads, carriageways, bridges, present traffic loads, safety etc
	Consult authorities responsible for proposed haul roads and prepare plans to improve conditions before use to maintain during use and to rehabilitate after use;
	Avoid transporting materials during peak traffic hours on roads with heavy traffic.
8. Health hazards and nuisance from dust raised during construction, material transport and blown by vehicles	Spray site roads with water during dry weather;
	Limit vehicle speeds to a maximum of 20 meters per hour (mph) on-site;
	Cover loose material with tarpaulins when carried by truck;
	Protect stockpiled material from wind and rain by storage in walled areas and/or covering with secure tarpaulins.
9. Air and noise pollution from operation of vehicles and equipment in populated areas	Ensure that contractors adhere to engine maintenance schedules and standards to reduce air pollution;
	Ensure that all operations comply with ambient air quality standards;
	Use appropriate noise reduction devices on all vehicles and machinery used in population centers;
	Avoid work during night and weekends in populated areas;

Potential Negative Effects	Mitigation Measures
	Cover loose material with tarpaulins when carried by truck;
	Obtain necessary permits from relevant authorities for all blasting and quarrying activities;
	Inform residents in advance regarding any blasting;
	Complete excavation work quickly in inhabited areas to reduce dust;
	Dig and complete short lengths of trench in populated areas to ensure that soil is only stockpiled for a short time.
10. Risks to health and safety of workers and public from construction works	Require contractors to (i) prepare and operate a health and safety plan for all construction sites (ii) assigned a qualified construction health and safety supervisor (iii) Provision and use of appropriate personal protective equipment by all workers (iv) provision of medical insurance coverage for all workers (v) prepare and strictly implement health and safety protocols to be observed by all workers to prevent the spread of COVID-19
	Security fences and patrols to exclude the public from construction sites;
	Regular health and safety training for all personnel; Provide visitor orientation on basic health and safety rules at the worksite; key areas of the training are: (i) slips, trips and falls; (ii) personal protective equipment; (iii) ergonomics, repetitive motion, and manual handling; (iv) workplace transport; and (v) legislation and responsibilities. (vi) health and safety protocols for the prevention of COVID-19

Potential Negative Effects	Mitigation Measures
	<p>Documented procedures for all site activities; Documentation of work-related accidents and the corresponding corrective actions</p>
	<p>System of documentation</p> <p>Ensure that properly trained personnel conduct and supervise potentially hazardous activities, such as traffic control, site safety and accident prevention etc.</p> <p>(i) Ensure that all his employees are familiar with safety regulations and practices, and emergency and rescue procedures;</p> <p>(ii) Ensure that qualified first-aid personnel is available on site. Equipped first-aid stations shall be easily accessible throughout the sites;</p> <p>(iii) Secure all installations from unauthorized intrusion and accident risks;</p> <p>(iv) Provide health and safety orientation training to all new workers to ensure that they are apprised of the basic site rules of work at the site, personal protective protection, and preventing injuring to fellow workers;</p> <p>(v) Provide visitor orientation if visitors to the site can gain access to areas where hazardous conditions or substances may be present. Ensure also that visitor/s do not enter hazard areas unescorted;</p> <p>(vi) Provide safety helmets, clothing and gumboots for all personnel including the Engineer's Representative and each of his staff and any authorized visitors to the site;</p> <p>(vii) Provide supplies of potable drinking water.</p> <p>(viii) Provide clean eating areas where workers are not exposed to hazardous or noxious substances.</p>
11. Encroachment into and damage of areas and artefacts of historical/ cultural importance and areas of recreational value or scenic beauty	<p>Select pipeline routes and facility sites that avoid excavation in areas known to be historically or culturally important, or of recreational or scenic value;</p>
	<p>If encroachment into such areas is unavoidable, liaise with responsible regional authorities (Department of Archaeology; Divisional Secretary; Department of Wildlife Conservation; Forest Department) to agree on construction procedure and appropriate mitigation and compensation for damage;</p>

Potential Negative Effects	Mitigation Measures
	Consult the Department of Archaeology to determine whether any of the construction sites are in areas with the potential to yield discoveries during excavation work;
	With assistance from the Department of Archaeology, develop a “chance finds” procedure any material of archaeological and/ or cultural importance that is found;
	Take any other action that may be recommended by the relevant authorities and ensure that these procedures are followed throughout all construction work.
12. Accidental damage of existing infrastructure and disruption to public utilities	Prepare an inventory of infrastructure at construction sites or pipeline routes by obtaining layout plans from service providers and conducting surveys where necessary;
	Plan site locations and pipeline routes to avoid existing infrastructure as much as possible; If it is necessary to move infrastructure, prepare relocation plans with service providers;
	Establish plans for immediate attendance by service providers to deal with any accidental damage to utilities;
	Make provision to allow satisfactory access to buildings, dwellings or other activity areas throughout construction (e.g., provide wooden walkways and metal plates to allow pedestrian and vehicle access across trenches);
	Replace or provide monetary compensation to the owners of any public and private structures damaged by construction (including vibration damage);
	Use vehicles and machines that adhere to accepted standards for vibration;
	Ensure that contractors keep sites free from all unnecessary obstructions by storing or disposing of any equipment or surplus material after use; and
	Ensure that contractors remove from site any debris and temporary works that are no longer required.
13. Conflicts with other planned projects in the area	Consult relevant authorities to obtain details of the other planned projects in the area;
	If there is any conflict, such as the same site being chosen for facilities by different projects, discuss and resolve in coordination with the implementing agencies.
14. Environmental and social disruption by construction camps, if these are used to house workers	Avoid the use of worker accommodation camps and provide socio-economic benefits to the local community by employing local people in the construction workforce as much as possible;

Potential Negative Effects	Mitigation Measures
	If there is no alternative to employing workers from outside the project area, ensure accommodation camps are sited on land that is obtained from willing sellers and located at a suitable distance from any neighboring communities;
	Ensure that any worker camps are properly managed and provided with adequate sanitation, health facilities and waste disposal according to labour laws;
	Ensure adequate and total clearance of any work camp sites after use and reinstate appropriate vegetation;
	Provide proper solid and liquid waste management program in workers' campsite, separate from spoils and debris disposal, as their presence can add to existing waste volume at the project sites
	Conduct programmes to raise worker awareness of the risks and dangers of HIV/ AIDS and COVID -19.
15. Effects from large volumes of heavy vehicle traffic, carrying construction materials from distant quarries and taking waste spoil for disposal (noise, dust, vehicle emissions, disturbance, reduced road safety, greenhouse gas emissions)	Conduct a thorough examination of potential sources of all construction materials to identify sources as close to project sites as possible;
	Use alternative materials wherever possible (e.g. war damaged building rubble as rip-rap or aggregate);
	It will be important to reduce the amount of dumping by re-using as much spoil and limestone derived from excavation and trenching within the project as possible and by providing material to other projects in the area.
16. Terrestrial flora and fauna-habitat loss and degradation	Every effort will be taken to avoid cutting of any trees encountered. When laying sewers, bends can be fitted to avoid cutting of trees. Tree cutting if unavoidable, need to be carried out in concurrence and in accordance with rules laid out by the Forest Department and the relevant local authority. Habitat degradation due to soil erosion and sedimentation can be controlled by implementing appropriate mitigation measures. Manual labor shall be used in sensitive areas wherever possible. The timing of major construction activities shall be adjusted to coincide with dry months of the year to minimize soil erosion and sedimentation.

Potential Negative Effects	Mitigation Measures
17. Excessive Clearing or Trimming of Vegetation Causing Damage to Habitat or Threatened Species	Clearly mark construction area to limit damage to adjacent vegetation. Clearly mark vegetation to be retained/or removed before clearing and trimming. If additional vegetation needs clearing or trimming consult the PEIC before proceeding. If native fauna or flora species are discovered contact the PEIC for further instructions. PMCIU will coordinate to the CEA for the necessary permits/clearance required for tree cutting.

3. Road Authority Requirements

74. It is a requirement that prior approval of the custodian authority be obtained before commencing any work in roads under their administrative purview. The contractor is required to enquire and be familiar with custodian authority requirements for design and construction of waterpipes in the roads administered under them and allow costs and any other requirements as deemed necessary in the tender proposal to comply with the road authority requirements.

75. Contract requirements for backfilling, temporary reinstatement and permanent reinstatement of pipe trenches falling under different road custodian authorities i.e. Pradeshiya Sabhas, Provincial Road Development Authorities and the Road Development Authority will be described in the individual contracts to be drawn up. Some example requirements are provided below:

- (i) For Padeshiya Sabha Roads/ Municipal council / Provincial Road Development Authority Roads
- (ii) Backfilling and reinstatement of natural ground - pipe located away from the road shoulder
- (iii) Backfilling, temporary reinstatement and permanent reinstatement of earth shoulder-pipe located on the road earth shoulder
- (iv) Backfilling, temporary reinstatement and permanent reinstatement of macadam road carriageway - pipe located on the macadam carriageway
- (v) Backfilling, temporary reinstatement and permanent reinstatement of concrete road carriageway - pipe located on the concreted carriageway
- (vi) Backfilling, temporary reinstatement and permanent reinstatement of asphalt concrete road carriageway - pipe located on the asphalt concrete carriageway

76. Road Development Authority Roads

- (i) Backfilling and reinstatement of natural ground - pipe located away from the road shoulder
- (ii) Backfilling, temporary reinstatement and permanent reinstatement of hard shoulder-pipe located on the road hard shoulder
- (iii) Backfilling, temporary reinstatement and permanent reinstatement of asphalt concrete road carriageway - pipe located on the asphalt concrete carriageway

4. Traffic Management and Construction safety

77. Construction site safety is one of the most overlooked things during a construction project. In most workplaces, accidents are a nuisance for the worker and a headache for HR. However, at construction sites, accidents have the potential to be life-threatening. With every new story about environmental disasters, earth-shattering explosions, and trapped laborers, construction sites become less and less appealing — even as the population grows and demands new, updated structures increases.

78. Construction work is one of the most dangerous professions. And work on the job site is where most accidents occur. Employers do need to mitigate safety hazards to construction workers, but workers need to keep in mind a lot of precautions themselves when working in such hazardous conditions. Thus, construction industry leaders must strive to safeguard their employees — if not for ethical reasons, then for the economic ones. Here are eight ways

construction businesses can reduce workplace accidents and promote construction site safety. Following practices to improve for construction site safety.

- (i) Awareness
- (ii) Training
- (iii) Communication
- (iv) Documentation
- (v) Proper equipment
- (vi) Supervision
- (vii) Innovation
- (viii) Transparency

79. The contractor's traffic management and control operations shall comply with the Manual on Traffic Control Devices Part II Road Works Areas Second Edition – Ministry of Transport and the Road Development Authority. The contractor shall obtain all necessary approvals from the appropriate authority having jurisdiction over the road, traffic police and engineer prior to implementation of all traffic control operations.

VI. ENVIRONMENTAL MANAGEMENT PLAN

80. This section presents the mitigation measures, environmental monitoring plan and institutional arrangements to address the environmental impacts of the project. The purpose of the environmental management plan (EMP) is to ensure all activities associated in the project will not result to significant adverse environmental and social impacts.

81. A copy of the EMP must always be kept on work sites. . This EMP will be included in the bid documents and will be further reviewed and updated during implementation. The EMP will be made binding on all contractors operating on site and will be included in the contractual clauses. Noncompliance with, or any deviation from, the conditions set out in the document constitutes a failure in compliance

A. Mitigation Measures

82. Table 17 shows that action to mitigate effects in the pre-construction period mainly requires either: discussion/ negotiation with stakeholders (which will be conducted by the NWSDB and the NPC-Provincial Irrigation Department as the Implementing Agencies); or decisions on the approach to each scheme and the location of components, which will be the responsibility of the design and supervision consultants, the PEIC, with review and approval by the NWSDB. During construction most of the effects are caused by the construction process itself, so mitigation is mainly the responsibility of the construction contractors, although there is also some action required by the PEIC and by the NWSDB. Mitigation during the operational period will mainly involve strengthening the regional office of the NWSDB to enable them to fulfill their responsibilities of managing the O&M of the two schemes and preparing procedures describing how the various operation, maintenance and repair activities are to be conducted. Capacity building will be implemented by the NWSDB, with guidance and support from the ADB and O&M manuals and procedures will be developed by the scheme designers, the PEIC.

83. The table below shows how the mitigation should be implemented, who should be responsible for each action and where and when mitigation activities should take place. It also provides a broad program for the mitigation plan, showing the period during which each activity should occur, from detailed design and tendering of contractors for the various work elements,

through the proposed construction stage, to the period in which the completed water system will be in operation. The final column of the table assesses whether the proposed action will successfully mitigate the effect (shown as 0) and indicates that some of the measures will provide an additional benefit (shown as +).

84. The NWSDB will conduct those activities that are their responsibility as part of their management of the project in the role of implementing agency through its project management coordination and implementation unit (PMCIU). They will prepare tender documents and contracts for the PEIC and should ensure that these require the PEIC to: (i) provide the mitigation that is their responsibility; and pay particular attention to environmental measures in their supervision of the contractors conducting the construction process. The PEIC will prepare construction contracts during the design stage and these should include the EMP specifying each of the actions allocated to the construction contractors as shown in Table 17. All parties will therefore be contractually required to provide the specified mitigation and penalty clauses in the contracts may be applied in the event of any deficiencies. It is recommended that NWSDB attach a copy of this IEE to all tender documents to make all parties aware of what is expected of them.

Table 17: Environmental Management Plan for the Jaffna City Area (Old Park, Nallur, JMC Tower (Existing) and Pommaiveli Zones)

Potential Negative Effects	Sig	Dur	Mitigation Activities and Method	Responsible	Location	
Pre-construction						
Inadequate awareness amongst the locality regarding making complaints, if any as they arise during construction	S	T	Distribution of leaflets to the locality in the vicinity of the project sites explaining how to make complaints, if any.	PEIC, PMCIU	Project sites	0
Non-compliance in securing applicable permits /clearances prior to civil works	S	T	All applicable permits/clearances should be secured prior to civil works	PEIC, PMCIU and Contractor	Project sites	0
Non-compliance to the applicable national technical design guidelines.	S	T	Design specifications should be consistent with the national guidelines	PEIC, PMCIU and Contractor	Project sites	0
Construction						
Rainfall at excavation sites may cause erosion and silt-laden runoff could cause water quality problems and sedimentation in nearby water bodies, lagoons and wetlands	S	T	Plan construction schedules to conduct excavation in dry season and avoid NE monsoon in October-December	Construction Contractor	All sites	0
			Clear vegetation only from the required working width to minimize soil exposure	Construction Contractor	All sites	0
			Design slopes to maintain stability of cut or filled surfaces	PEIC	All sites	0
			Protect exposed surfaces with geo-textile fabric during rainfall	Construction Contractor	All sites	0
			Compact filled surfaces when completed to avoid erosion	Construction Contractor	All sites	0
			Build earth bunds beside drainage channels to avoid overspill	Construction Contractor	All sites	0
			Hold drainage water in ponds to reduce the sediment content and by use of silt traps etc. prior to discharge to water bodies, especially if soil is stockpiled;	Construction Contractor	All sites	0

			Acquire permission from local authority before discharge to any water bodies	Construction Contractor	All sites	0
			Avoid erosion by rapid seeding of exposed soil with grass	Construction Contractor	All sites	0
Natural hydrology/drainage is changed if rain or groundwater collects in excavated areas	M	T	As above: plan work to avoid excavating in rainy season	Construction Contractor	All sites	0
			Re-fill trenches and build RCC components quickly in dug areas so that voids are only open for short periods	Construction Contractor	All sites	0
Spills of oil, grease, fuel and other toxic materials used on site can pollute surface and groundwater	S	T	Avoid locating pipelines and facilities near sensitive areas e.g. water bodies, wetlands, conservation zones, recreation areas	PEIC	All sites	0
			Adopt effective pollution prevention/ abatement measures on site: store fuel, oil, etc. in leak-proof	Construction Contractor	All sites	0
			Areas with concrete floors and bunds; avoid storing toxins near sensitive sites	Construction Contractor	All sites	0
			Adopt good site practices to avoid accidental spills and set up contingency plans for immediate removal of any spill	Construction Contractor	All sites	0
Inappropriate disposal of waste materials from			Collect and recycle or dispose of safely to designated local authority sites all used lubricants, oil drums etc.	Construction Contractor	All sites	0
			Spoil, limestone rubble from trenching and excavations should be re-used if found suitable e.g. as fill at STP site or given away to be used in other projects taking place in the area. If there is no other alternative, dispose of all spoil and other waste to designated local authority sites, without causing visual or leachate pollution or hazards to other users of the disposal site	Construction Contractor	All sites	0
Vegetation clearance, excavation from borrow pits and construction of large	S	P	Choose borrow pits where the borrow pit owners avoid excavation and creation of large voids where valuable scenery is spoiled	Construction Contractor, PEIC	All sites	0

Dust produced during construction by material transport and other vehicles may be a health hazard and a nuisance	M	T	Spray site roads with water during dry weather	Construction Contractor	All sites	0
			Limit vehicle speeds to a maximum of 20 mph on site	Construction Contractor	All sites	0
			Cover loose material with tarpaulins when carried by truck	Construction Contractor	All sites	0
			Store stockpiled material in walled areas and/or cover with tarpaulins to protect from wind and rain	Construction Contractor	All sites	0
Vehicles and equipment cause air and noise pollution which could be a nuisance in populated areas	S	T	Maintain vehicles and equipment according to manufacturers' schedules and standards	Construction Contractor	All sites	0
			All operations must meet ambient air quality standards	Construction Contractor	All sites	0
			Use noise reduction devices on vehicles and machinery used in population centers	Construction Contractor	Inhabited area	0
			Avoid work at night and weekends in populated areas	Construction Contractor		
			As above: Use tarpaulins to cover loose material on trucks	Construction Contractor	All sites	0
			Obtain necessary permits for all blasting and quarrying	Construction Contractor	All sites	0
			Inform residents in advance of all blasting activity	Construction Contractor	All sites	0
			Complete trenching and excavation quickly in residential areas	Construction Contractor	Inhabited area	0
			Dig and complete short lengths of trench in populated areas so that soil is only stockpiled for a short time	Construction Contractor		
During excavations, for laying of pipelines, if the limestone layer is encountered, a rock hammer will be used to excavate the limestone layer. During installation of shoring there would be vibration since a rock hammer will be used here too.	S	T	If to install the sheet piling system a rock hammer is used, there will be vibration. It is better to use a non-vibrating hammer if the area is heavily residential. If for excavation of the limestone layer, a vibrating hammer is used, it will affect foundations of surrounding properties adversely. If the vibrating method is used, a survey of the affected buildings in the immediate area should be carried out. The people in the affected buildings should be informed. Evacuation of the affected people should take place during the duration of usage of the vibrating hammer if necessary. If any	Construction Contractor	Inhabited area	0

			persons are affected adversely, they should be provided with alternative accommodation for the duration. If commercial establishments are affected adversely, compensation should be paid for loss of income for the duration. The vibration hammer method may damage some foundations of buildings in the immediate area. Once the piling is completed, the foundations of the damaged buildings should be repaired by the contractor.			
There are inherent dangers in all construction work that present risks to the health and safety of workers and the public	S	T	<p>Designate a qualified health and safety officer to monitor the implementation of Health and safety plan.</p> <p>Prepare and operate a site-specific Health and Safety (H&S) Plan for all construction sites, which includes:</p> <ol style="list-style-type: none"> 1. Maintenance of worker safety in compliance with labor laws and other relevant legislation; 2. Provision and use of Personal Protective Equipment; 3. Secure fences and patrols to exclude the public from site 4. Regular H&S training for all personnel; 5. Documented procedures for all site activities; 6. Accident and training records and remedial action. 7. Traffic control, site safety and other hazardous activities should be conducted by properly trained personnel 8. First-aid facilities should be present in the project area and at least one safety and health officer/first-aider should be present on-site. 9. Provide medical insurance to all workers 10. Prepare and strictly implement health and safety protocol for the prevention of COVID-19. 	Construction Contractor	All sites	0

Toolbox Meetings	S	T	Toolbox meetings will be held by the contractor's project manager to increase workers awareness about occupational safety in addition to formal training sessions regarding occupational safety. Toolbox meetings will be held every day lasting between five to ten minutes by the supervisor to different sets of workers on-site to explain different aspects of occupational safety.	Construction Contractor	Project sites	0
Excavation may encroach into and damage areas and artefacts of historical/ cultural importance and areas of recreational value or scenic beauty	M	P	Choose pipeline routes and facility sites that avoid areas of known historical, cultural, recreational or scenic value	PEIC	All sites	0
			Liaise with relevant authority to agree on construction procedure and mitigation/ compensation for any damage that may be caused	Construction Contractor	All sites	0
			Consult Department of Archaeology to assess whether any sites have the potential to yield discoveries during excavation			
			An AIA will be carried out. Once the AIA is completed, any recommendations included in the AIA report will be strictly adhered to during the implementation of the project			
			Take any other action recommended by relevant authority			
			With assistance from Department of Archaeology develop a "chance finds" procedure of action to recognize and protect any important archaeological or cultural material that is found			
Excavation and other	S	P	Prepare inventory of utilities at proposed sites via	PEIC	All sites	0

construction work could damage existing infrastructure and disrupt public utilities			plans from service providers plus surveys if necessary			
			Plan pipeline routes and facility sites to avoid existing utilities wherever possible	PEIC		
			If any utilities must be moved, prepare relocation plans with service providers	Construction contractor		
			Arrange for service providers to attend to the site immediately to deal with any accidental damage to utilities			
			Provide pedestrians and vehicles with safe access to buildings, houses etc. when construction is in the			
The proposed works could come into conflict with other planned projects in the same area which will probably increase in number as Government, NGOs etc. support rehabilitation of the North	S	P	Obtain details of planned projects from relevant agencies	PEIC, PMCIU	All sites	0
			If conflicts occur (e.g., same site being chosen by different projects) discuss and resolve with implementing agencies		All Inhabited sites	0
If workers are housed in accommodation camps this may cause environmental damage and social disturbance in the vicinity	M	T	Avoid housing workers in camps and provide socio-economic benefits locally by employing local people	Construction Contractor	Accommodation camps	+
			If there is no alternative to employing workers from elsewhere, locate accommodation camps away from communities on land acquired from willing sellers			0
			Provide labor camps with adequate sanitation, waste disposal and health facilities according to labor laws			0
			Clear work camp sites after use and reinstate vegetation			0
Construction effects in general will be more acute where sites are located in	S	T	Establish effective and regular communication with stakeholders including affected communities	PEIC, PMCIU, Construction Contractor	All sites	0

inhabited areas, because people and their activities will inevitably be disturbed			Inform communities in advance when work is to be carried out in their vicinity and the nature and effects of the work			
			Complete work quickly in inhabited areas	Construction Contractor		
Residents near sites used to store and process building materials (batching/ crushing plants) may be disturbed by noise, dust, visual intrusion	M	T	Locate all sites for materials storage/ processing on un-used Government land away from roads and inhabited areas	Construction Contractor	Materials storage /Processing	0
			Use noise reduction and dust suppression equipment at storage/processing sites (covered storage; water roads etc.)			
Large volume of heavy vehicles taking waste for disposal and bringing construction materials from quarries south of Kilinochchi will cause noise, dust, vehicle emissions, disturbance, reduced road safety along haul routes and emissions of greenhouse gases may contribute to global warming			Search thoroughly for materials sources as close to sites as possible	PEIC, PMCIU, Construction Contractor	All sites	0
			Use alternative materials (e.g. war damaged building rubble may be suitable as rip-rap or aggregate after crushing)			+
			Reduce waste by re-using spoil in this project (dug soil may be used to raise bund); provide material to other projects	Contraction contractor		+

Sig = Significance of Effect (S = Significant; M = Moderately Significant). Dur = Duration of Effect (T = Temporary; P = Permanent) DSC = Design and Supervision Consultant; NWSDB = National Water Supply and Drainage Board, This column shows effects remaining after mitigation: 0 = zero effect (effect successfully mitigated); + = positive effect (mitigation provides a benefit).

VII. MONITORING AND INSTITUTIONAL ARRANGEMENT

A. Monitoring

85. Effective implementation of all the mitigation measures recommended in this IEE Report must be monitored during (i) the investigation and detailed design stage; (ii) construction stage; and (iii) the operation and maintenance stage of the projects and the submission of monthly monitoring report of contractor to PMCIU and the submission of quarterly and semi-Annual monitoring reports of PMCIU to ADB. Please refer attached files as sample QPRs and SEMR templates.

86. The PMCIU set up by the NWSDB to manage design and implementation of the project must ensure that all design measures and investigations recommended by the IEE in the pre-construction phase are effectively implemented. PMCIU staff includes a qualified and experienced Environmental Officer to deal with these and other matters related to the environment. This officer will also check contract documents (prepared by the PEIC) to ensure that they require contractors to implement all mitigation allocated to them in Table 17. Contracts should also require contractors to behave responsibly towards the environment throughout their work, protecting the environment both on and off site; and limiting nuisance and hazards to people and damage to property resulting from construction work, material supply and other related activities throughout the construction period.

87. In the tender documents, prospective contractors must be informed that they are required to prepare, submit and implement an Environmental Management Plan (EMP) describing in detail how they will provide each of the mitigation measures that are their responsibility and that they must include the cost of such activities in their Financial Proposal. The Project Engineering and Institutional Consultancy (PEIC) staff also includes an Environmental Specialist (consultant) to assist the contract specialist in preparing these aspects of the documents and drafting other specialized clauses relating to environmental mitigation measures. Once the EMPs are submitted, they must be reviewed by the PEIC Environmental Specialist and any inadequacies must be identified and rectified before construction begins.

88. The PMCIU and the PEIC has to-date kept records of all community engagements conducted so far which are with the Land Acquisition and Resettlement Officer of the PMCIU and the Community Liaison Officer and the Resettlement Specialist of the PEIC. These records are maintained and updated constantly. They will be made available to the contractor's environmental team.

89. Table 18 below which is the responsibility of the contractor need to be implemented. The contractor's environmental management team should keep a record by means of a checklist of when, where and how etc. mitigation measures mentioned in Table 18 were implemented, in particular those mitigation measures with regard to community safety and occupational safety during construction. When visiting the project sites, all observations should be recorded on the checklist. A file should be kept of all the individual checklists of all site visits. Reports will need to be produced using the filed checklists periodically for the client, the ADB etc. Such reports can include information such as describing the progress of implementation of the Environmental Management Plan and corrective actions taken, if any. The checklists should be shared with the Environmental Specialist of the PEIC at all times.

90. During the construction period, monitoring will mainly be the responsibility of the PEIC and will be conducted as part of their supervision of the construction process.

91. Environmental monitoring will be conducted by the PEIC's Environmental Specialist and will involve observations of contractor's practices during site inspections, plus checks of documentation and other activities. This monitoring is mainly aimed at ensuring that contractors provide the mitigation measures and do not cause additional environmental damage in the course of the construction work. If deficiencies are noted, the PEIC will issue instructions for remediation to the contractor and penalty clauses may then be applied if there are repeated transgressions.

Table 18: Environmental Monitoring Plan for the Water Supply components

Mitigation Measure	Parameters to Monitor	Monitoring Location	Nature of Measurements	Frequency	Responsibility of Monitoring	Costing
Pre- Construction						
Air Quality	Nitrogen Dioxide (NO ₂), Sulphur Dioxide (SO ₂), Carbon Monoxide (CO), Ozone (O ₃) and Particulate Matter (PM ₁₀)	Construction site	On site	Before the construction stage	PEIC's Environmental Specialist, with PMCIU's Environmental Monitoring Officer	
Noise Level	Noise	Construction site	On site	Before the construction stage	PEIC's Environmental Specialist, with PMCIU's Environmental Monitoring Officer	
Vibration level	Vibration	Construction site	On site	Before the construction stage	PEIC's Environmental Specialist, with PMCIU's Environmental Monitoring Officer	
Distribution of leaflets to the locality in the vicinity of the project sites explaining how to make complaints, if any.	Distribution Leaflets	At the contractor's offices	Discussions with the contractor, the Resettlement Specialist of the PEIC, the Land Acquisition and resettlement Officer of the PMCIU	As required during the construction stage	PEIC's Environmental Specialist, with PMCIU's Environmental Monitoring Officer	Part of cost of employing Design and Supervision Consultant, PEIC
Construction						
Plan construction schedules to conduct excavation in dry	That all provisions	At construction sites, stock	Physical observations and	Twice a week during the pre-	PEIC's Environmental Specialist, with	Part of cost of

season and avoid NE Monsoon in October-December; Clear vegetation only from the required working width to minimize soil exposure; Design slopes to maintain stability of cut or filled surfaces; Protect exposed surfaces with geotextile fabric during rainfall; Compact filled surfaces when completed to avoid erosion; Build earth bunds beside drainage channels to avoid overspill; Hold drainage water in ponds to reduce the sediment content and by use of silt traps etc. prior to discharge to water bodies, especially if soil is stockpiled; Acquire permission from local authority before discharge to any water bodies; Avoid erosion by rapid seeding of exposed soil with grass	mentioned are actually in place and proper working practices are followed	yards, vehicle parking areas, fuel and refueling area and workers camps	discussions with the contractor and workers	construction and construction periods	PMCIU's Environmental Monitoring Officer	employing Design and Supervision Consultant, PEIC
Adopt effective pollution prevention/ abatement measures on site: store fuel, oil, etc. in leak-proof areas with concrete floors and bunds; avoid storing toxins near sensitive sites Adopt good site practices to avoid accidental spills and set up Contingency plans for immediate removal of any spill.	That all provisions mentioned are actually in place and proper working practices are followed	At all construction sites, stock yards, vehicle parking areas, fuel and refueling area and workers camps	Physical observations and discussions with the contractor and workers	Twice a week during the pre-construction and construction periods	PEIC's Environmental Specialist, with PMCIU's Environmental Monitoring Officer	Part of cost of employing Design and Supervision Consultant, PEIC

Collect and recycle or dispose of safely to designated local authority sites all used lubricants, oil drums etc. Spoil, limestone rubble from trenching and excavations should be re-used if found suitable e.g. as fill at STP site or given away to be used in other projects taking place in the area. If there is no other alternative, dispose of all spoil and other waste to designated local authority sites, without causing visual or leachate pollution or hazards to other users of the disposal site	That there is a formal waste management plan and that it is implemented	At all construction sites, stock yards, vehicle parking areas, fuel and refueling area and workers camps	Physical observations, discussion with the contractor	Twice a week during the pre-construction and construction periods	PEIC's Environmental Specialist, PMCIU's Environmental Monitoring Officer with	Part of cost of employing Design and Supervision Consultant, PEIC
As above: source materials from licensed borrow pits and prohibit creation of new borrow pits; Source material from borrow pits where the borrow pit owners use waste from excavated areas to re-fill cavities created by removal of material at the borrow pit site; Source material from borrow pits where the borrow pit owners dig drains in unfilled cavities to prevent water collecting	Physical observations at borrow pit sites, check licenses of borrow pits which are being used to source material	Borrow pit sites, Discussions with the pit owners	Physical observations, Discussions with the borrow pit owners	At the beginning of the pre-construction period	PEIC's Environmental Specialist, PMCIU's Environmental Monitoring Officer with	Part of cost of employing Design and Supervision Consultant, PEIC
Source material from locations close to	That provisions mentioned are	At the pipeline sites, at the	Physical observations,	Three times a week during	PEIC's Environmental Specialist, with	Part of cost of

construction sites; Prepare Traffic management Plan with relevant Government Agency: plan routes to avoid narrow roads, highly populated areas; plan diversions to allow trenching in narrow roads;	provided and proper procedures	elevated tower sites	discussions with the local	the pre-construction and construction periods	PMCIU's Environmental Monitoring Officer	employing Design and Supervision Consultant, PEIC
<p>Prepare and operate a Health and Safety (H&S) Plan for all construction sites, which includes:</p> <ul style="list-style-type: none"> - Maintenance of worker safety in compliance with labor laws and other relevant legislation; - Provision and use of Personal Protective Equipment; - Secure fences and patrols to exclude the public from site; - Regular H&S training for all personnel; - Documented procedures for all site activities; - Accident and training records and remedial action. <p>Traffic control, site safety and other hazardous activities should be conducted by properly trained personnel</p>	Elements contained in The Health and Safety Plan of the contractor	Contractor's offices	That all elements described is contained in The Health and Safety Plan of the contractor, discussions with the contractor	Once prior to pre-construction and once a week during pre-construction and construction periods	PEIC's Environmental Specialist, with PMCIU's Environmental Monitoring Officer	Part of cost of employing Design and Supervision Consultant, PEIC
Toolbox meetings will be held by the contractor's project manager to increase workers awareness about	Attending toolbox meetings and listening in.	Project sites	Listening to the toolbox meetings. Discussions with the supervisor	Once a week during the construction period	PEIC's Environmental Specialist, with PMCIU's Environmental	Part of cost of employing Design and

occupational safety in addition to formal training sessions regarding occupational safety. Toolbox meetings will be held every day lasting between five to ten minutes by the Supervisor to different sets of workers on-site to explain different aspects of occupational safety.	Observing effectiveness of toolbox meetings.		and sets of workers about effectiveness of toolbox meetings		Monitoring Officer	Supervision Consultant, PEIC
Prepare inventory of utilities at proposed sites via plans from service providers plus surveys if necessary Plan pipeline routes and facility sites to avoid existing utilities wherever possible; If any utilities must be moved, prepare relocation plans	Utility drawings are referenced. Service providers are contacted.	Along the pipelines, at the elevated tower sites	Physical observations, Discussions with the tower site owners	Three times a week during the construction period	PEIC's Environmental Specialist, with PMCIU's Environmental Monitoring Officer	Part of cost of employing Design and Supervision Consultant, PEIC Part of cost of employing Design and Supervision Consultant, PEIC
Avoid housing workers in camps and provide socio-economic benefits locally by employing local people; If there is no alternative to employing workers from elsewhere, locate accommodation camps away from communities on land acquired from willing sellers; Provide labor camps with adequate sanitation, waste	Workforce registers, discussions with workers	Contractor's offices, workers camps	That workforce is local as much as possible; That required provisions are provided to the workers and that the workers are satisfied with the provisions	Once a month during pre-construction and construction periods	PEIC's Environmental Specialist, with PMCIU's Environmental Monitoring Officer	Part of cost of employing Design and Supervision Consultant, PEIC

disposal and health facilities according to labor laws; Clear work camp sites after use and reinstate vegetation; Conduct programs to raise worker awareness of HIV/AIDS and Covid-19.						
Establish effective and regular communication with stakeholders including affected communities; Inform communities in advance when work is to be carried out in their vicinity and the nature and effects of the work; Complete work quickly in inhabited areas	That communities are informed in advance when work is to be carried out in their vicinity and the nature and effects of the work; Complete work quickly in inhabited areas	Along the pipelines, at the elevated tower sites	Consultations with all stakeholders including affected communities	Twice a week during the pre-construction and construction periods	PEIC's Environmental Specialist, with PMCIU's Environmental Monitoring Officer	Part of cost of employing Design and Supervision Consultant, PEIC
Locate all sites for materials storage/ processing on unused Government land away from roads and inhabited areas; Use noise reduction and dust suppression equipment at storage/processing sites (covered storage; water roads etc.)	That provisions mentioned are provided and procedures mentioned are followed	At sites for materials storage/ processing	Physical observations; discussions with contractors and the PMCIU	Twice a week during the pre-construction and construction periods	PEIC's Environmental Specialist, with PMCIU's Environmental Monitoring Officer	Part of cost of employing Design and Supervision Consultant, PEIC
Search thoroughly for materials sources as close to sites as possible; Use alternative materials (e.g. war damaged building rubble may be suitable as rip-rap or aggregate after crushing);	That materials are sourced as close to sites as possible; that alternative materials are used; that	At construction sites and at contractor's offices	Physical observations; discussions with contractors	During the pre-construction and construction periods	PEIC's Environmental Specialist, with PMCIU's Environmental Monitoring Officer	Part of cost of employing Design and Supervision Consultant, PEIC

Reduce waste by re-using spoil in this project (dug soil may be used to raise bund); provide material to other projects	material is reduced where possible; That waste is reduced by provisions of material to other projects					
Proper maintenance of vehicles, boats, machinery and safe use and storage of chemicals shall be carried out to avoid any accidental spillages and leakages.	That procedures mentioned are followed	Traces of pipelines	Physical observations; discussions with contractors	During the pre-construction and construction periods	PEIC's Environmental Specialist, with PMCIU's Environmental Monitoring Officer	Part of cost of employing Design and Supervision Consultant, PEIC
Locate pumps below ground if this will not impair operation; Locate pump stations as far as possible from houses.	Discussions with the design engineers and the Resettlement Specialist of the PEIC, the Land Acquisition and Resettlement	At the PEIC offices	Discussions with the design engineers and the Resettlement Specialist of the PEIC, the Land Acquisition	As required during the design phase	PEIC / PMCIU	Part of cost of employing Design and Supervision Consultant, PEIC

Table 19: Budget for the Environmental Safeguard activities

No	Item	Cost			Source of Funds
		Quantity in LKR	Periods in Months	Sub -total in LKR	
Administrative Cost					
1	Public Consultation	Work has been done			Project cost
Environmental Monitoring					
2	Allow for the EMP carried out the work during the contract period as per the Employer's requirements	10,000.00	21	210,000.00	Project cost
3	Construction Phase				Civil works Contractor's cost

Table 20: Additional cost - Daily cost for COVID-19 precaution measures

No	Description	Cost
1	Wash basin and pipe arrangement	500.00
2	Water tank arrangement	900.00
3	Thermometer	1,000.00
4	Appointment of safety officer with transport facility	3,600.00
5	Face mask, Hand sanitizer, hand wash	3,914.29
6	Additional vehicle facility for labors to travel site with social distancing	6,000.00
7	Water filling for tanks by bowser	10,000.00
	Total cost per day	25,914.29

B. Health and safety protocols for the prevention of COVID-19

92. There is a special committee formed for monitoring health and safety in offices and sites by the project Director. And he informed the following instruction to prevent staff of JKWSSP from COVID-19.

Table 21: Health and safety protocols for the prevention of COVID-19

Issues/Concerns	Action	Status	Responsible officer	Remarks
Transport to the staffs	Transport facilities will be given to the staff within the Jaffna districts including the Maruthankerni area. If any staff using public transport facilities, then they have to wear proper masks and gloves. Gloves need to be placed outside the office.	Ongoing	Manager	
Entrance to the PMCIU Office	Staff advised entering the office cleaning footwear- Staff should be clean footwear by Chlorinated Doormat carpet	Ongoing	Office assistant and Security officer.	
	Staff requested to wash the hands properly and enter the office	Ongoing	Security officer.	
	Staff should use fingerprint and signing of attendance for daily attendance.	Ongoing	Office assistant and Security officer.	

	Staffs should wear a proper mask when they are in the office if any staffs do not obey to wear a mask and take necessary actions by the head of the institution	Ongoing	Office assistant and Security officer.	
Temperature measurement	Temperature will be taken when staff entering to the office and if any high temperature (>37 Celsius) found then that staff should not allow entering to office.	Ongoing	Security officer	
Meeting	<ul style="list-style-type: none"> • All members will be used by Zoom software to attend the meeting. • Quality sanitizer and masks need to be provided 	Ongoing	Office assistant	
Contractor staffs	<ul style="list-style-type: none"> • Unless otherwise requested or needed only contractor staffs could come to the office • Outside conference hall Space allocated for discussion <p>Need to resisted about the details – name,</p>	Ongoing	Office assistant and Security officer.	

	designation, working place, telephone number			
	<ul style="list-style-type: none"> • Suggest working in separate groups. Engineer and relevant office staffs could work in the main office and respective EAs could work in site offices • Take precautions during a site visit • Check the implementation of submitted health and safety arrangements in sites • Frequently check the approved staffs are working in sites Inform to MOH with details when contractor staffs returning from other districts and get relevant instructions from the health sector • Progress review meeting could be held with limited staffs in DN 2 conference hall 	Ongoing	DPD{D/CE/PE/one EA/ TL/Maximum two to three contractor personnel	

Table 22. Training Program for Environmental Management

Program	Description	Participants	Form of Training	Duration/ Location
Pre-Construction				
Awareness Workshop	<p>Module 1: Orientation on ADB Safeguard Policy Statement and Environmental Policy of Sri Lanka</p> <p>Module 2: Environmental and Social impact assessment – implementation and monitoring</p> <p>Awareness of requirements of environmental safeguards in design, execution and managing the assets created under the project including procedures to follow and approvals to be obtained.</p> <p>*Environmental Considerations Jaffna city Development Projects:</p> <p>*Environmental components affected by Municipal development in construction and operation stages</p> <p>*Activities causing pollution during construction and operation stage</p> <p>Environmental Management</p>	PMCIU, PEIC, Representatives of Municipal council, Predeshiya sabha, RDA	Workshop	1 day
Awareness Workshop for Contractors and Supervisory Staff	<p>Module 1: Orientation on ADB Safeguard Policy Statement and Environmental Policy of Sri Lanka</p> <p>Module 2: Environmental and Social impact assessment – implementation and monitoring</p> <p>Module 3: Construction and occupational health and safety</p> <p>Module 4: How to accomplish the SEMR and QPR templates</p> <p>Review of IEE and its Integration into Designs:</p> <p>*IEE Methodology</p> <p>Environmental Provisions in the EMPs</p> <p>*Implementation Arrangements</p> <p>Methodology of pollution monitoring methodology</p> <ul style="list-style-type: none"> • EMP implementation and monitoring measures • Institutional arrangement-roles and responsibilities on environmental safeguards 	PMCIU, PEIC, Contractors Representatives of Municipal council, Predeshiya sabha, RDA	Workshop	2 days

	<ul style="list-style-type: none"> • Preparation of site-specific EMP • Public relations, meaningful consultation activities • Grievance redress mechanism • Monitoring and reporting requirements • Preparation of corrective action (if will be required by the project) • Construction site standard operating procedures (SOP) • OHS plan-construction occupational health and safety plan • Chance find (archeological) protocol • Traffic management plan • Waste management plan • Site clean-up and restoration 			
Construction Stage				
Workshop /Seminar	<p>Review of Modules 1-3</p> <p>Project implementation and monitoring</p> <p>How to accomplish and prepare site inspection checklist, SEMR and QPR</p> <p>Roles and Responsibilities of officials/ contractors/ consultants towards protection of environment</p> <p>Implementation Arrangements</p> <p>Monitoring mechanisms</p> <p>Introducing necessities of auditing, checks and balances</p>	PEIC, PMCIU, Contractors	Workshop	1 day every quarter

C. Implementation Arrangement

93. The Ministry of Water Supply and Drainage (MWSD) and the Ministry of Local Government and Provincial Councils is the executing agency with overall responsibility for the project; and the key implementing agencies responsible for successful construction and operation will be the National Water Supply and Drainage Board (NWSDB) for water supply and sanitation and the Northern Provincial Council (NPC).

94. The NWSDB has set up a Project Management Coordination and Implementation Unit (PMCIU) in Jaffna to oversee detailed design and construction supervision (by the PEIC), national level coordination, preparation of O&M manuals and other guidelines, capacity building and other aspects common to both water supply and sanitation components. PMCIU staff will comprise a Project Director, Engineers (water supply), a Procurement Officer, a Land Acquisition and Resettlement Officer and an Environmental Officer. These key technical and managerial staff will be supported by consultants funded by the project including specialists to assist in monitoring and supervising implementation of the EMP and in coordinating any land acquisition and resettlement activities.

95. The project is being overseen by a National Project Coordination Committee (NPCC), with membership comprising Secretaries of relevant ministries, representatives from other relevant institutions/agencies and senior staff of the PMCIU and PIU.

Name	Name of the Officer	Designation/ Office	Email Address	Contact Number	Roles
PMCIU ¹	T.Barathithasan	Project Director	pdjkwssp@gmail.com	212220256	Review sub-project and activity plan, design, cost, and bid documents to ensure environmental factors and mitigations are incorporated, and sub-project documents and environmental documents are in harmony. PD/DPD/CE/SE are monitoring and checking the reports regularly submitted by Environmental officer assigned for monitoring works.
	S.Malathy	Deputy Project Director	malathycejkwssp@gmail.com		
	R.Balendra	Chief Engineer	balendrajkwssp@gmail.com		
	V.Vijaykanth	Senior Engineer	vijayjkwssp@gmail.com		

¹ Project Engineering and Institutional Consultancy (PEIC) for the Project, a consortium led by Grontmij A/S of Denmark in association with Hifab of Sweden, Green Tech Consultants (Pvt.) Ltd., TMS and the Lanka Hydraulics Institute (LHI) of Sri Lanka has been appointed. Contract of the consultants has been finished and there is not any external monitors engaged for this project except environmental officer of contractor site staff.

Name	Name of the Officer	Designation/ Office	Email Address	Contact Number	Roles
	S.Sivathasan	Chemist / Environmental Officer	s.thas13@gmail.com		Monitor the environmental related issues at the sites during implementation of subprojects and activities, and provide feedback to the PD/DPD/CESE of the PMCIU ² .
	S.Arani	Project Engineer / Environmental Officer	seearani@gmail.com		
PIU (Contractor Side)		Environmental officer			Internal auditing in all sites for monitoring and enforcing health and hygiene legislation. And also investigate when there's an incident, such as pollution, a noise problem, toxic contamination, pest infestation or an outbreak of food poisoning and provide feedback to the PM.
Consultant	T.Thirunavukkarasu	Team Leader (Individual Consultant)	thirudtladb6@gmail.com	0773521346	Monitoring short coming and taking corrective measure.

96. The functions and responsibilities of the Environmental Officer shall include the following:

- (i) Oversee that the environmental/technical requirements and administrative policies and recommendations are properly integrated in the designing and planning as well as during construction and operation of the project;
- (ii) Review the submitted Environmental Management Plans (EMP) as well as the contract of the Contractor.
- (iii) Ensure that applicable guidelines and criteria on environment are complied with;
- (iv) Oversee regular monitoring activities during construction and operation phases of the project conducted by others;
- (v) Ensure that mitigating measures and preventative activities are properly implemented and adequate measures are taken in cases where unexpected effects arise; and
- (vi) Prepare Environmental Monitoring Plans and regular reports on the activities undertaken and the results of monitoring for submission to appropriate authorities (NPCC, ADB, and CEA).

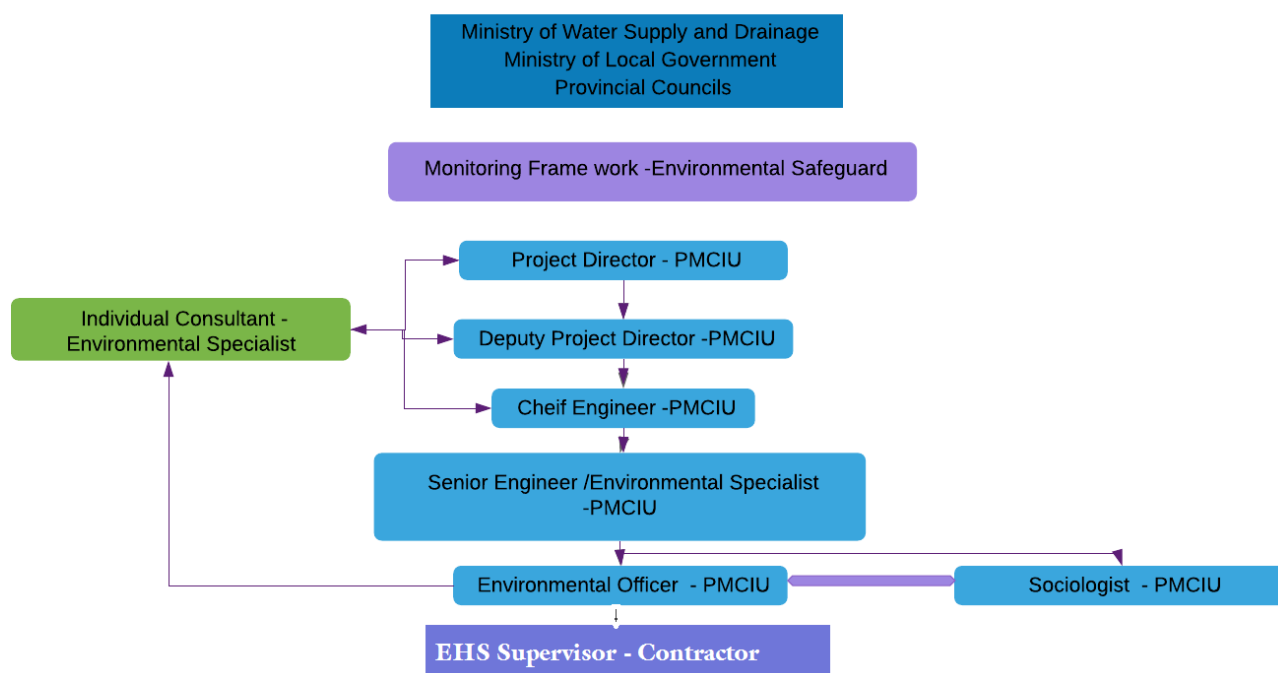
² S. Sivathasan – Chemist and S. Arani – Project Engineer assigned for monitoring environmental issues.

97. During the construction phase, the Environmental Monitoring Officer (EMO) will participate in the Environmental monitoring activities conducted by the Supervising Consultant's Environmental Specialist. With assistance from the ES, the EMOs will expand the outline monitoring plans provided in this IEE include specific details of monitoring locations, frequencies, parameters etc. These monitoring plans will then be implemented by the ES, reporting to the EMOs to ensure that the contractors provide the mitigation measures set out in their contracts and do not cause additional environmental damage.

1. Mobilization of PMCIU/PCU level Environmental Monitoring

98. Eng. Arani and the Chemist Mr.S.Sivathasan is the responsible officer for the monitoring environmental related activities on the behalf of Project Management Coordination and Implementation Unit. As for the Consultant side Individual Consultant Mr.T.Thirunavukarasu will be look after the monitoring activities. Likewise, Environmental Specialist and the Safety Officer will be appointed by the contractor once the contract awarded and they are the responsible for implementing the Environmental Management Plan.

Figure 10: Safeguards Implementation Arrangement

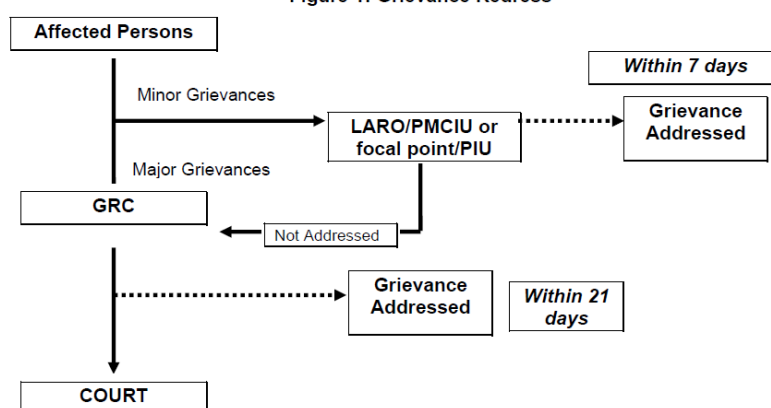


VIII. GRIEVANCE REDRESS MECHANISM

99. The GRM will be made accessible to affected persons and capable of responding to a wide scope of issues so that affected persons can approach it easily with their diverse concerns including trace-related grievances, land acquisition and compensation-related grievances, construction-related grievances, and resettlement sites-related grievances. The institutional arrangements established to ensure effective management of the design, construction and subsequent operation of the project infrastructure, include special provisions to enable affected persons to bring to the attention of the project authorities any dissatisfaction they may experience and to ensure that this is dealt with appropriately.

Figure 11: Grievance Redress

Figure 1: Grievance Redress



GRC = Grievance Redress Committee, LARO = Land Acquisition and Resettlement Officer, PIU = project implementation unit; PMCIU = project management, coordination and implementation unit.

100. Grievances of affected persons will first be brought to the attention of the Sociologist / Land Acquisition and Resettlement Officer (LARO) in the project management, coordination and implementation unit (PMCIU) or the focal point in the PIU. The sociologist/ LARO is responsible for the following grievance related activities:

- (i) Assist the affected persons in land acquisition and compensation processes including their relocation to new sites (if relevant);
- (ii) maintain good relations with affected persons, responding to their concerns, and providing assistance to them as required;
- (ii) Identify all resettlement impacts before, during, and after construction; and taking steps to mitigate them;
- (iii) Participate in Grievance Redress Committees (GRCs) as an ex-officio member;
- (iv) Function as lowest level receiver of grievances along with the PIU focal point;
- (v) Record, register, and sort grievances;
- (vi) Conduct an initial assessment of grievances;
- (vii) Refer grievances to appropriate units or persons;
- (viii) Notify complainants and other affected parties of eligibility, the resolution process, and the outcomes;

- (ix) Track, monitor, document, and evaluate of all grievances; and Submit annual summary report to PMCIU project director and to ADB.

101. As complaints are expected to be infrequent, the GRC will meet only when a grievance is not resolved by the PMCIU Environmental Officer. They will be given notice of the meeting, meet to determine the merit of the grievance and resolve the grievance within a month of receiving the notice for the meeting, informing the complainant verbally and in writing of the outcome. If the affected persons are not satisfied with the outcome, they may refer the case to the appropriate courts of law.

102. The Environmental Officer will participate in the GRC as an ex-officio member and function as the lowest level receiver of grievances along with the PIU focal point. The Environmental Officer will be responsible to (i) record, register and sort grievances; (ii) conduct an initial assessment of grievances; (iii) refer grievances to appropriate units or persons; (iii) notify complainants and other affected parties of eligibility, the resolution process, and outcomes; (iv) track, monitor, document and evaluate grievances; and (v) submit annual summary report to the PMCIU Project Director to be submitted to the ADB. Details of the committee members are attached in Annex – 2.

IX. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

103. The main objective of consultation and grievance redress participation is to involve stakeholders in the decision-making process, to keep all affected people informed of resettlement and compensation options and to provide a mechanism through which they can raise any concerns so that they may be addressed in project design and implementation.

104. Identification of the primary and secondary stakeholders was the first step. People affected, beneficiaries and the National Water Supply and Drainage Board (NWSDB), as the implementing agency, are the primary stakeholders. Members of MC, *Pradeshiya Sabhas* and Local Authorities, officials of district and divisional secretariats and local authorities in the area are secondary stakeholders. NGOs operating in the area will also be in this category.

105. Stakeholder consultation was conducted during the initial period of project preparation and then continued when the project recommenced. Consultation covered both environmental and social issues, as described below.

A. Creating Awareness amongst Stakeholders

106. The awareness campaign has also been completed amongst all staff of fifty percent of Divisional Secretariat Offices in the Jaffna. The awareness campaign has also covered Jaffna Technical College, College of Education, Jaffna, staff of the National Housing Authority, Jaffna staff of the Industrial Development Board, Jaffna, and staff of the Education Office. Topics covered included how to get water, how to use water, how to minimize utilization, water conservation and management, making children and elders aware of the project by members of the society, the society member's contribution towards water supply and management, formation of water management groups within their respective societies and regarding health related sanitation.

107. Meaningful consultation and active participation of stakeholders including local community, NGOs/community-based organizations, and the media in all stages of project preparation and implementation is essential for successful implementation of the project. It will ensure that the subprojects are designed, constructed, and operated with utmost consideration to local needs, ensures community acceptance, and will bring maximum benefits to the people. Public consultation and information disclosure is a must as per the ADB policy.

108. **Consultation during construction.** Prior to start of construction, PMCIU will conduct information dissemination sessions at various places and solicit the help of the local community, leaders/prominent for the project work. Focus group meetings will be conducted to discuss and plan construction work (mainly pipeline work) with local communities to reduce disturbance and other impacts and regarding the project GRM. Project information and construction schedule will be provided to the public via mass media (newspapers, television, project websites etc.). A constant communication will be established with the affected communities to redress the environmental issues likely to surface during construction phase. Contractor will provide prior public information (in local language and English) about the construction work in the area, once 7 days prior to the start of work and again a day before the start of work via pamphlets. At the work sites, public information boards will also be provided to disseminate project related information

2. Information Disclosure

109. Based on ADB disclosure requirements, the following will be posted on ADB website: (i) this IEE upon receipt; (ii) new or updated IEE; (iii) corrective action plan prepared during project implementation to address unanticipated environmental impacts and to resolve non-compliance to EMP provisions; and (iv) environmental monitoring reports after being reviewed and cleared by ADB. Executive summary of the IEE will be translated in the local language and made available at the offices of PMCIU, PIU, and municipality and displayed on their notice boards. Hard copies of the IEE will be accessible to citizens to disclose the document and at the same time creating wider public awareness. Electronic version of the IEE in English and Executive Summary in the local language will be placed in the official website of the project after approval of the IEE by ADB. Stakeholders will also be made aware of grievance register and redress mechanism.

110. Public information campaigns to explain the project details to a wider population will be conducted. Public disclosure meetings will be conducted at key project stages to inform the public of progress and future. Prior to start of construction, the PMCIU and PIU will issue Notification on the start date of implementation in local newspapers. A notice board showing the details of the project will be displayed at the construction sites for the information of public.

111. Stakeholder consultations will continue throughout the implementation of the subprojects and operation. Local communities will be continuously consulted regarding location of construction camps, access and hauling routes and other likely disturbances during construction. The road closure together with the proposed detours will be communicated via advertising, pamphlets, radio broadcasts, road signage, etc.

X. CONCLUSIONS AND RECOMMENDATION

112. The process described in this document has assessed the environmental impacts of all elements of supply and laying of distribution pipes at Jaffna City area. All potential impacts were identified in relation to design and location construction, and operation phases. Planning principles and design considerations are reviewed and incorporated into the site planning process whenever possible; thus, environmental impacts as being due to the project design or location are not significant. Most of the individual elements of the subproject are relatively small and involve straightforward construction and operation, so impacts will be mainly localized and not greatly significant. Most of the predicted impacts are associated with the construction process, and are produced because that process is invasive, involving trenching and other excavation. However, the routine nature of the impacts means that most can be easily mitigated. Mitigation measures have been developed to reduce all negative impacts to acceptable levels.

113. Mitigation will be assured by a program of environmental monitoring to ensure that all measures are implemented and will determine whether the environment is protected as intended. It will include observations on- and off-site, document checks, and interviews with workers and beneficiaries. Any requirements for corrective action will be reported to the ADB. The stakeholders are involved in developing the IEE through discussions on-site and public consultation, after which views expressed are incorporated into the IEE and in the planning and development of the subproject. The IEE will be made available at public locations in the city and will be disclosed to a wider audience via the ADB websites.

114. The consultation process will be continued and expanded during project implementation to ensure that stakeholders are fully engaged in the project and have the opportunity to

participate in its development and implementation. A grievance redress mechanism is described within the IEE to ensure any public grievances are addressed quickly. A copy of the EMP shall be kept on-site during the construction period at all times. The EMP shall be made binding on all contractors operating on the site and will be included in the contractual clauses. Non-compliance with, or any deviation from, the conditions set out in this document shall constitute a failure in compliance.

115. The IEE should be updated based on the detailed design. The updated IEE shall be submitted to ADB for final review and disclosure on PMCIU ADB websites. No works shall commence until ADB clears the updated IEE, including the SEMP.

Appendix 1: Rapid Environmental Assessment (REA) Checklist (Supply and Laying of Distribution)

Instructions:

(i) The project team completes this checklist to support the environmental classification of a project. It is to be attached to the environmental categorization form and submitted to the Environment and Safeguards Division (SDES) for endorsement by the Director, SDES and for approval by the Chief Compliance Officer.

(ii) This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB's (a) checklists on involuntary resettlement and Indigenous Peoples; (b) poverty reduction handbook; (c) staff guide to consultation and participation; and (d) gender checklists.

(iii) Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

Country/Project Title	Jaffna Kilinochchi Water Supply Project, Sri Lanka
Sector Division:	Urban Infrastructure
Subproject Name:	Supply and laying of distribution system for Jaffna City area

Screening Questions	Yes	No	Remarks
A. Project Siting Is the project area...			
▪ Densely populated?	√		The population distribution shows that the project area is densely populated
▪ Heavy with development activities?		√	
▪ Adjacent to or within any environmentally sensitive areas?		√	
• Cultural heritage site		√	
• Protected Area		√	
• Wetland		√	
• Mangrove		√	

Screening Questions	Yes	No	Remarks
• Estuarine		√	
• Buffer zone of protected area		√	
• Special area for protecting biodiversity		√	
• Bay		√	
B. Potential Environmental Impacts Will the Project cause...		√	
▪ pollution of raw water supply from upstream wastewater discharge from communities, industries, agriculture, and soil erosion runoff?		√	
▪ impairment of historical/cultural monuments/areas and loss/damage to these sites?		√	There are some cultural and historical area present in the project area. Please refer Table 15. We are strictly avoid this area during the construction work
▪ hazard of land subsidence caused by excessive ground water pumping?		√	
▪ social conflicts arising from displacement of communities ?		√	
▪ conflicts in abstraction of raw water for water supply with other beneficial water uses for surface and ground waters?		√	
▪ unsatisfactory raw water supply (e.g. excessive pathogens or mineral constituents)?		√	All water supply to comply with the National Drinking Water Quality Standard but during the groundwater pumping time seawater intrusion maybe occur
▪ delivery of unsafe water to distribution system?		√	
▪ inadequate protection of intake works or wells, leading to pollution of water supply?		√	
▪ over pumping of ground water, leading to salinization and ground subsidence?		√	

Screening Questions	Yes	No	Remarks
▪ excessive algal growth in storage reservoir?		√	
▪ increase in production of sewage beyond capabilities of community facilities?		√	
▪ inadequate disposal of sludge from water treatment plants?		√	
▪ inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances and protect facilities?		√	
▪ impairments associated with transmission lines and access roads?		√	
▪ health hazards arising from inadequate design of facilities for receiving, storing, and handling of chlorine and other hazardous chemicals.		√	
▪ health and safety hazards to workers from handling and management of chlorine used for disinfection, other contaminants, and biological and physical hazards during project construction and operation?		√	Personal protective equipment will be provided to the workers
▪ dislocation or involuntary resettlement of people?		√	No displacement of communities
▪ disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?		√	
▪ noise and dust from construction activities?	√		Anticipated during construction activities. However impacts are temporary and short in duration. The EMP includes measures to mitigate the impacts.
▪ increased road traffic due to interference of construction activities?	√		Anticipated during construction activities. However impacts are temporary and short in duration. The EMP includes measures to mitigate the impacts.

Screening Questions	Yes	No	Remarks
▪ continuing soil erosion/silt runoff from construction operations?		√	
▪ delivery of unsafe water due to poor O&M treatment processes (especially mud accumulations in filters) and inadequate chlorination due to lack of adequate monitoring of chlorine residuals in distribution systems?		√	The project will include development of O&M manuals to ensure that facilities are kept in working condition, including checking and maintenance of distribution network. Any distributed water must comply with the National Drinking Water Quality Standards.
▪ delivery of water to distribution system, which is corrosive due to inadequate attention to feeding of corrective chemicals?		√	No anticipated. Water quality will be regularly monitored
▪ accidental leakage of chlorine gas?		√	No anticipated.
▪ excessive abstraction of water affecting downstream water users?		√	No anticipated.
▪ competing uses of water?		√	No anticipated.
▪ increased sewage flow due to increased water supply		√	
▪ increased volume of sullage (wastewater from cooking and washing) and sludge from wastewater treatment plant		√	
▪ large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?		√	No anticipated.
▪ social conflicts if workers from other regions or countries are hired?		√	Priority in employment will be given to local residents
▪ risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during operation and construction?		√	Not Applicable, Construction will not involve use of explosives.

Screening Questions	Yes	No	Remarks
<ul style="list-style-type: none"> community safety risks due to both accidental and natural hazards, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning? 		√	Work areas will be clearly demarcated with signage and safety barriers, and access will be controlled. Only workers and project concerned members will be allowed to visit the operational sites. Operational area will be clearly demarcated and access will be controlled.

A Checklist for Preliminary Climate Risk Screening

Country/Project Title: Jaffna Kilinochchi Water Supply Project, Srilanka

Sector: Urban Water Supply
Subsector:- Division/Department: Urban Water Supply Division

Screening Questions	Score	Remarks ³
Location and Design of project	Is siting and/or routing of the project (or its components) likely to be affected by climate conditions including extreme weather related events such as floods, droughts, storms, landslides?	0
	Would the project design (e.g. the clearance for bridges) need to consider any hydro-meteorological parameters (e.g., sea-level, peak river flow, reliable water level, peak wind speed etc)?	0
Materials and Maintenance	Would weather, current and likely future climate conditions (e.g. prevailing humidity level, temperature contrast between hot summer days and cold winter days, exposure to wind and humidity hydro-meteorological parameters likely affect the selection of project inputs over the life of project outputs (e.g. construction material)?	0
	Would weather, current and likely future climate conditions, and related extreme events likely affect the maintenance (scheduling and cost) of project output(s) ?	0
Performance of project outputs	Would weather/climate conditions, and related extreme events likely affect the performance (e.g. annual power production) of project output(s) (e.g. hydro-power generation facilities) throughout their design life time?	0

Options for answers and corresponding score are provided below:

³ If possible, provide details on the sensitivity of project components to climate conditions, such as how climate parameters are considered in design standards for infrastructure components, how changes in key climate parameters and sea level might affect the siting/routing of project, the selection of construction material and/or scheduling, performances and/or the maintenance cost/scheduling of project outputs.

Response	Score
Not Likely	0
Likely	1
Very Likely	2

Responses when added that provide a score of 0 will be considered low risk project. If adding all responses will result to a score of 1-4 and that no score of 2 was given to any single response, the project will be assigned a medium risk category. A total score of 5 or more (which include providing a score of 1 in all responses) or a 2 in any single response, will be categorized as high risk project.

Result of Initial Screening (Low, Medium, High): *Low*

Other Comments: *As the Jaffna city area is not sensitive for floods/storms/land slide and it is environmentally friendly for laying the pipes including the soil condition.*

Prepared by: *S. Sivathanan, JKWSSP*

Appendix 2: Exemption from Environmental Clearance from the Central Environment Authority

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மத்திய சுற்றாடல் அதிகாரசபை
Central Environmental Authority

පරිසර පිටප, 104, ඩෙන්සිල් කොබ්බෑකඩුව මාවත, බත්තරමුල්ල, ශ්‍රී ලංකාව.
 "பரிசர பிபு", 104, டென்சில் கொப்பெகடுவ மாவத்தை, பத்தரமுல்லை, திரிபுவணம்.
 "Parisara Piyasa", 104, Denzil Kobbekaduwa Mawatha, Battaramulla, Sri Lanka. Web: www.cca.lk

අපේ ලේඛන අංකය: NO/JA/08/NON-ER/13/2020
 අපේ ලේඛන අංකය: NO/JA/08/NON-ER/13/2020
 අපේ ලේඛන අංකය: NO/JA/08/NON-ER/13/2020

ඔබේ ලේඛන අංකය: 22.06.2020
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 ඔබේ ලේඛන අංකය: 22.06.2020

District Office, Jaffna T.P: 021224050

Project Director
 Jaffna Kilinochchi Water Supply and Sanitation Project
 National Water Supply and Drainage Board

**Application for Environmental Clearance from Central Environmental Authority
 for Laying of Distribution Network (Pipe Laying) in Jaffna City Area**

This has reference to your request letter No: PD/JKWSSP/PMCIU/JMC Distribution/2020 dated 17.06.2020 submitted by you to this Authority.

Based on the information provided in the request letter, it seems that the mentioned project activities are not prescribed under the Gazette Extraordinary No:772/22, dated 24th June 1993 under National Environmental Act No.47 of 1980 and its amendments.

I therefore kindly inform you that these project activities do not require Environmental Clearance from Central Environmental Authority. However, if any changes in the project activities mentioned above and fall within any prescribed activities listed in the above gazette should obtain Environmental Approval through IEE/EIA process.

Assistant Director/Northern Province
 Central Environmental Authority
 Northern Provincial Office
 Kilinochchi

PD's OFFICE - NWS & DB
RECEIVED
 Date: 22 JUN 2020
 Signature:
 S.No: 666 Time:
 Action: D.D./C.E. Surgeyist
 n/a at
 1.4.2

Appendix 3: GRC Members Details

This Committee is supported to record and resolve grievances regarding the ongoing project under the guidance of the Divisional Secretary. The members of GRC are given below.

18.05.2012 - Poonakary (01)

- Chairman - Mr. K. S. Vasanthakumar, DS, Poonakary
- Vice Chairman - Mr. V. Sokkanathan, ADP, Poonakary
- Secretary - Mrs. S. Mary Masdolona, Secretary, Poonakary Pradeshiya Sabha
- Members

1. Mr. V. Chandralogarasingam (PS Members)
2. Mr. S. Sanmuganathan (Farmers Organization)
3. Mr. A. Iyampillai (FO)
4. Mr. S. Thavarasa (GS, Pallikudah)
5. Mr. J. Josephrajan, (CEA)

22.05.2012 - Pachilaipallai (02)

- Chairman - Mr. S. Sathiyaseelan, AGA, Pallai
- Vice Chairman - Mr. K. Jeyakumar, ADP, Pallai
- Secretary - Mr. S. Sivapragasam, Secretary, Pallai Pradheshiya Sabha
- Members

1. Mr. S. Puwanaraja, GS, Palai
2. Mr. S. Mathanatharshan, RDS Leader, Palai
3. Mr. Y. Vedanayagam, GS, Puloppalai
4. Mr. Nickelalas, RDS Leader, Puloppalai
5. Mr. V. Ganesharatnam, Leader, Puloppalai West

08.06.2012 - Chankanai (03)

- President - Mr. Sothinathan, Divisional Secretary, Changanai.
- Vice President - Mr. Latheesan, MOH
- Secretary - Ms. U. Sambavi, Sec, PS
- Members

1. K. Iyalingam, Araly FO Leader
2. Mr. N. Sithamparanathan
3. Mr. S. Gopalakrishnan, Chankanai UrbanD
4. Ms. K. Savithri, DO, Tholpuram
5. Mr. R. Sreerajan, GS
6. Mr. NadanaShanmuganathan, FO, Araly

15.06.2012 - Sandilipay (04)

- President - Ms. U. Yasotha, Divisional Secretary, Sandilipay.
- Vice President - Ms. V. Niranjala, ADP
- Secretary - P. Sivalingam (PS Secretary)
- Members

1. S. Mohanamurali (FO Navali South)
2. R. Manoharan (RDS Uyarapulam)
3. K. Kandaswamy (RDS Vadaliyadaipu)
4. S. Sivakumar (Kaddudai) C. V. P. M. K. Muthaliyar (FO Manipay West)
5. K. Ezhilchelvan (Navali GS)
6. P. Niruban (Sandilipay Central GS) 8. A. Nishanthan (Anaikoddai GS)

04.07.2012 - Karachchi (05)

- Chairman - Mr. G. Nageswaran, AGA, Karachchi
- Secretary - Mr. S. B. Amalarasa, ADP, Karachchi
- Members
 1. Mr. K. Sivaneswaran, RDS Leader Vaddakachchi
 2. Mr. N. Sabanayagam, Teacher, Akkarayan
 3. Mr. K. Navaratnarajah, RDS Leader, Akkarayan Centre,
 4. Mr. S. Vihirthan, ID/ TO Mokshanathan, Rajakanthan)
 5. Mr. S. Baskeran, Vaddakachchi, Farmer
 6. Mr. Mahendiran, GS, Skanthapuram,

06.07.2012 - Karainagar (06)

- President - Mrs. T. Babu, DS, Karainagar
- Vice President - Miss. R. Ratneswary, ADP, Karainagar
- Secretary - Mr. K. Kanagathurai, Secretary, Karainagar Pradheshiya Sabha
- Members
 1. Mrs. T. Rajeshwary (WRDS - J/48)
 2. Mr. K. Thambiah (RDS J/42)
 3. Mr. S. Suganthan (J/42)
 4. Mr. M. Suganthakumar (J/47)
 5. Mr. S. Prabhakaran (J/46)
 6. Mr. R. Thirupugaloorsingham (J/44)

04.07.2012 - Karachchi (07)

- Chairman - Mr. G. Nageswaran, AGA, Karachchi
- Secretary - Mr. S. B. Amalarasa, ADP, Karachchi
- Members
 1. Mr. K. Sivaneswaran, RDS Leader Vaddakachchi
 2. Mr. N. Sabanayagam, Teacher, Akkarayan
 3. Mr. K. Navaratnarajah, RDS Leader, Akkarayan Centre,
 4. Mr. S. Vihirthan, ID/ TO Mokshanathan, Rajakanthan)
 5. Mr. S. Baskeran, Vaddakachchi, Farmer
 6. Mr. Mahendiran, GS, Skanthapuram,

06.07.2012 - Karaingar (08)

- President - Mrs. T. Babu, DS, Karainagar
- Vice President - Miss. R. Ratneswary, ADP, Karainagar
- Secretary - Mr. K. Kanagathurai, Secretary, Karainagar Pradheshiya Sabha
- Members
 1. Mrs. T. Rajeshwary (WRDS-J/48)
 2. Mr. K. Thambiah (RDS J/42)

3. Mr.S.Suganthan (J/42)
4. Mr.M.Suganthakumar (j/47)
5. Mr.S. Prabhakaran (j/46)
6. Mr.R.Thirupugaloosingham (j/44)

SUMMARY OF GRIEVANCE REDRESS COMMITTEES – JKWSSP

13.07.2012 - Delft (09)

- President - Mr.A.Shree, DA, Delft
- Vice President - Mr.Gnanaharan, DO
- Secretary - Mr.S.Thambirasa
- Members
 1. Mr.A.Arunthavaseelan, Youth Clup Leader
 2. Mr.E.Mayilvahanam,PS Member
 3. Mrs.P.Damayanthi,WARDS Leader, 01ward
 4. Mr.C.Edward Rasa,PS Member
 5. Mr.K.Sivananthan,PS Member
 6. Mr.Christopher kamaliyal mudaliyar, ward no 09
 7. Mr.P.Kathiresan.14th ward
 8. Mr.K.Pareerathan 4th ward
 9. Mrs.S.Thavaranjani, 05th ward
 10. A.W.Ariyanagam, 11th ward

23.08.2012 - Kayts (10)

- President - Mrs.E.Anton Yoganagam DS Kayts
- Vice President - Mrs.Sutharshana ADP Kayts
- Secretary - Mrs.S.Sutharjan Secretary, PS
- Members
 1. Mr.V.Vadivalagaiyan (Analaithivu GS)
 2. Mr.A.Aarooran (Eluvaithivu GS)
 3. Mrs.R.Jovita (j/54 SDO)
 4. Mr.M.P.P.Albert (Vice Chairman PS)
 5. Mr.L.Sivanesapillai (RDS Leader J/56)
 6. Mr.V.Ahilan (RDS J/60)
 7. Mr.V.Vijayanesan (Land Use)
 8. Mr.T.Franklin (Graduata Trainee)
 9. Mrs.k.Thaiyaljanaqki (J/60 Women's Society)

SUMMARY OF GRIEVANCE REDRESS COMMITTEES –JKWSSP

15.11.2012 – Jaffna (11)

28.11.2012 _ Nallur (12)

19.12.2012- kopay (13)

- President - Divisional Secretary
- Vice President - Asst Director Planning
- Secretary - Secretary, Pradeshiya Sabha
- Members
 1. Mr.S.Jeyaseelan MOH,

2. Mrs.Colasteena jeyathas (land officer)
3. Mr.Naguleswaran (GS) –Watharawathai
4. Mr.Gobalathas (GS) –puttur East
5. Mr.S.Sinnathambi (RDS –Puttur East)
6. Ms. Komathi (WRDS Puttur East)
7. MRr.Shiyamala (GS Awarangal Manager)
8. MS.P.Sureskumar (Samurdhi south)
9. Mr.T.Thavarasa (RDS – Atchuvveli south)
10. Mr.Suthakar (Economic Development Trainee)

SUMMARY OF GRIEVANCE REDRESS COMMITTEE-JKWSSP

09.01.2012 – Chavakachcheri (14)

- President - Divisional Secretary
- Vice President -Asst Director Planning
- Secretary - Secretary, Pradeshiya Sabha
- Members
 1. Mr.S.Jeyaseelan MOH,
 2. Mrs.Colasteena jeyathas (land officer)
 3. Mr.Naguleswaran (GS) – Watharawathai
 4. Mr.Gobaleswaran GS –Puttur East
 5. Mr.S.Sinnathambi (RDS – Putter East)
 6. Ms.Komathi (WRDS Puttur East)
 7. Ms.Shiyamala (GS Awarangal East)
 8. Mr.P.Sureskumar (Samurdhi Manager)
 9. Mr.T.Thavarasa (RDS-Atchuvveli South)
 10. Mr.Suthakar (Economic Development Trainee)

SUMMARY OF GRIEVANCE REDRESS COMMITTEES –JKWSSP

29.05.2013 - Velanai (15)

- President - Divisional Secretary
- Vice President - Asst Director Planning
- Secretary - Sociologist (JKWSSP)
- Members
 1. Mr.P.Sabanayagam , J/07
 2. Mr.C.Ratneswaran , GS J/10
 3. Mr.K.Gangaiveniyan, J/17
 4. Mr.k.Markanduthasan , J/16
 5. Mr.P.Seevarathnam ,J/13
 6. Mr.K.Ganesalingam ,GS J/20
 7. Mr.A.Sanmuganathan, J/22
 8. Mr.K.Sreeskantha, J/28
 9. Mr.K.Santhira,GS J/24
 10. Mr.T.Kogularuban, GS J/34
 11. Mr.S.Pararuban, J/24
 12. Mr.P.Sreeskantha, J/30

SUMMARY OF GRIEVANCE REDRESS COMMITTEES –JKWSSP

30.05.2013 - Karaveddy (16)

- President - Divisional Secretary.
- Vice President - Asst Director Planning
- Secretary - Secretary, Pradeshiya Sabha
- Members
 1. Mr. V.K.Shanmuganathan, AO for GSs
 2. Ms.L.Thanuja, GS – J/366
 3. Mr.P.Elankeeran, EDO
 4. Mr. M.S.Sabanayagam, RDS- Nellyyadi
 5. Mr.M.Manivarnan, Predeshiya Saba
 6. Mrs.V.Thevamararchelvi, WRDS
 7. Ms.S.Selvamalar, WRDS
 8. Ms.J.Sivajini, DO

11.11.2015 – Vadamarachchi East (17)

- President - Divisional Secretary.
- Vice President - Asst Director Planning
- Secretary - Sociologist, NWSDB
- Members
 1. Mr. Jones Inparaj, Coordinator & DO, VE
 2. Mr. M.Thavaraja, GS – J/428
 3. Mr. J.Aswin Dias, Secretary, Fisheries Society, Thalaiyadi
 4. Mr.Y.Yoganathan, President, Rural Development Society, Thalaiyadi
 5. Mr. Y.Emilrajan, Member, Rural Development Society, Thalaiyadi
 6. Mrs.D. Mary Subajini, Member, Women Rural Development Society, Thalaiyadi
 7. Mrs. M.Mary Renuka, Member, Women Rural Development Society, Thalaiyadi
 8. Ms. Y.Thusara, Member, Women Rural Development Society, Thalaiyadi
 9. Mr. R. Sulaxsan, Member, Rural Development Society, Thalaiyadi
 10. Mr. J.Latheeswaran, Member, Rural Development Society, Thalaiyadi

Appendix 5: Summary of Public Consultations

S.No	Date	Location	Subject of Meeting	Male	Female	Total
1	05.02.2014	Divisional Secretariat - Jaffna	Awareness on Jaffna Project Pipe laying (Sewerage & Water Supply)	55	72	127
2	12.02.2014	Divisional Secretariat - Nallur	Awareness on Jaffna Project Pipe laying (Sewerage & Water Supply)	39	39	78
3	10.04.2014	Provincial Department of Education Northern Province	Awareness on Jaffna Project Pipe laying (Sewerage & Water Supply)	57	29	86
4	16.05.2014	Divisional Secretariat Jaffna	Awareness on Jaffna Project Pipe laying (Sewerage & Water Supply)	153	262	415
5	20.05.2014	Jaffna Municipal Council	Awareness on Jaffna Project Pipe laying (Sewerage & Water Supply)	42	21	63
6	03.01.2015	J/72	Awareness on Jaffna Project Pipe laying (Sewerage & Water Supply)	14	42	56
7	09.02.2015	J/80	Awareness on Jaffna Project Pipe laying (Sewerage & Water Supply)	13	5	18
8	03.01.2015	J/81	Awareness on Jaffna Project Pipe laying (Sewerage & Water Supply)	14	42	56
9	03.01.2015	J/90	Awareness on Jaffna Project Pipe laying (Sewerage & Water Supply)	14	42	56
10	30.01.2015	J/72	Awareness on Jaffna Project Pipe laying (Sewerage & Water Supply)	9	17	26
11	02.02.2015	J/72	Awareness on Jaffna Project Pipe laying (Sewerage & Water Supply)	27	7	34
12	15.11.2016	Pommaiveli	Pipe laying (Water Supply & Tower Construction)	32	38	70
13	13.03.2017	Ariyalai Center west - J/92	Pipe laying (Water Supply & Tower Construction)	18	13	31
14	14.04.2017	Ariyalai south west - J/93	Pipe laying (Water Supply & Tower Construction)	21	19	40
15	16.05.2017	Ariyalai north west - J/91	Pipe laying (Water Supply & Tower Construction)	32	11	43
16	17.05.2017	Iyanar Kovilady - J/97	Pipe laying (Water Supply & Tower Construction)	9	13	22
17	20.09.2017	Ariyalai East - J/90	Pipe laying (Water Supply & Tower Construction)	11	15	26
18	28.11.2017	Kantharmadam north west - J/102	Pipe laying (Water Supply & Tower Construction)	18	9	27
19	28.11.2017	Vannarpannai north - J/98	Pipe laying (Water Supply & Tower Construction)	14	7	21
20	23.04.2018	Jaffna Town	Pipe laying (Water Supply & Tower Construction)	13	27	40
21	23.03.2018	Jaffna MC area	Pipe laying (Water Supply & Tower Construction)	27	18	45

Appendix 6: Photographs of the community consultations

Appendix 7: Photographs of the Laying sections



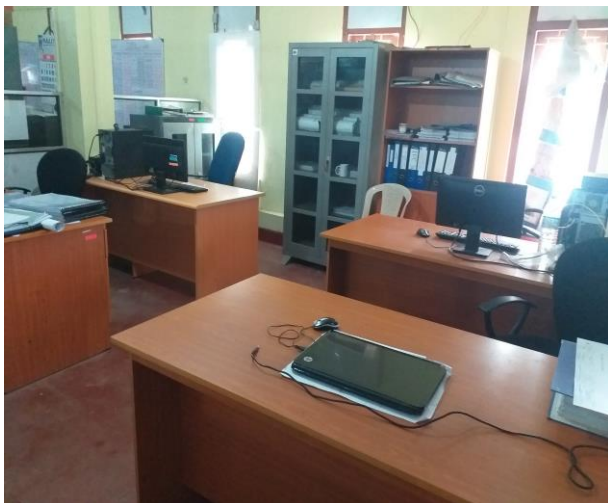
Appendix 8: Photographs for Health and safety protocols for the prevention of COVID-19 at our office

Table arrangement in our Office



Notice display for prevention method for COVID-19



Hand wash setup – In front of Office -20/04/2020



Disinfection process is ongoing at the Office

Appendix 9: Environmental condition at the project area as before the construction

MEASUREMENT OF BASELINE NOISE LEVELS

1. SCOPE

The client, PMCIU, Jaffna Killinochchi Water Supply and Sanitation Project, requested the Environmental Division of National Building Research Organisation (NBRO) to measure the baseline noise levels at selected locations within the project area of the proposed Jaffna Killinochchi Water Supply and Sanitation Project, to be located in Jaffna. The monitoring programme was scheduled to obtain baseline data for both the Environmental Impact Assessment (EIA) of the sanitation component and the Initial Environmental Examination of both the water supply and sanitation components of the project.

In this regard, the following officers of the Environmental Division of NBRO carried out the noise measuring program on the 16th and the 17th October 2014.

Staff Involved:

Mr. H.D.S.Premasiri - Senior Scientist - Air Quality Studies
Mr. V. Daniel - Technical Assistant - Air Quality Studies
Mr. W.A. Weerasinghe - Field Assistant - Air Quality Studies
Mr. A.S. Premarathna - Field Assistant - Air Quality Studies

Witness: Mr. Gabrial, Assistant Engineer, Jaffna Killinochchi Water Supply and Sanitation Project

2. DESCRIPTION OF THE STUDY AREA

The study area covers the proposed Jaffna Killinochchi Water Supply and Sanitation Project, both the water supply and sanitation components of the project. The project refers to the development of the provision of a safe and reliable water supply and a sewerage system for the Jaffna Peninsula and parts of the adjacent mainland. To cover the sanitation component of the project, measuring locations were selected to represent locations where proposed pumping stations of the sewerage network will be located and the proposed sewage treatment plant site. To cover the water supply component, some elevated tower sites and the proposed water treatment plant site were selected. The measuring locations identified are representative of locations where most of the construction and operation activities will take place due to the proposed project.

3. WEATHER CONDITIONS

Dry weather with fair scattered wind was prevailed during the measuring period.

4. NOISE LEVEL MEASUREMENTS

4.1 MEASURING INSTRUMENTS

Sound Level Meter	: RION NA 28
Calibrator	: RION NC 74 – IEC 60942:2003, Class 1
Calibration Due	: November 2015

The sound level meter conforms to the requirements of both IEC 61672-12002 Class 1 and JIS C 1509-1:2005 Class 1.

4.2 METHOD OF MEASUREMENT

The sound level measurements were carried out in accordance with methods laid down in the International Organisation for Standardization (ISO) 1996 (Part 1,2,3) and BS 4142: 1990, as stipulated in the National Environmental Noise Control Regulations.

The equivalent continuous A weighted sound pressure level ($L_{eq,T}$) was measured for a periods of T (15 and 5 minutes during the day time and 5 minutes during night time) with the integrated time of one (1.0) second in the fast selection mode of the meter.

4.3 DESCRIPTION OF THE MEASURING LOCATIONS

Fourteen locations were selected by considering areas which will be affected by the proposed project activities. The locations are described in Table 1.

Table 1: Noise Monitoring Location Description

Location	GPS Coordinates	Description of Locations
N ₁	N 09° 39' 18.3" E 080° 00' 46.6"	At the premises in front of the Proposed PS No: 2 on Beach Rd, Jaffna
N ₂	N 09° 39' 15.6" E 080° 01' 38.5"	At the junction between Eachchamoddai Rd and Old Park Rd, close to the Palkulum Pond and the Proposed PS No: 5
N ₃	N 09° 39' 11.5" E 080° 01' 25.6"	At the premises of the Barathy community centre playground
N ₄	N 09° 39' 21.3" E 080° 00' 59.9"	At the junction between Velagani Rd and Beach Rd, close to Proposed PS No: 10
N ₅	N 09° 39' 51.0" E 080° 00' 40.3"	At the premises in front of Veerasingham Hall, close to the Proposed PS No: 13
N ₆	N 09° 39' 50.5" E 080° 00' 16.4"	At the premises of a reservation area, close to Proposed PS No: 15
N ₇	-	At the premises of a reservation area, close to Proposed PS No: 15
N ₈	N 09° 40' 26.6" E 080° 01' 17.0"	At the roadside of Thukkumaran Rd, in front of Proposed PS No: 7
N ₉	N 09° 40' 19.4" E 080° 00' 45.5"	At the road side of Kasturiar Rd, close to the proposed PS No: 19
N ₁₀	N 09° 41' 03.6" E 080° 01' 13.2"	At the junction between Sivan Rd and Paramesvaran Rd, close to Proposed PS No: 26
N ₁₁	N 09° 34' 54.4" E 080° 02' 56.8"	At the boundary of the Proposed Water Treatment Plant site
N ₁₂	N 09° 40' 28.1" E 080° 02' 45.3"	At the boundary of the Proposed Nallur Tower and Sump site

N ₁₃	N 09° 39' 48.6" E 080° 04' 57.4"	At the boundary of the Proposed Navatkuli Tower site
N ₁₄	N 09° 39' 28.6" E 080° 01' 44.9"	At the boundary of the Proposed Old Park Tower site

4.4 MEASURING CONDITIONS

A set of 15 and 5 minute continuous time integrated noise levels were taken at selected locations during the day time. Another set of 5 minute continuous time integrated noise levels were taken at same locations during night time. The height of the noise level meter receiver was about 2 m from ground level for each measurement. It was noticed that noise generated due to vehicular movements on nearby roads and commercial and residential activities were the main contributors to the baseline noise level at each location.

4.6 NOISE MONITORING RESULTS

Measured baseline noise levels at each selected location in during day and night time of the 16th and 17th October 2014 are provided in Table 2.

Table 2: Measured Noise Levels at the Selected Locations

Location	Monitoring Date	Time	Run Time (min)	Measured Residual Noise Level Leq (dB)	Background Noise Level L ₉₀ (dB)
N1	16-17/10/2014	Day	15	59	46
		Day	5	60	67
		Night	5	54	40
N2	16-17/10/2014	Day	15	65	58
		Day	5	66	59
		Night	5	53	41
N3	16-17/10/2014	Day	15	57	52
		Day	5	59	52
		Night	5	48	40
N4	16-17/10/2014	Day	15	61	56
		Day	5	63	57
		Night	5	64	57
N5	16-17/10/2014	Day	15	58	53
		Day	5	60	54
		Night	5	46	39
N6	16-17/10/2014	Day	15	53	43

		Day	5	55	44
		Night	5	52	38
N7	16-17/10/2014	Day	15	48	44
		Day	5	50	45
		Night	5	45	42
N8	16-17/10/2014	Day	15	49	45
		Day	5	51	47
		Night	5	40	39
N9	16-17/10/2014	Day	15	55	45
		Day	5	56	46
		Night	5	49	39
N10	16-17/10/2014	Day	15	56	51
		Day	5	58	52
		Night	5	43	40
N11	16-17/10/2014	Day	15	60	44
		Day	5	61	44
		Night	5	61	42
N12	16-17/10/2014	Day	15	46	40
		Day	5	47	40
		Night	5	45	35
N13	16-17/10/2014	Day	15	56	43
		Day	5	57	44
		Night	5	56	44
N14	16-17/10/2014	Day	15	50	44
		Day	5	51	45
		Night	5	44	35

4.5 MAXIMUM PERMISSIBLE NOISE LEVEL

The maximum permissible noise levels that can be maintained at the boundary of a site during the construction period of the proposed project as stipulated by the Central Environmental Authority of Sri Lanka under the Extraordinary Gazette No. 924/12- Thursday, May 23, 1996, is:

75 dB (A) Leq during day time
 50 dB (A) Leq during night time

The maximum permissible noise level that can be maintained at the boundary of a site during the operation period of the proposed project as stipulated by the Central Environmental Authority of Sri Lanka under the Extraordinary Gazette No. 924/12- Thursday, May 23, 1996, is:

63 dB (A) Leq during day time
 50 dB (A) Leq during night time

5. CONCLUSION

The measured baseline residual noise levels in the area were relatively high due to contributions of noise sources such as vehicle movements and commercial and domestic activities. The day time residual noise levels at all locations were below the maximum permissible levels during the operation period of the project. However the night time residual noise levels at several locations (N₁, N₂, N₄, N₆, N₁₁ and N₁₃) already exceeded the maximum permissible levels for night time during the operation period.

.....
 S.V. Dias
 Director/E.S.S.D
 National Building Research Organisation

.....
 H.D.S. Premasiri
 Coordinator/ Air Quality Studies
 National Building Research Organisation

MEASUREMENT OF BASELINE VIBRATION LEVELS

1. Scope:

The client, PMCIU, Jaffna Killinochchi Water Supply and Sanitation Project, requested the Environmental Division of National Building Research Organisation (NBRO) to measure the baseline vibration levels at selected locations within the project area of the proposed Jaffna Killinochchi Water Supply and Sanitation Project, to be located in Jaffna. The monitoring programme was scheduled to obtain baseline data for both the Environmental Impact Assessment (EIA) of the sanitation component and the Initial Environmental Examination of both the water supply and sanitation components of the project.

In this regard, the following officers of the Environmental Division of NBRO carried out the noise measuring program on the 16th and the 17th October 2014.

Staff Involved:

Mr. H.D.S. Premasiri - Senior Scientist - Air Quality Studies
Mr. V. Daniel - Technical Assistant - Air Quality Studies
Mr. W.A. Weerasinghe - Field Assistant - Air Quality Studies
Mr. A.S. Premarathna - Field Assistant - Air Quality Studies

Witness: Mr. Gabriel, Assistant Engineer, Jaffna Killinochchi Water Supply and Sanitation Project

4. DESCRIPTION OF THE STUDY AREA

The study area covers the proposed Jaffna Killinochchi Water Supply and Sanitation Project, both the water supply and sanitation components of the project. The project refers to the development of the provision of a safe and reliable water supply and a sewerage system for the Jaffna Peninsula and parts of the adjacent mainland. To cover the sanitation component of the project, measuring locations were selected to represent locations where proposed pumping stations of the sewerage network will be located and the proposed sewage treatment plant site. To cover the water supply component, some elevated tower sites and the proposed water treatment plant site were selected. The measuring locations identified are representative of locations where most of the construction and operation activities will take place due to the proposed project.

5. WEATHER CONDITIONS

Dry weather with fair scattered wind was prevailed during the measuring period.

4. VIBRATION MEASUREMENTS

4.1 DESCRIPTION OF MONITORING LOCATIONS

Fourteen sensitive locations were selected as per the client's requirement within the study area of the proposed project. The selected monitoring buildings can be categorised as Type 3 Structures according to the Interim Vibration Levels Standard of the Central Environmental Authority of Sri Lanka. A locations description is provided in Table 1.

Table 1: Vibration Monitoring Locations Description

Location	GPS Coordinates	Description of the Location
V ₁	N 09° 39' 18.3" E 080° 00' 46.6"	At the premises in front of proposed PS No: 2, Beach Rd, Jaffna
V ₂	N 09° 39' 15.6" E 080° 01' 38.5"	At the junction between Eachchamoddai Rd and Old Park Rd, close to Palkulam pond and proposed PS No: 5
V ₃	N 09° 39' 11.5" E 080° 01' 25.6"	At the premises of the Barathy community centre playground
V ₄	N 09° 39' 21.3" E 080° 00' 59.9"	At the junction between Velagani Rd and Beach Rd, close to proposed PS No: 10
V ₅	N 09° 39' 51.0" E 080° 00' 40.3"	At the premises in front of Veerasingham Hall, close to the Proposed PS No: 13
V ₆	N 09° 39' 50.5" E 080° 00' 16.4"	At the premises of a reservation area, close to Proposed PS No: 15
V ₇	-	At the premises of a reservation area, close to Proposed PS No: 15
V ₈	N 09° 40' 26.6" E 080° 01' 17.0"	At the roadside of Thukkumaran Rd, in front of Proposed PS No: 7
V ₉	N 09° 40' 19.4" E 080° 00' 45.5"	At the roadside of Kasturiam Rd, close to Proposed PS No: 19
V ₁₀	N 09° 41' 03.6" E 080° 01' 13.2"	At the junction between Sivan Rd and Paramesvaran Rd, close to Proposed PS No: 26
V ₁₁	N 09° 34' 54.4" E 080° 02' 56.8"	At the boundary of the proposed water treatment plant site
V ₁₂	N 09° 40' 28.1" E 080° 02' 45.3"	At the boundary of the Proposed Nallur Tower and Sump site
V ₁₃	N 09° 39' 48.6" E 080° 04' 57.4"	At the boundary of the Proposed Navatkuli Tower Site
V ₁₄	N 09° 39' 28.6" E 080° 01' 44.9"	At the boundary of the Proposed Old Park Tower Site

4.2 METHOD OF MEASUREMENT

Continuous vibration levels were recorded at selected locations in accordance with methods laid down in the International Organisation for Standardization - ISO - 4966: 1990E, as stipulated in the Interim Vibration Levels Standard of the Central Environmental Authority of Sri Lanka.

4.3 MEASURING INSTRUMENTS

Vibration Meter	: InstanTel BlastMate III
Calibration Due	: November 2015
Minimum Detection Limit	: PPV of 0.07 mm/s

4.4 MEASURING CONDITIONS

Continuous 1 hour vibration levels (peak particulate velocity levels) were recorded at selected locations within the selected area to cover the morning, afternoon, evening and night time of a day. The measuring time was selected as:

- Taken at 09:00 represent 06.00 – 11.00 - Morning
- Taken at 13:00 represent 11.00 – 15.00 - Afternoon
- Taken at 18.00 represent 17.00 – 21.00 - Evening
- Taken at 23.30 represent 22.00 – 24.00 - Night

The recording time of the instrument is 30 sec. at 1024 sps in continuous mode and at a geo-range of 31.7 mm/s.

4.5 VIBRATION MONITORING RESULTS

Table 2: Maximum Vibration Levels at Each Measuring Location

Location	Date	Run Time (min)	Morning		Afternoon		Evening		Night	
			Frequency Range (Hz)	Vibration In ppv (mm/sec)	Frequency Range (Hz)	Vibration In ppv (mm/sec)	Frequency Range (Hz)	Vibration In ppv (mm/sec)	Frequency Range (Hz)	Vibration In ppv (mm/sec)
V ₁	15.10.2014	1 hr	>50	0.35	>50	0.30	>50	0.31	0-10	1.00
V ₂	15.10.2014	1 hr	>50	0.51	>50	0.45	>50	0.53	>50	0.56
V ₃	15.10.2014	1 hr	>50	0.46	>50	0.48	>50	0.44	>50	0.42
V ₄	15.10.2014	1 hr	10-50	0.53	>50	0.51	10-50	0.45	>50	0.24
V ₅	15.10.2014	1 hr	10-50	0.57	10-50	0.59	>50	0.61	>50	0.88
V ₆	16.10.2014	1 hr	10-50	1.01	>50	1.21	>50	0.87	10-50	0.25
V ₇	16.10.2014	1 hr	>50	0.97	10-50	0.85	>50	0.97	>50	0.96
V ₈	16.10.2014	1 hr	10-50	0.42	10-50	0.45	10-50	0.32	10-50	0.19
V ₉	16.10.2014	1 hr	10-50	1.16	10-50	0.97	>50	0.98	>50	0.85
V ₁₀	17.10.2014	1 hr	>50	0.71	>50	0.65	>50	0.43	10-50	0.21

V ₁₁	17.10.2014	1 hr	>50	0.67	>50	0.62	10-50	0.62	>50	0.59
V ₁₂	17.10.2014	1 hr	>50	0.27	10-50	0.23	>50	0.43	>50	0.95
V ₁₃	17.10.2014	1 hr	>50	0.53	>50	0.52	>50	0.50	>50	0.49
V ₁₄	17.10.2014	1 hr	>50	1.12	>50	0.92	10-50	0.46	10-50	0.22

4.6 MAXIMUM PERMISSIBLE VALUES

Table 3. The Maximum Permissible Interim Vibration Levels to be Maintained during Construction and Operation Phases of the Project as Stipulated by the Central Environmental Authority of Sri Lanka for Different Types of Structures Summarised Below

Structure Type	Type of Vibration	Frequency of Vibration (Hz)	Vibration in ppv (mm/sec)
Type 1 Structures – Multi-story buildings of reinforced concrete or structural steel, with filling panels of block work, brick work or pre-cast units not designed to resist earthquakes	Continuous	0 - 10	5.0
		10 - 50	7.5
		Over 50	15.0
	Intermittent	0 - 10	10.0
		10 - 50	15.0
		Over 50	30.0
Type 2 Structures – Two-storey domestic houses and buildings made of reinforced block work, pre-cast units and reinforced floor and roof construction or wholly of reinforced concrete or similar, not designed to resist earthquakes	Continuous	0 - 10	2.0
		10 - 50	4.0
		Over 50	8.0
	Intermittent	0 - 10	4.0
		10 - 50	8.0
		Over 50	16.0
Type 3 Structures – Single and two storey houses and buildings made of lighter construction, using lightweight materials such as bricks, cement blocks etc. not designed to resist earthquakes	Continuous	0 - 10	1.0
		10 - 50	2.0
		Over 50	4.0
	Intermittent	0 - 10	2.0
		10 - 50	4.0
		Over 50	8.0
Type 4 Structures – Structures that, because of their sensitivity to vibration, do not correspond to those listed above 1,2 and 3 and declared as archeologically preserved structures by the Department of Archaeology	Continuous	0 - 10	0.25
		10 - 50	0.5
		Over 50	1.0
	Intermittent	0 - 10	0.5
		10 - 50	1.0
		Over 50	2.0

5. CONCLUSION

The sources that contributed towards baseline vibration levels were vehicular movements and domestic activities around the measuring points. Measured baseline vibration levels at all measured locations were well below the intermittent vibration levels stipulated for Type 3 Structures in the Interim Vibration Levels Standard of the Central Environmental Authority of Sri Lanka.

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MONITORING OF BASELINE AMBIENT AIR QUALITY LEVELS

1. SCOPE

The client, the PMCIU, Jaffna Killinochchi Water Supply and Sanitation Project, requested the Environmental Division of National Building Research Organisation (NBRO) to monitor ambient air pollutant levels, namely Nitrogen Dioxide (NO₂), Sulphur Dioxide (SO₂), Carbon Monoxide (CO), Ozone (O₃) and Particulate Matter (PM₁₀) at selected locations around the Jaffna area where the proposed Jaffna Killinochchi Water Supply and Sanitation Project is to be located. The monitoring programme was scheduled to obtain baseline data for both the Environmental Impact Assessment (EIA) of the sanitation component and the Initial Environmental Examination of both the water supply and sanitation components of the project.

In this regard, the following officers of the Environmental Division of NBRO carried out the noise, vibration and air quality monitoring program on the 16th and 17th October 2014.

Staff Involved:

Mr. H.D.S. Premasiri - Senior Scientist - Air Quality Studies

Mr. V. Daniel - Technical Assistant - Air Quality Studies

Mr. W.A. Weerasinghe - Field Assistant - Air Quality Studies

Mr. A.S. Premarathna - Field Assistant - Air Quality Studies

Witness: Mr. Gabriel, Assistant Engineer, Jaffna Killinochchi Water Supply and Sanitation Project

6. DESCRIPTION OF THE STUDY AREA

The study area included catchments 1 and 2 where the sewerage network will be based and the Sewage Treatment Plant site. Therefore, ambient air quality levels at or near each of the following locations needed to be measured:

- (i) Near Proposed PS No.14 behind Subhas Hotel
- (ii) In front of Proposed PS No.2 on Beach Road
- (iii) At the junction between Sivan Road and Paramesvaran Road (near Proposed PS No.26)
- (iv) At the boundary of the proposed Sewage Treatment Plant site

The project refers to the development of the provision of a safe and reliable water supply and sewerage system for the Jaffna Peninsula and parts of the adjacent mainland. Measuring locations were selected to represent catchments 1 and 2 where the sewerage collection network will be based and the sewage treatment plant site. The measuring locations identified are representative of locations where most of the construction and operation activities will take place due to the proposed project.

7. WEATHER CONDITION

Dry weather with fair scattered wind prevailed during the sampling period.

4. AMBIENT AIR QUALITY MONITORING

Four measurement locations were selected which represents locations where most project activities will take place. These included pumping stations locations within catchments 1 and 2 and the sewage treatment plant site. A location description is provided in Table 1.

4.1 DESCRIPTION OF SAMPLING LOCATIONS

Table 1: Ambient Air Quality Monitoring Locations Description

Location No.	GPS Coordinates	Description
L1	-	At the premises of B.Sundaram, 260/15, Stanley Road, Jaffna
L2	N 09° 39' 18.3" E 080° 00' 46.6"	At the premises of J.A. Melonous, No 2, Beach Road, Jaffna
L3	N 09° 41' 03.6" E 080° 01' 13.2"	At the premises of Ananda Kumaraswamy, Ramanathan Road, Jaffna
L4	N 09° 41' 50.3" E 079° 58' 49.2"	At a location of 340 m away from the waste disposal area, Araly

4.2 SAMPLING AND ANALYTICAL CONDITIONS

Air samples were collected from the selected locations on an eight (08) hour basis for the analysis of SO₂, NO₂, CO and on a twenty four (24) hour basis for the analysis of PM₁₀. The sampling receiver height was about 3m from ground level and the sampling rates were 0.5 l/min for SO₂, NO₂, 1.0 l/min for CO and 18 l/min for PM₁₀. CO samples were measured on-site. Samples collected for the analysis of SO₂ and NO₂ were stored in a cooler box. The PM₁₀ samples were stored in filter cassettes. Then samples were sent to the NBRO laboratory for analysis.

The laboratory received samples in a satisfactory condition. They were analyzed on the same day for SO₂ and NO₂. The PM₁₀ samples were analysed on the 21st October 2014 after drying to a constant weight in desiccators. A description of the sampling and analytical methods is provided in Table 2 and the results are provided in Tables 4a and 4b.

4.3 A DESCRIPTION OF SAMPLING AND ANALYTICAL METHODS

Table 2: A Description of Sampling and Analytical Methods for Each Parameter

Parameter	Testing Method	Minimum Detection Limit	CEA Recommended Method	Instrumentation
SO ₂	ASTM D 2914 - 78, 1987 West-Gaek and pararosaniline spectrometric method	0.004 mg/m ³ (0.0015 ppm)	Pararosaniline method or equivalent (pulsed fluorescent method)	*Standard Personal Air Samplers * UV - Visible Spectrophotometer

NO ₂	ASTM D 1607 - 76, 1987 Griess – Saltzman reaction method	0.004 mg/m ³ (0.002 ppm)	Colorimetric using Saltzman method or equivalent (gas phase chemiluminescence)	*Standard Personal Air Samplers * UV - Visible Spectrophotometer
CO	ASTM D 3162 – 78, 1987 non - dispersive infrared spectrometric method	1.0 mg/m ³ (1 ppm)	Non - dispersive infrared (IR) spectroscopy	*Riken Keiki CO Detector *Model - CO-7
O ₃	ASTM D 2912 - 76, 1987 neutral buffered potassium iodide method (NBKI), UV spectrometric method		Chemiluminescence method or equivalent (ultraviolet photometric)	* Standard Personal Air Samplers * UV - Visible Spectrophotometer
PM ₁₀	ASTM D 4096 – 82, 1997 high - volume sampling and gravimetric analysis	0.002 mg/m ³	Hi - volume sampling and gravimetric	* High Volume Sampler with size select sampling inlet * Sartorius analytical balance

4.4. AMBIENT AIR QUALITY MONITORING RESULTS:

Table 3: Concentrations of Each Parameter at Each of the Ambient Air Quality Monitoring Locations

Parameter	Date of Sampling	Date of Analysis	Time Average	Concentration (µg/m ³)			
				L1	L2	L3	L4
SO ₂	16/10/2014	16/10/2018	8 hr	6	5	4	7
NO ₂	16/10/2014	16/10/2014	8 hr	11	8	7	12
CO	16/10/2014	16/10/2014	8 hr	1400	1400	<1000	<1000
O ₃	16/10/2014	16/10/2014	1 hr	2	3	2	6
PM 10	16/10/2014	16/10/2014	24 hrs	18	16	23	38
PM 2.5	16/10/2014	16/10/2014	24 hrs	12	9	12	20

4.5 AMBIENT AIR QUALITY STANDARDS FOR NO₂, SO₂, CO, & PM10

Table 4. The Permissible Ambient Air Quality Standards as Stipulated Under the Extraordinary Gazette, No. 1562/22, August 15, 2008, by the Ministry of Environment and Natural Resources of Sri Lanka

POLLUTANT	TIME AVERAGE	CONCENTRATION ($\mu\text{g}/\text{m}^3$)
Sulphur Dioxide (SO_2)	8 hrs	200
Nitrogen Dioxide (NO_2)	8 hrs	250
Carbon Monoxide (CO)	8 hrs	30,000
Ozone (O_3)	1 hrs	200
Particulate Matter (PM_{10})	24 hrs	100

5. CONCLUSION

The measured baseline ambient air quality levels at the selected locations were well below the Ambient Air Quality Standards as stipulated by the Ministry of Environment and Natural Resources of Sri Lanka (Extraordinary Gazette, No. 1562/22, August 15, 2008).

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Appendix 10: Environment Safeguards QPR checklist

Environment Safeguards QPR checklist¹

Activity	Yes / No	Remarks (If Answer Is No)
A. For subproject packages under bidding		
1. IEEs cleared by ADB?	<i>Not yet</i>	
2. IEEs/EMPs included in the bidding documents?	<i>Yes</i>	
3. Are there changes in the scope of work of the cleared IEEs?	<i>Not yet</i>	
4. Core labor standards and environment, health and safety (EHS) incorporated in Section 8 of the bid documents?	<i>Yes</i>	
5. BOQ line item includes EMP requirements?	<i>Yes</i>	
6. IEE disclosed in form and language understood by stakeholders and affected persons (APs)?	<i>Yes</i>	
For subproject packages with contracts awarded (no works yet)		
1. All statutory clearances/permits obtained?	<i>yes</i>	
2. Each contractor appointed EHS and/or safety officer?	<i>yes</i>	
3. Baseline regarding condition of roads, agricultural land and other infrastructure prior to start of transportation of materials and construction has been recorded?	<i>yes</i>	
4. Contractor has established tie-ups with local hospitals/clinics for emergencies onsite?	<i>no</i>	
5. For DBO packages, detailed design completed and updated IEE submitted to ADB?	<i>not yet</i>	
6. For civil works packages, site-specific EMP submitted to ADB?	<i>yes</i>	
For subproject packages with contracts awarded and works on-going		
1. Contractors have appointed EHS and/or safety officer onsite per subproject package?	<i>yes</i>	
2. Site-specific EMP posted onsite?	<i>yes</i>	
3. Contractors' records of accidents / incidents submitted to PMU on a monthly basis?	<i>yes</i>	
4. Contractors provided PMU with a notification/incident report of any accident(s) within 24 hours of its occurrence?	<i>no</i>	
5. Reports of complaints/grievances reported monthly to PMU?	<i>yes</i>	
6. Records of information disclosure/consultations submitted by PIUs to PMU monthly?	<i>yes</i>	
7. Records of site inspection by PIU submitted to PMU monthly?	<i>yes</i>	

¹ This checklist should provide the Project's **general** compliance to environment safeguards during the reporting period. The indicators are aligned with project loan agreement, PAM, IEEs and ADB's Sustainable Development Safeguards Division Safeguards project performance rating. The detailed environmental safeguards compliance status should be provided in the semi-annual environmental monitoring report.

Appendix 11: TOR of the Environment Officer and/or Environment, Health and Safety Officer

Section 01450: Health and Safety

This section includes safety, security and health issues.

1.01 Safety and Security

- A. In addition to any requirements as set down in the General Conditions of Contract the Contractor shall at all times maintain a safe system of working and shall comply with all enactments, regulations and working rules relating to safety, security, health and welfare of all persons who may be affected by his work.
- B. In particular he shall ensure that only persons who are properly trained for their duties are employed, and that the correct tools and procedures are used.
- C. Not later than 28 days after the Letter of Acceptance of the Works, the Contractor shall submit to the Engineer his comprehensive proposals relating to the safety, health and welfare of all his personnel on the Site.
- D. In addition to any requirements as set down in the General Conditions of Contract, the Contractor shall be responsible for the implementation of safety related site procedures which shall include but not be limited to:
 - a. Safety;
 - b. Working in hazardous areas;
 - c. Permit to work;
 - d. Fire and smoking regulations;
 - e. First aid;
 - f. Warning signs;
 - g. Trenching scaffolding and other construction structures;
 - h. Safety barriers;
 - i. Protective clothing and equipment;
 - j. Safety training;
 - k. Safety meetings and inspections;
 - l. Health and welfare.
- E. The proposals shall be appropriate for all grades of labour and personnel who will work on or visit the Site on behalf of the Employer, Engineer or Contractor.
- F. The Engineer shall have the power to stop any activity or work in any area where there is a breach of the published site safety rules such that health or life is put at risk.
- G. The Contractor shall, in addition, comply with the Safety Policy of the Employer, copies of which are available on request from the Engineer.

1.02 First Aid and Life-saving Apparatus

The Contractor shall provide on the Site such life-saving apparatus as may be appropriate and an adequate and easily accessible first aid outfits. In addition, an adequate number of persons permanently on the Site shall be instructed in their use, and the persons so designated shall be made known to all employees by the posting of their names and designations in a prominent position on Site.

1.03 Electrical Safety

- A. The Contractor shall be responsible for the electrical safety of all Plant supplied and installed. Whilst any equipment is being installed or tested, the Contractor shall ensure that all necessary precautions are taken to safeguard personnel working on site. If necessary, this shall include fencing off areas which are considered to pose a risk, and erecting warning notices.
- B. The Contractor shall be responsible for ensuring that the electrical installation is carried out by suitably trained competent personnel and that the work is carried out in a safe manner.
- C. The Contractor shall be responsible for the operation on the Site of a permit to work system during the period of electrical equipment installation and testing. This system shall regulate the installation, the energising and the use of electrical Plant installed and the method of work adopted.
- D. Power hand tools for use on site shall operate at no greater than 110 V (55-0-55 V).

1.04 Warning and Safety Signs

Statutory safety signs in accordance with ISO 3864, shall be adequately provided throughout the Site, both indoors and outdoors. These safety signs shall cover mandatory, prohibition, warning, emergency, fire fighting and general notices. All signs shall be positioned around the Site at highly visible points. Provision of signs, and the positions of signs shall be subject to the Engineer's approval. Special attention shall be given to areas designated hazardous.

1.05 Hazardous Material Identification

- A. There may be hazardous materials supplied as part of this Work. The Contractor shall be alert to potentially hazardous materials even though the materials may be located outside the construction area or in an area not normally accessible to the Contractor or his employees. Neither the requirements of this clause nor an act or failure to act by the Employer or the Engineer shall relieve the Contractor of

responsibility and liability for the safety of Engineer, Employer, Contractor, or subcontractor personnel and property.

- B. Hazardous materials may include, but are not necessarily limited to, petroleum and associated by-products, paints, thinners and other such construction materials together with those chemicals used in the operation of the facilities to be constructed.
- C. The Contractor shall ensure that all containers of substances belonging to the Contractor and his Subcontractors that are on-site or in storage are properly labeled as to the contents and the potential hazard (if any). The Contractor shall submit a Material Safety Data Sheet (USA Department of Labor Form OSHA-20), or the local equivalent, for all hazardous material brought to the project site at least five days before delivery.

1.06 Guidelines to Safety in Sewers and Sanitary Structures

- A. The Contractor shall be aware of the guidance and provisions contained in 'Safe Working in Sewers and at Sewage Works' published by the United Kingdom National Joint Health and Safety Committee for the Water Service.
- B. The Contractor must inform his work force of the:
 - 1. Hazards of inflammatory or otherwise noxious volatile liquids being discharged into sewers. Some of these may produce vapours which can cause irritation to the eyes, nose or skin. Should the presence of such liquids be suspected, suitable precautionary measures shall be taken;
 - 2. Danger of bacterial infection while working in a sewage contaminated environment and shall impress upon them the importance of personal hygiene.
- C. If working in sewers where accumulations of sludge or silt occur, the Contractor's attention is drawn to the fact that, when disturbed, sludge may release toxic gases.
- D. The Contractor shall be responsible for ensuring adequate precautions are taken by his workforce to safeguard against any accidents to whosoever while working in or adjacent to sewers, sewage works, manholes, pumping stations, etc.
- E. All members of the workforce shall be vaccinated against tetanus, typhoid and para-typhoid and the Contractor must have up to date medical records of each person. The Contractor shall provide a medical certificate of fitness each of his personnel. Should any one working in a manhole, sewer or chamber, complain of nausea or dizziness then all personnel should be removed from that location and work should resume only when it is safe to do so, or with the use of breathing apparatus under site supervision of safety officer.

- F. All members of the workforce shall be fit and everyone who will be expected to work in sewers shall not suffer from:
1. Any heart defect;
 2. Any history of fits or blackouts;
 3. Deafness or loss of balance;
 4. Claustrophobia;
 5. Recurrent back ailments;
 6. Shortage of breath on light exertion.
- G. The Contractor shall safeguard his workforce against dangers of toxic, asphyxiatory, inflammable or explosive gaseous conditions in manholes, sewers and ancillary structures and physical injury, caused by falling objects, or by falling themselves.
- H. Each group of workers engaged on sewers, manholes, pumping or lifting stations and ancillary structures shall be provided with and be familiar with the operation of reputable gas testing equipment suitable to check hydrogen sulphide combustible gases and lack of oxygen.
- I. Precautions to be taken include, but not by way of limitation, the provision for each person working in sewage works of:
1. Safety helmet;
 2. Safety boots with no ferrous studded soles;
 3. Safety belt (strong readily washable with no ferrous attachments for lifeline);
 4. Gloves;
 5. Overalls.
- J. In addition to the above items, each group shall have with them at each entry point to a confined space of the following:
1. A lifting harness;
 2. 4 No. 15 metre life lines with spring shackle one end, eye at other;
 3. Ladder;
 4. Lifting frame complete with ropes and shackles for hand operation;
 5. Powerful hand lamp, with flameproof switch;
 6. Ventilation blowers together with portable generator and flexible trunking;
 7. Positive pressure respiratory face masks with associated portable compressor and air hoses;
 8. Gas detectors (suitable for H₂S);
 9. Radio activity detectors;
 10. An atmosphere monitoring device capable of monitoring oxygen levels and levels of toxic and flammable gas;
 11. Washing facilities with disinfectants and toiletries;
 12. Communication facilities.
- K. Before entering any manhole, sewer and ancillary structure the atmosphere shall be tested as mentioned.

- L. The Contractor shall also test for radioactivity and any increase found abnormal shall be reported immediately to the concerned authorities and all works in the vicinity must be stopped.
- M. The Contractor shall provide, erect and maintain, adequate scaffolding, ladders, etc., required for work and to facilitate the Engineer's Representative to inspect and test. These shall be removed as directed upon completion of all works.
- N. The Contractor shall be solely responsible for liability in respect of any claim or legal action arising as a result of an accident and shall not be absolved of any liability under the contract in respect of his having complied with the above requirement.
- O. The Contractor shall appoint a safety officer who shall be responsible for ensuring that the Contractor's employees follow the safety procedures. The safety officer shall ensure that at least one person in each gang shall be instructed rescue procedures, resuscitation techniques, basic first aid and the use of gas detection apparatus.
- P. A mobile mess room with washing and changing facilities shall be provided by the Contractor for each working area.
- Q. The Contractor shall keep installed in the mobile changing rooms, or mobile office, within easy access of each working group emergency equipment which shall include, but not by way of limitation:
 - 1. Barrier cream;
 - 2. Disinfectant;
 - 3. First aid kit with eye bath;
 - 4. Stretcher;
 - 5. 15m long lifelines with spring shackle one end, eye at other, lifting harnesses;
 - 6. Breathing apparatus with air bottle - 2 sets.
- R. Address and telephone number of the nearest hospital with emergency facilities shall be posted in each mess room.
- S. The Contractor shall provide safety barriers to be erected around all unattended open manholes and cover them with suitable temporary steel sheets. Whenever the Contractor's workforce leaves the site of the works all manhole covers shall be replaced.

Appendix 12: Water Quality Reports of the Dug wells situated in the Jaffna City Area.

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Regional Manager (J)
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Water Quality Report-2015

1. Date of Sampling : 29.09.2015
2. Report required : Project Director (ADB 6th)
3. Location : JMC Area

Room Temperature : 27.4 °C

Laboratory Sample No	Time	SAMPLE LOCATION	Coordinates	Turbidity	pH	Electrical Conductivity	Chloride (as Cl)	Total Hardness (as CaCO ₃)	Alkalinity (as CaCO ₃)	Nitrite(as NO ₂)	Nitrate (as NO ₃)	Fluoride (as F)	Total Phosphate (PO ₄ ³⁻)	Sulphate (as SO ₄ ²⁻)	Total Dissolve Solid	Bacteriological		Remarks
																T. Coll	E. Coll	
Unit				NTU	-	µS/cm	mg/ L	mg/ L	mg/ L	mg/ L	mg/ L	mg/ L	mg/ L	mg/ L	-	-		
SLS 614 : 2013 Maximum permissible Level				2.00	6.5 - 8.5	750	250	250	200	3.000	50.0	1.00	2.00	250	500	3	-	
JPS 4456	10.00	Dug well - S. Thijagarajah 70, Abocobacker Rd, New Moor Rd	N - 9°40'05.78" E - 80°02'12.25"	0.46	7.46	2070	470	433	338	0.010	9.7	0.31	0.61	248	1325	3	Nil	
JPS 4457	10.15	Dug well - Rajendra Shop 200, Hospital Rd, Jaffna	N - 9°39'03.44" E - 80°02'12.36"	0.51	7.57	2720	701	467	448	0.030	Undet	0.50	0.35	436	1741	4	Nil	
JPS 4458	10.25	Dug well- Arumai kadai No 8, Jemima Mosque Lane, Jaffna	N - 9°38'53.00" E - 80°02'08.19"	0.44	7.37	2260	544	559	352	3.350	28.3	0.32	1.09	172	1446	12	Nil	
JPS 4459	10.38	Dug well - Araselingam (Golden caté) Stanly Rd, Jaffna	N - 9°39'11.99" E - 80°03'02.94"	1.13	7.14	2730	816	576	385	0.099	10.2	0.28	0.24	98	1747	7	Nil	
JPS 4460	10.42	Dug well -Pilsayer kovil Attiyady Rd, Jaffna	N - 9°38'55.46" E - 80°03'15.31"	0.56	7.50	1435	313	371	288	0.026	1.8	0.48	0.46	129	918	6	Nil	
JPS 4461	10.48	Dug well -S.Ravinrakumar Pointpedro Rd, Annaphanthi	N - 9°39'07.43" E - 80°03'21.18"	0.37	7.82	1930	599	422	319	0.016	14.2	0.58	0.14	221	1235	3	Nil	

JPS 4462	10.56	Dug well - S. Sathkunanantham 1A Amman Rd, Kantharmadam	N - 9°39'02.54" E - 80°02'47.97"	0.46	7.11	1870	553	433	338	0.049	Undet	0.24	1.35	223	1197	8	Nil	
JPS 4463	11.03	Dug well - S. Kirushnapala 62/A Wimen Rd, Nallur	N - 9°39'02.82" E - 80°02'25.82"	0.60	7.06	1412	290	388	338	3.383	9.7	0.11	0.06	92	904	Nil	Nil	
JPS 4464	11.15	Dug well - Uthayan Geust House, 392 Navalar Rd, Nallur	N - 9°38'50.30" E - 80°02'21.28"	0.34	7.22	1053	180	365	291	0.033	4.9	0.21	0.42	95	674	Nil	Nil	
JPS 4465	11.25	Dug well - Ministry of transport & Fishing (North Province) No 655, Navalar Rd, Nallur	N - 9°38'47.36" E - 80°02'11.51"	0.37	7.42	1296	221	348	423	0.010	1.3	0.34	0.48	97	829	11	Nil	
JPS 4466	11.35	Dug well - S. Vigneswaran Kachcheri- Nallur Rd, Ariyalai	N - 9°38'52.77" E - 80°01'51.87"	0.35	7.44	1702	599	433	470	0.016	0.9	0.48	0.42	151	1089	Nil	Nil	
JPS 4467	11.50	Dug well - T. Thilakarajah 67 Aseenvathapillai Rd, Nallur	N - 9°39'04.13" E - 80°01'55.05"	0.54	7.28	2920	922	416	573	0.072	4.9	0.54	0.60	437	1869	47	15	
JPS 4468	12.2	Dug well - Jaffna Franch Frinship Association, Kachcheri Nallur Rd, Chundukuli	N - 9°39'49.41" E - 80°01'50.66"	0.39	6.99	3510	1383	1026	423	0.003	4.0	0.24	0.06	341	2246	18	Nil	
JPS 4469	12.28	Dug well - S. Veeragathipillai Hospital street, Kachcheri	N - 9°40'06.53" E - 80°02'47.27"	0.38	7.10	1760	645	365	442	0.013	11.1	0.26	0.33	227	1126	25	Nil	
JPS 4470	12.35	Dug well - Archdeacon of Jaffna 452 Main street, Chundukuli	N - 9°39'32.76" E - 80°00'46.57"	0.40	7.49	2240	830	479	376	0.026	7.5	0.33	0.56	212	1434	Nil	Nil	
Undet - Undeterminable amount (small amount)																		

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Chemist

S. Saravanan
Regional Chemist
National Water Supply & Drainage Board
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ජාතික ජල සම්පාදන හා ජලාපවහන මණ්ඩලය
தேசிய நீர் வழங்கல் வடிகாலமைப்புச் சபை
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Water Quality Report-2015

1. Date of Sampling : 17.09.2015
2. Report required : Project Director (ADB 6th)
3. Location : JMC Area

Laboratory Sample No	Time	SAMPLE LOCATION	Coordinates	Turbidity	pH	Electrical Conductivity	Chloride (as Cl)	Total Hardness (as CaCO ₃)	Total Alkalinity (as CaCO ₃)	Nitrite (as NO ₂ -)	Nitrate (as NO ₃ -)	Fluoride (as F)	Manganese (as Mn)	Total Iron (as Fe)	Total Phosphate (PO ₄ ³⁻)	Sulphate (as SO ₄ ²⁻)	Total Dissolve Solid	Bacteriological		Remarks
																		T. Coli	E. Coli	
Unit				NTU	-	µS/cm	mg/ L	mg/ L	mg/ L	mg/ L	mg/ L	mg/ L	mg/ L	mg/ L	mg/ L	mg/ L	mg/ L	-	-	
SLS 614 : 2013 Maximum permissible Level				2.00	6.5 - 8.5	750	250	250	200	3.000	50.0	1.00	0.100	0.30	2.00	250	500	-	-	
JPS 4400	9.55	Dug well - Army camp Circular Rd, Jaffna	N - 9°39' 52.41" E - 80°00' 23.04"	0.93	7.43	3270	1019	599	362	0.010	Undet	0.41	0.099	0.05	0.78	374	2093	20	6	
JPS 4401	10.05	Dug well - V. Ravindrajah Meenadchi amman Rd, Koddady	N - 9°39' 55.63" E - 80°00' 13.17"	0.66	7.34	5000	1706	1482	799	0.020	Undet	0.54	0.090	0.05	0.78	610	3200	18	2	
JPS 4402	10.15	Dug well - Army camp Karainagar Rd, Navanthurai	N - 9°40'06.89" E - 80°00'04.83"	4.38	7.90	6630	2674	2109	564	0.053	3.1	0.48	0.110	0.17	0.69	668	4243	14	1	
JPS 4403	10.20	Dug well - V. Sinnathampi 157 Karainagar Rd, Navanthurai	N - 9°40'27.76" E - 80°00'06.21"	2.51	7.47	4100	1291	1083	846	0.003	Undet	0.69	0.152	0.14	0.59	639	2624	16	2	
JPS 4404	10.25	Dug well - M. Maheswaran 114 Karainagar Rd, Navanthurai	N - 9°40'27.76" E - 80°00'06.21"	0.96	7.48	18610	8575	2964	799	0.062	2.7	2.02	0.227	0.04	0.73	2290	11910	Countless	Countless	
JPS 4405	10.32	Dug well - K. Thangamalar A/85 Arali Rd, Vasanthapuram	N - 9°41'03.78" E - 80°00'00.55"	2.63	7.53	13290	5947	2052	986	0.095	4.0	0.96	0.209	0.13	0.51	1299	8506	Nil	Nil	

JMC 17-19-2015

JMC 17-19-2015

JPS 4406	10.40	Dug well - Kannagai Amman Kovil 100/9 Chelvan Olungal, Oddumadam	N- 9°40'58.24" E- 80°00'19.74"	0.42	7.58	4390	1660	798	517	0.013	0.4	0.47	0.050	Undet	0.65	530	2810	13	2	
JPS 4407	10.47	Dug well - Common well Tafts Rd, New Moor rd Pommaiveli	N- 9°40'44.86" E- 80°00'20.45"	2.73	7.60	6630	2720	1596	658	0.273	2.2	0.73	0.286	0.29	0.63	99	4243	15	2	
JPS 4408	11.13	Dug well - S. Balakrishnan Sivapirakasam Rd, Kokkuvil	N-9°41'08.31" E-80°00'37.31"	0.42	7.15	2130	526	479	418	0.033	14.2	0.24	0.084	0.02	0.49	145	1363	Nil	Nil	
JPS 4409	11.22	Dug well - Kesavil Pillayar kovil Kaeikattu olungal, Kokkuvil west	N- 9°41'22.91" E- 80°00'40.57"	0.25	7.09	1936	516	382	376	0.023	15.1	0.21	0.077	Undet	1.15	141	1239	Nil	Nil	
JPS 4410	11.30	Dug well - R. Rajakumar Poonari Rd, Kokkuvil west	N- 9°41'36.90" E-80°00'30.77"	0.26	6.99	1720	443	371	404	0.049	7.5	0.31	0.061	0.04	0.80	127	1101	12	1	
JPS 4411	11.37	Dug well -S. Thanuja Poonari Rd, Kokkuvil west	N- 9°41'32.07" E-80°00'46.48"	0.27	7.05	1526	396	319	334	0.023	12.0	0.24	0.050	0.03	0.45	108	977	15	2	
JPS 4412	11.45	Dug well - Dr. S.Sivapalan Sapapathy lane Kokkuvil west	N- 9°41'20.08" E- 80°00'59.86"	0.15	6.99	2330	549	445	484	0.026	Undet	0.44	0.053	0.01	0.53	214	1491	Nil	Nil	
JPS 4413	11.54	Dug well - S. Dasiyash 74/1 Oddumadam Rd, Vannarpennai	N- 9°40'45.16" E- 80°00'39.60"	0.17	7.29	2210	539	388	446	0.013	13.7	0.32	0.063	0.01	0.88	210	1414	Nil	Nil	

Undet - Undeterminable amount (small amount)

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JMC 17-19-2015

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Water Quality Report-2015

1. Date of Sampling : 22.09.2015
2. Report required : Project Director (ADB 6th)
3. Location : JMC Area

Laboratory Sample No	Time	SAMPLE LOCATION	Coordinates	Turbidity	pH	Electrical Conductivity	Chloride (as Cl)	Total Hardness (as CaCO ₃)	Total Alkalinity (as CaCO ₃)	Nitrite (as NO ₂)	Nitrate (as NO ₃)	Fluoride (as F)	Total Phosphate (PO ₄ ³⁻)	Sulphate (as SO ₄ ²⁻)	Total Dissolve Solid	Bacteriological		Remarks
																T. Coll	E. Coll	
Unit				NTU	-	µS/cm	mg/ L	mg/ L	mg/ L	mg/ L	mg/ L	mg/ L	mg/ L	mg/ L	mg/ L	-	-	
SLS 614 : 2013 Maximum permissible Level				2.00	6.5 - 8.5	750	250	250	200	3.000	50.0	1.00	2.00	250	500	-	-	
JPS 4426	11.32	Dug well - Sadanathar sivan kovil, Pointpedro Rd, Kalvijankadu	N - 9°40'42.89" E - 80°02'12.03*	0.30	7.33	1413	313	473	301	0.016	Undet	0.47	1.93	111	904	3	-	
JPS 4425	11.25	Dug well - R. Patarajasingam No 14 Sadanathar Rd Nallur	N - 9°40'50.66" E - 80°01'53.67*	0.37	7.22	1204	184	399	357	0.023	Undet	0.26	2.02	85	771	Countless	Countless	
JPS 4427	11.41	Dug well - Sri Rajeswary amman, Adiyaphatham Rd Nallur	N - 9°40'46.78" E - 80°02'21.92"	0.39	7.54	994	152	376	305	0.026	6.2	0.27	1.63	80	636	19	6	
JPS 4422	10.59	Dug well - B. Nirmananthan Ramanathan Rd, Thirunelvely	N - 9°40'59.40" E - 80°01'20.24*	0.21	7.04	939	106	376	334	0.030	6.2	0.19	0.98	52	601	20	7	
JPS 4423	11.07	Dug well - M. Makaladamy No 10, H. L. lane, Kantharmadam	N - 9°40'46.60" E - 80°01'17.18"	0.41	6.86	1620	341	479	390	0.118	6.6	0.19	1.20	129	1037	62	Nil	
JPS 4424	11.16	Dug well - S. Sivaseelan No 46 Manatharai Lane, Kantharmadam	N - 9°40'45.96" E - 80°01'35.50"	0.37	7.21	829	92	359	296	0.177	8.0	0.07	1.81	69	531	15	Nil	

JMC 22-09-2015

JMC 22-09-2015

JPS 4420	10.48	Dug well - K. Kanagasabi No 125 Brown Rd, Jaffna	N- 9°40'45.17" E- 80°01'01.17"	0.29	6.99	1873	396	410	329	0.030	0.9	0.22	1.12	128	1199	13	Nil	
JPS 4419	10.41	Dug well - R. Sasigala No 25 Clock tower Rd Kannathiddi	N - 9°40'26.99" E- 80°00'59.24"	0.25	7.07	1838	387	399	385	0.082	9.7	0.31	1.08	184	1176	Nil	Nil	
JPS 4421	10.52	Dug well - S. Thangarajah 45/24 Kaladdi Amman Rd, Thaddatheru	N-9°41'04.09" E-80°01'01.31"	0.44	7.09	1110	184	325	310	0.010	3.5	0.29	1.04	69	710	Countless	5	
JPS 4418	10.33	Dug well - T. Veemarajah 426/1 Kilner Rd, Jaffna	N- 9°40'37.50" E- 80°00'44.22"	0.33	7.29	2170	387	388	536	0.046	Undet	0.60	0.72	263	1389	16	3	
JPS 4417	10.21	Dug well - P. Muthamilselvan 153 Navalar Rd, Vannarpannai	N- 9°40'27.51" E- 80°00'35.53"	0.37	7.43	2100	383	376	479	0.013	11.1	0.46	1.30	219	1344	11	Nil	
JPS 4416	10.10	Dug well - S. Mohanambal 81/A Sivan panna Rd, Jaffna	N- 9°40'21.43" E- 80°00'29.75"	0.35	7.18	1933	415	479	385	1.291	8.4	0.46	0.91	153	1237	2	Nil	
JPS 4429	11.52	Dug well - S. Kengeswary Semmani Rd, Nallur	N - 9°40'25.12" E - 80°02'10.78"	0.40	7.45	1264	184	342	442	0.033	Undet	0.48	1.87	112	809	21	8	
JPS 4428	11.48	Dug well - G. Amalathas No 119, Semmani Rd, Nallur	N - 9°40'24.74" E- 80°02'26.25"	0.27	7.04	2350	636	422	395	0.013	3.5	0.39	1.34	272	1504	11	Nil	
JPS 4430	11.57	Dug well - T. Thuraiasami No 84, Chetti Rd, Nallur	N - 9°40'24.09" E - 80°01'51.48"	0.55	7.11	1507	313	353	385	1.067	12.4	0.42	1.36	98	964	31	10	
Undet - Undeterminable amount (small amount)																		

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Chemist

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Lab Assistant

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Water Quality Report-2015

1. Date of Sampling 13.10.2015
2. Report required Project Director (ADB 6th)
3. Location JMC Area

Laboratory Sample No	Time	SAMPLE LOCATION	Coordinates	Turbidity	pH	Electrical Conductivity	Chloride (as Cl)	Total Hardness (as CaCO ₃)	Total Alkalinity (as CaCO ₃)	Nitrite (as NO ₂)	Nitrate (as NO ₃)	Fluoride (as F)	Room Temperature : 27.4 °C					Remarks
													Total Phosphate (PO ₄ ³⁻)	Sulphate (as SO ₄ ²⁻)	Total Dissolve Solid	Bacteriological		
																T. Coli	E. Coli	
Unit				NTU	-	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	-	-		
SLS 514 : 2013 Maximum permissible Level				2.00	6.5 - 8.5	750	250	250	200	3.000	50.0	1.00	2.00	250	500	-	-	
JPS 4519	10.30	Dug well - Prison of Jaffna, Kandy Rd, Gurunakar	N - 9°39'31.58" E - 80°01'00.35"	0.93	7.18	3330	927	923	404	0.135	20.4	0.30	1.48	280	2131	3	-	
JPS 4520	10.40	Dug well - S. Inparupan 129 Main street, Jaffna	N - 9°39'31.64" E - 80°01'20.60"	0.43	7.30	1885	456	467	442	0.007	Undet	0.26	0.27	73	1206	Nil	Nil	
JPS 4521	10.50	Dug well - Housing Department Kandy Rd, Jaffna	N - 9°39'36.72" E - 80°01'51.73"	0.33	7.28	2860	715	547	479	0.013	3.1	0.37	0.46	329	1830	Nil	Nil	
JPS 4522	11.00	Dug well - M. Amphikaithamilan 25/1 Kusavanmai lane, Ariyalai	N - 9°40'58.24" E - 80°00'19.74"	0.76	7.83	3670	1337	798	564	0.043	0.4	0.35	0.46	329	1830	Countless	Nil	
JPS 4523	11.15	Dug well - P. Satkunanathan 32 Mulli Rd Ariyalai	N - 9°39'31.20" E - 80°03'20.59"	0.53	7.31	6530	2674	1995	752	0.043	Undet	0.69	0.76	520	4179	Countless	Nil	

Room Temperature : 27.4 °C

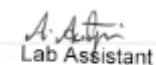
JMC 13-10-2015

JPS 4524	11.30	Dug well - S. Kanesalingam No 74/10 D Pillayar kovilady Nedunkulam Rd Colombothurai	N - 9°39'11.99" E - 80°03'02.94"	2.52	7.69	991	226	393	254	0.036	Undet	0.53	0.40	55	634	Nil	Nil	
JPS 4525	11.35	Dug well - J. Subanesan 491, Main street, Colombothurai	N - 9°39'02.54" E - 80°02'47.97"	1.14	7.46	3790	1245	1140	705	0.046	Undet	0.36	1.00	649	2426	Countless	Nil	
JPS 4526	11.40	Dug well - Muthumari Amman Kovil Maniyanthoddam, Columbothurai	N - 9°39'01.64" E - 80°02'59.23"	1.09	7.55	941	148	376	305	0.010	Undet	0.19	0.13	98	602	Nil	Nil	
JPS 4527	11.45	Dug well - T. Kiritharan 1st cross street Maniyanthoddam	N - 9°38'55.46" E - 80°03'15.31"	1.38	7.41	1655	304	547	427	0.020	Undet	0.28	1.36	454	1059	Nil	Nil	
JPS 4528	11.55	Dug well - K. Pirigid 1st cross street Maniyanthoddam	N - 9°39'07.43" E - 80°03'21.18"	0.92	7.36	1212	194	365	334	0.003	Undet	0.18	0.42	382	776	Countless	Nil	
JPS 4529	13.20	Dug well - S. Ravendran 32 Stanly collage lane, Ariyalai	N - 9°39'49.69" E - 80°02'10.37"	0.48	7.33	2160	507	513	432	Undet	1.3	0.30	0.37	230	1382	Nil	Nil	
JPS 4530	13.30	Dug well - S. Pathmanathan 32 Stanly collage lane, Ariyalai	N - 9°40'24.74" E - 80°02'26.25"	0.50	7.76	5150	1844	1710	611	0.020	Undet	0.77	0.77	530	3296	Nil	Nil	

Undet - Undeterminable amount (small amount)

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Chemist


Lab Assistant

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Water Quality Report-2015

1. Date of Sampling : 16.10.2015
2. Report required : Project Director (ADB 6th)
3. Location : JMC Area

Room Temperature : 27.4°C

Laboratory Sample No	Time	SAMPLE LOCATION	Coordinates	Turbidity	pH	Electrical Conductivity	Chloride (as Cl)	Total Hardness (as CaCO ₃)	Total Alkalinity (as CaCO ₃)	Nitrite(as NO ₂ ⁻)	Nitrate (as NO ₃ ⁻)	Fluoride (as F)	Total Phosphate(PO ₄ ³⁻)	Sulphate (as SO ₄ ²⁻)	Total Dissolve Solid	Bacteriological		Remarks
																T. Coll	E.Coll	
Unit				NTU	-	μS/cm	mg/ L	mg/ L	mg/ L	mg/ L	mg/ L	mg/ L	mg/ L	mg/ L	mg/ L	-	-	
SLS 614 : 2013 Maximum permissible Level				2.00	6.5 - 8.5	750	250	250	200	3.000	50.0	1.00	2.00	250	500	-	-	
JPS 4545	10.10	Dug well - MPCs Building K.K.S rd, Jaffna	N- 9°39'57.11" E- 80°00'32.40"	0.87	7.57	1943	447	638	366	0.098	8.4	0.24	1.80	168	1244	3	-	
JPS 4546	10.25	Dug well - V.Kanesan Muneswaran Rd, Jaffna	N - 9°39'54.57" E - 80°00'42.48"	1.05	7.53	3460	1106	798	432	0.049	1.3	0.68	0.26	496	2214	Nil	Nil	
JPS 4547	10.30	Dug well -T. Selvanayakam 190/5 1st cross street Jaffna	N - 9°39'47.43" E - 80°00'57.88"	0.37	7.49	3530	1106	912	503	0.046	1.3	0.61	0.80	498	2259	12	5	
JPS 4548	10.40	Dug well - V. Thiyageswaran 46 TCT Geust House, Aseervatham lane, Jaffna	N - 9°39'47.79" E - 80°01'18.41"	3.95	7.02	5260	2121	1368	423	1.363	8.0	0.44	0.54	214	3366	Nil	Nil	
JPS 4549	10.50	Dug well - M. Thirunhanam, No 60 Temple Rd, Jaffna	N - 9°39'52.92" E - 80°01'34.86"	0.51	7.25	1256	198	410	352	0.016	4.9	0.09	0.87	119	804	15	4	
JPS 4550	11.00	Dug well - A.Panchsacharam 419 Main street, Colombothurai	N - 9°36'08.59" E - 80°02'34.31"	0.64	7.67	4210	1567	1254	517	0.013	2.7	0.33	0.58	498	2696	Nil	Nil	

JMC 16-10-2015

JMC 16-10-2015

JPS 4551	11.15	Dug well - M.Ravindra 60/14 Vidan lane Chundukkuli	N - 9°36'16.89" E - 80°01'57.63"	0.53	7.13	9890	4149	2964	564	0.236	2.2	0.58	0.49	800	6330	3	Nil	
JPS 4552	11.30	Dug well - S.Sivarupan 69/1 Colombagam Rd, Chundukkuli	N - 9°39'26.93" E - 80°01'55.11"	0.68	7.67	1427	327	570	291	0.010	Undet	0.11	0.45	131	913	8	2	
JPS 4553	11.40	Dug well - S.Kandhasamy Nedunkulam Rd Colombothurai	N - 9°39'14.36" E - 80°02'49.67"	0.58	7.14	4650	1936	1254	470	0.125	0.4	0.63	0.77	383	2976	Nil	Nil	
JPS 4554	11.50	Dug Well - T.Kiruthurasa Kugan veethi Ariyalai	N - 9°39'30.86" E - 80°03'07.39"	2.86	7.19	7640	3411	2394	564	0.161	Undet	1.21	0.74	1799	5018	13	4	
JPS 4555	12.00	Dug well - J.Rajeswaran 520 beach Rd Passaiyoor	N - 9°38'52.77" E - 80°01'51.87"	2.28	7.37	11360	4702	3192	611	0.079	Undet	0.83	0.12	2459	7270	20	6	
JPS 4556	12.10	Dug well - S. Sellathurai No 60, Swamiyar Rd, Colombothurai	N - 9°39'10.06" E - 80°02'17.76"	0.39	7.56	3120	885	695	357	Undet	Undet	0.32	0.51	314	1997	8	3	
JPS 4557	12.20	Dug well - R. Rophin 22/61 Puthukudjirupu Rd, Passaiyoor	N - 9°38'03.44" E - 80°02'12.36"	0.86	7.41	5040	2075	1824	564	0.108	14.2	0.35	0.91	1070	3226	Nil	Nil	
JPS 4558	12.25	Dug well - A.Eugin Beach Road, Passaiyoor	N - 9°38'53.00" E - 80°02'08.19"	0.86	7.75	23600	10050	4446	705	0.236	85.0	1.17	0.03	2940	15104	Nil	Nil	
JPS 4559	12.30	Dug well - M.Peters No 74/10 D Pillayar kovilady Nedunkulam Rd Colombothurai	N - 9°39'11.99" E - 80°03'02.94"	1.12	8.02	5720	2489	1311	423	0.016	Undet	0.61	0.05	1069	3651	Nil	Nil	

Undet - Undeterminable amount (small amount)

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Chemist

Lab Assistant

JMC 16-10-2015

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Water Quality Report-2015

1. Date of Sampling : 28.10.2015
2. Report required : Project Director (ADB 6th)
3. Location : JMC Area Pond

Laboratory Sample No	Time	SAMPLE LOCATION	Coordinates	Turbidity	pH	Electrical Conductivity	Chloride (as Cl)	Total Hardness (as CaCO ₃)	Total Alkalinity (as CaCO ₃)	Nitrite(as NO ₂)	Nitrate (as NO ₃)	Fluoride (as F)	Manganese (as Mn)	Total Iron (as Fe)	Total Phosphate(Po ₄ ³⁻)	Sulphate (as SO ₄ ²⁻)	Total Dissolve Solid	Room Temperature : 27.4 °C		Remarks
																		Bacteriological		
																		T. Coll	E Coll	
Unit				NTU	-	µS/cm	mg/ L	mg/ L	mg/ L	mg/ L	mg/ L	mg/ L	mg/ L	mg/L	mg/ L	mg/ L	mg/ L	-	-	
SLS 614 : 2013 Maximum permissible Level				2.00	6.5 - 8.5	750	250	250	200	3.000	50.0	1.00	0.100	0.30	2.00	250	500	-	-	
JPS 4627	11.10	Marawakkulam - Old Park Rd, Paasaiyoor	N - 9°39'06.14" E - 80°01'39.59"	3.09	7.71	1251	350	211	169	0.020	Undet	0.18	0.066	0.07	0.11	69	801	3	-	
JPS 4628	11.35	Vannan kulam - Pankankulam Rd, Paasaiyoor	N - 9°39'05.04" E - 80°02'05.31"	2.04	7.40	5290	1752	1140	423	0.010	Undet	0.41	0.218	0.15	0.65	481	3386	Nil	Nil	
JPS 4629	11.40	Elanthai kulam - Elanthai kulam Rd, Koyyathoddam	N - 9°39'18.78" E - 80°02'22.55"	3.90	7.80	3350	1125	661	155	0.016	1.3	0.15	0.312	1.09	0.12	173	2144	Nil	Nil	
JPS 4630	11.45	Parapan kulam - Kandy Rd, Ariyalai	N - 9°39'37.20" E - 80°02'28.11"	4.83	7.45	7980	3135	1710	470	0.026	1.8	0.36	1.721	0.21	0.65	598	5107	Countless	Countless	
JPS 4631	11.55	Neernochithalvu kulam - Kandy Rd, Ariyalai	N - 9°39'35.82" E - 80°02'46.03"	118.00	7.43	537	138	160	141	0.043	6.6	Undet	0.085	0.28	0.58	13	344	Countless	Countless	
JPS 4632	12.15	Munduk kulam - Pachchavai Rd, Gurunagar	N - 9°39'18.82" E - 80°01'24.40"	18.10	7.47	1539	456	296	249	0.076	6.2	0.12	0.112	0.20	0.14	104	965	Countless	5	
																		Nil	Nil	


JMC 28-10-2015

JMC 28-10-2015

JPS 4633	12.25	Theverir kulam - Convent Rd, Jaffna	N - 9°39'35.90" E - 80°01'19.80"	3.40	7.35	1234	332	251	240	0.046	4.9	0.09	0.041	0.05	0.51	42	790	5	1	
JPS 4634	12.30	Pulur kulam - Sri Vaithiyalingam Thuraiamy Rd, Jaffna	N - 9°39'48.30" E - 80°00'43.06"	21.20	9.04	3320	1042	353	146	0.092	2.7	0.35	0.037	0.10	0.37	409	2125	Countless	Countless	
JPS 4635	12.35	Ditch of Fort Circular Rd, Jaffna	N - 9°39'39.31" E - 80°00'30.58"	119.00	8.76	7400	3365	1197	423	0.345	67.3	0.28	0.242	0.77	0.49	711	4736	Countless	Countless	
JPS 4636	12.50	Ariyakulam - Stanley Rd, Jaffna	N - 9°40'6.47" E - 80°01'06.82"	14.30	7.73	1706	530	245	207	0.105	10.6	0.14	0.061	0.17	0.09	42	1092	13	3	

Undet - Undeterminable amount (small amount)

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Chemist


Lab Assistant

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Water Quality Report-2015

1. Date of Sampling : 28.10.2015
2. Report required : Project Director (ADB 6th)
3. Location : JMC Area

Laboratory Sample No	Time	SAMPLE LOCATION	Coordinates	Turbidity	pH	Electrical Conductivity	Chloride (as Cl)	Total Hardness (as CaCO ₃)	Total Alkalinity (as CaCO ₃)	Nitrite(as NO ₂)	Nitrate (as NO ₃)	Fluoride (as F)	Total Phosphate(PO ₄ ³⁻)	Sulphate (as SO ₄ ²⁻)	Total Dissolve Solid	Room Temperature : 27.4 C		Remarks
																Bacteriological		
																T. Coli	E. Coli	
Unit				NTU	-	µS/cm	mg/ L	mg/ L	mg/ L	mg/ L	mg/ L	mg/ L	mg/ L	mg/ L	mg/ L	-	-	
SLS 614 : 2013 Maximum permissible Level				2.00	6.5 - 8.5	750	250	250	200	3.000	50.0	1.00	2.00	250	500	3	-	
JPS 4622	10.50	Dug well -Kuru vedio center A.V lane Chundukuli	N - 9°39'29.69" E - 80°02'36.78"	1.96	7.45	3970	1291	1026	517	0.394	23.4	0.62	1.90	539	2541	Nil	Nil	
JPS 4623	11.00	Dug well - A. Sanmugavadi Ganagaratnam Rd, Nayanmarkaddu	N - 9°36'08.59" E - 80°02'34.31"	0.96	7.57	10430	3596	1824	846	0.023	1.8	1.47	0.59	1980	6675	Countless	Countless	
JPS 4624	11.20	Dug Well - V. Peramalatha Kugan veethi Ariyalai	N - 9°36'16.69" E - 80°01'57.63"	1.35	7.25	2230	618	490	282	0.016	7.5	0.19	0.12	195	1427	Countless	Countless	
JPS 4625	11.25	Dug Well - P. Ramesh 2nd lane Jaffna	N - 9°39'26.93" E - 80°01'55.11"	0.40	7.63	2470	530	388	446	0.003	3.5	0.30	0.73	311	1581	Nil	Nil	
JPS 4626	12.05	Dug Well - Amman kowil Ilanthaikulam Rd, Ariyalai	N - 9°39'14.36" E - 80°02'49.67"	0.76	7.38	8870	3319	1767	376	0.003	Undet	0.55	0.32	869	5677	Countless	Countless	
Undet - Undeterminable amount (small amount)																		

Undet - Undeterminable amount (small amount)

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Chemist

JMC 28-10-2015

Lab Assistant

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Water Quality Report-2015

1. Date of Sampling : 21.10.2015
2. Report required : Project Director (ADB 6th)
3. Location : JMC Area

Laboratory Sample No	Time	SAMPLE LOCATION	Coordinates	Turbidity	pH	Electrical Conductivity	Chloride (as Cl)	Total Hardness (as CaCO ₃)	Total Alkalinity (as CaCO ₃)	Nitrite(as NO ₂)	Nitrate (as NO ₃)	Fluoride (as F)	Total Phosphate(PO ₄ ⁻³)	Sulphate (as SO ₄ ⁻²)	Total Dissolve Solid	Bacteriological		Remarks
																T. Coll	E.Coll	
Unit			NTU	-	µS/cm	mg/ L	mg/ L	mg/ L	mg/ L	mg/ L	mg/ L	mg/ L	mg/ L	mg/ L	-	-		
SLS 614 : 2013 Maximum permissible Level				2.00	6.5 - 8.5	750	250	250	200	3.000	50.0	1.00	2.00	250	500	-	-	
JPS 4570	10.00	Dug well - S. Pelsiyan 80 Bankshai I Rd, Gurunagar	N - 9°39'32.76" E - 80°00'46.57"	0.92	7.60	1646	313	422	357	0.220	17.7	0.23	1.15	177	1053	3	-	
JPS 4571	10.10	Dug well- N. Iruthayanesan Reclamation Gurunagar	N- 9°40'24.94" E- 80°00'18.40"	0.56	7.78	4410	1429	912	470	0.125	40.7	0.61	0.90	550	2822	Nil	Nil	
JPS 4572	10.20	Dug well -S. Jol perdinan 101 Reclamation Rd Naval Jetty Gurunagar	N - 9°39'04.00" E - 80°01'05.63"	1.42	7.72	7310	2904	1938	470	1.770	19.9	0.95	1.01	729	4678	8	2	
JPS 4573	10.25	Dug well - 5 Storey building Reclamation Rd Gurunagar	N - 9°38'59.60" E - 80°01'16.98"	1.06	7.52	6630	2489	1596	517	0.069	8.0	0.87	0.33	879	4243	5	1	
JPS 4574	10.30	A. Antony kowshik 502/1 Beach Rd, Gurunagar	N - 9°39'32.16" E - 80°00'36.67"	1.55	7.62	2200	507	547	305	0.016	Undet	0.37	1.01	379	1408	10	2	
JPS 4575	10.50	Dug well - A.Pirankin 949 Beach Rd Colombothurai	N - 9°38'50.30" E - 80°02'21.28"	0.74	7.44	13930	5624	4104	564	0.154	2.2	0.96	0.67	1980	8915	8	2	
JMC 21-10-2015																Nil	Nil	

JPS 4576	11.00	Dug well - S. Inthumathy Beach Road, Passaiyoor	N - 9°38'53.00" E - 80°02'08.19"	1.68	7.27	10490	3965	1938	846	0.033	Undet	0.87	0.93	1399	6714	21	7	
JPS 4577	11.10	Dug well - J. Suriyathasan Punithapuram Colombothurai east	N - 9°39'07.43" E - 80°03'21.18"	1.80	7.47	3770	1014	798	658	0.030	10.6	0.56	0.56	809	2413	13	5	
JPS 4578	11.20	Dug well - K. Archana 491, Main street, Colombothurai	N - 9°39'02.54" E - 80°02'47.97"	1.53	7.44	3630	1106	798	423	0.342	27.0	0.30	1.78	495	2323	28	6	
JPS 4579	11.35	Dug well - A. Antanmelanis 620 beach Rd Passaiyoor	N - 9°39'02.82" E - 80°02'25.82"	0.88	7.48	4940	1936	1026	470	0.013	20.8	0.41	1.07	530	3162	7	2	
JPS 4580	11.40	Dug well - K. Mariyathas 48 Beach Rd, Passaiyoor	N - 9°39'17.82" E - 80°01'03.93"	1.25	7.32	4890	1844	1254	517	0.115	Undet	0.58	0.66	669	3130	Nil	Nil	
JPS 4581	11.50	Dug well - J. Jebatharsan 43 Old Park Rd Passaiyoor	N - 9°39'04.16" E - 80°01'37.34"	0.67	7.51	2890	857	610	287	Undet	Undet	0.50	0.46	470	1850	Nil	Nil	
JPS 4582	11.55	Dug well - St. Mary church 36 Echchamaddai Rd Passaiyoor	N - 9°39'04.13" E - 80°01'55.05"	1.48	7.73	1154	249	399	254	0.039	3.5	0.15	0.80	70	739	Nil	Nil	
JPS 4583	12.10	Dug well - N. Anantharajah 94 Pungankulam Rd, Ariyalai	N - 9°39'28.17" E - 80°02'15.90"	0.85	7.42	2810	719	524	451	0.013	Undet	0.47	0.76	376	1798	Nil	Nil	
JPS 4584	12.15	Dug well - T. Sanmugathas 97/6 Ananthan- Vadaly Rd, Ariyalai	N - 9°39'29.69" E - 80°02'36.78"	0.73	7.39	2860	784	570	366	0.016	Undet	0.39	0.35	311	1830	Countless	Countless	

Undet - Undeterminable amount (small amount)

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Chemist

A. Arthy
Lab Assistant

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Water Quality Report-2015

1. Date of Sampling : 02.11.2015
2. Report required : Project Director (ADB 6th)
3. Location : JMC Area Pond

Room Temperature : 27.4°C

Laboratory Sample No	Time	SAMPLE LOCATION	Coordinates	Turbidity	pH	Electrical Conductivity	Chloride (as Cl)	Total Hardness (as CaCO ₃)	Total Alkalinity (as CaCO ₃)	Nitrite(as NO ₂ ⁻)	Nitrate (as NO ₃ ⁻)	Fluoride (as F)	Manganese (as Mn)	Total Iron (as Fe)	Total Phosphate(PO ₄ ³⁻)	Sulphate (as SO ₄ ²⁻)	Total Dissolve Solid	Room Temperature : 27.4°C		Remarks
																		Bacteriological		
																		T. Coll	E. Coll	
Unit				NTU	-	µS/cm	mg/ L	mg/ L	mg/ L	mg/ L	mg/ L	mg/ L	mg/ L	mg/ L	mg/ L	mg/ L	mg/ L	-	-	
SLS 614 : 2013 Maximum permissible Level				2.00	6.5 - 8.5	750	250	250	200	3.000	50.0	1.00	0.100	0.30	2.00	250	500	3	-	
JPS 4646	10.35	Rasali kulam - Oddumadam Rd, Saphi nagar, Pommaiveli	N- 9°40'57.48" E- 80°00'10.61"	18.70	7.75	1128	323	211	132	1.717	13.2	0.09	0.125	0.05	0.45	111	722	Nil	Nil	
JPS 4647	10.50	Pond - Nachchimar Kovil K K S Rd, Kokkuvil	N- 9°41'13.53" E- 80°00'46.78"	28.40	7.77	316	74	108	103	0.644	1.8	Undet	0.082	Undet	0.55	17	202	11	Nil	
JPS 4648	11.00	Kannathiddi kulam- Kannathiddy Rd Jaffna	N - 9°40'17.42" E - 80°00'48.13"	19.80	7.29	763	157	205	207	1.662	4.9	0.09	0.033	0.02	1.15	29	488	10	1	
JPS 4649	11.07	Pillayar kovil kulam - Rakka Rd, Chundukuli	N - 9°39'51.17" E - 80°01'40.44"	27.70	7.56	312	51	108	122	1.750	15.1	0.02	0.063	0.06	0.46	3	200	Countless	10	
JPS 4650	11.15	Permanakattu kulam - Pointpedro Rd, Nallur	N - 9°40'21.64" E - 80°01'36.68"	42.40	7.51	272	51	103	103	1.363	4.4	Undet	0.059	0.01	0.24	26	174	Nil	Nil	
JPS 4651	11.45	Wannan Kulam - Manatherai lane Kantharmadam	N - 9°40'37.20" E - 80°01'37.58"	150	7.34	1650	493	393	117	0.355	4.9	0.14	0.162	Undet	0.20	174	1056	Countless	13	

JMC 02-11-2015

JMC 02-11-2015

JPS 4652	11.55	Pandara kulam - Pandarakulam Rd, Nallur	N - 9°40'37.24" E - 80°02'00.14"	159	7.38	796	138	245	132	0.913	Undet	0.01	0.120	0.04	0.54	70	509	Nil	Nil	
JPS 4653	12.00	Nayanmar kaddu kulam - Nayanmarkaddu, Nallur	N - 9°40'13.68" E - 80°02'31.81"	85	7.34	1419	447	353	207	1.356	0.4	0.04	0.127	Undet	0.09	12	908	23	Nil	
JPS 4654	12.10	Nedum kulam - Nedunkulam Rd, Colombothurai	N - 9°40'12.14" E - 80°01'17.22"	47	7.70	1486	452	376	263	0.069	Undet	0.33	0.041	0.01	0.01	177	951	39	9	
JPS 4655	12.35	Pali kulam - Echchamaddai Rd, Paasaiyoor	N - 9°39'07.20" E - 80°01'43.24"	43	7.32	4100	1660	1083	291	0.749	0.4	0.14	0.201	0.02	0.18	127	2624	17	Nil	
JPS 4656	12.45	Vannan kulam - Punnai Rd, Jaffna	N - 9°40'15.58" E - 80°00'23.38"	48	7.48	3910	1614	1026	193	0.016	Undet	0.01	0.176	0.03	0.30	61	2502	21	Nil	
JPS 4657	12.50	Uppu kulam - Uppukulam kovil lane, Colombothurai	N - 9°39'07.42" E - 80°01'43.33"	39	7.88	7780	2858	1710	846	0.026	Undet	0.33	0.065	0.02	0.07	456	4979	Countless	11	
JPS 4658	13.00	Vannan kulam - Stanly Rd, Jaffna	N - 9°40'8.10" E - 80°00'42.44"	111	7.65	2550	885	507	179	0.013	Undet	Undet	0.292	0.43	0.04	49	1632	21	3	
JPS 4659	13.05	Kovil kulam - Taffs Rd, Pomaiveli	N - 9°39'18.82" E - 80°01'24.40"	154	7.46	6740	2582	1482	564	0.026	8.9	0.13	0.565	0.02	0.21	306	4314	19	Nil	
JPS 4660	13.15	Nedun kulam - Villoondi Rd, Pannai	N - 9°40'27.08" E - 80°00'18.69"	219	7.90	3040	1010	336	141	1.626	34.5	0.39	0.098	0.03	0.25	219	1946	15	Nil	

Undet - Undeterminable amount (small amount)

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Chemist

Lab Assistant

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தேசிய நீர் வழங்கல் வடிகாலமைப்புச் சபை
National Water Supply & Drainage Board



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Water Quality Report-2015

1. Date of Sampling : 07.10.2015
2. Report required : Project Director (ADB 6th)
3. Location : Proposed dumping site at Navali

Room Temperature : 30.6°C

SAMPLE CODE	SAMPLE LOCATION	Coordinates	Time	Turbidity	pH	Electrical Conductivity	Chloride (as Cl)	Total Hardness (as CaCO ₃)	Total Alkalinity (as CaCO ₃)	BOD	COD	Total Suspended Solid	Nitrate (NO ₃)	Nitrite (as NO ₂)	Fluoride (as F)	Total Phosphate(PO ₄ ³⁻)	Room Temperature : 30.5°C									
																	Bacteriological		Remarks							
																	T. Col	E. Col								
Unit				NTU	-	µS/cm	mg/ L	mg/ L	mg/ L	mg/ L	mg/ L	mg/ L	mg/ L	mg/ L	mg/ L	mg/ L	mg/ L	mg/ L	mg/ L	mg/ L	mg/ L					
JPS 4502	Dug well Idikundu lane Navaly North	X- 0388542 Y-1075695	10.45	0.36	7.48	4320	1752	1197	423	5	16	1	0.026	1.8	0.56	0.57	0.01	0.159	342	2765	Countless	Nil				
JPS 4503	Dug well Idikundu lane Veeravar temple well	X-0388467 Y-1075640	10.55	1.24	7.75	1302	350	291	235	6	32	7	0.059	6.2	0.49	0.44	0.08	0.052	82	833	Nil	Nil				
JPS 4504	Dug well Idikundu lane Navaly North	X-0388435 Y-1075761	11.00	4.19	7.67	6380	2660	1653	329	10	44	20	0.046	5.3	0.65	0.59	0.04	0.210	348	4083	Nil	Nil				
JPS 4505	Dug well Mrs. S. Sathiyapenna House Idikundu lane	X-0388342 Y-1075754	11.10	1.00	7.85	3100	1111	821	188	2	16	3	0.043	2.2	0.63	0.42	0.05	0.278	135	1984	42	Nil				
JPS 4506	Dug well -Manipay lane Navaly	X-0378342 Y-1075784	12.10	3.18	7.94	5290	2305	1482	376	3	24	18	0.033	3.5	0.69	0.50	0.08	0.261	432	3386	Countless	12				

Undet - Undetectable amount (small amount)

Under - Undeterminable amount (small amount)

This report is issued for the information of the client. It shall not be published in total or in part, without written authority of General Manager, National Water Supply and Drainage Board. This report is limited specifically to this specimen

Chemist

A. Anty
Lab Assistant

SAMPLE Semi-Annual Environmental Monitoring Report Template

INTRODUCTION

- Overall project description and objectives
- Environmental category as per ADB Safeguard Policy Statement, 2009

PROJECT SAFEGUARDS TEAM

- Identify the role/s of Safeguards Team including schedule of on-site verification of reports submitted by consultants and contractors.

Name	Designation/Office	Email Address	Contact Number
1. PMU			
2. PIUs			
3. Consultants			

OVERALL PROJECT AND SUBPROJECT/PACKAGE PROGRESS AND STATUS

- Indicate (i) status of design – preliminary design or final design, (ii) status of implementation - under bidding, contract awarded but no works yet, contract awarded with works, civil works completed, or O&M

Package Number	Components/List of Works	Type of Contract (specify if DBO, DB or civil works)	Status of Implementation (specify if Preliminary Design, Detailed Design, On-going Construction, Completed Works, or O&M phase) ⁴	Contract Status (specify if under bidding or contract awarded)	If On-going Construction	
					%Physical Progress	Expected Completion Date

- For package with awarded contract, provide name/s and contact details of contractor/s' nodal person/s for environmental safeguards.

Package-wise Contractor/s' Nodal Persons for Environmental Safeguards

Package Name	IEE Cleared by ADB (provide date)	Contractor	HSE Nodal Person	Email Address	Contact Number

⁴ If on-going construction, include %physical progress and expected date of completion

STATUS OF IEE PER SUBPROJECT/PACKAGE

- Provide status of updated/final IEE⁵ per package.

Package-wise Implementation Status

Package Number	Final IEE based on Detailed Design				Site-specific EMP (or Construction EMP) approved by Project Director? ⁶ (Yes/No)	Remarks
	Not yet due (detailed design not yet completed)	Submitted to ADB (provide date of submission)	Disclosed on project website (provide link)	Final IEE provided to Contractor/s (Yes/No)		

COMPLIANCE STATUS WITH NATIONAL/STATE/LOCAL STATUTORY ENVIRONMENTAL REQUIREMENTS⁷

Package No.	Statutory Environmental Requirements ⁸	Status of Compliance (Specify if obtained, submitted and awaiting approval, application not yet submitted)	Validity Date(s) (if already obtained)	Action Required	Specific Conditions that will require environmental monitoring ⁹

COMPLIANCE STATUS WITH ENVIRONMENTAL LOAN COVENANTS

Schedule No. and Item (see Project Loan Agreement and list provisions relevant to environmental safeguards, core labor standards and occupational health and safety)	Covenant	Status of Compliance	Action Required

⁵ IEE prepared based on preliminary design and cleared by ADB with condition that updated/Final IEE based on detailed design will be submitted.

⁶ Works will not be allowed until SEMP/CEMP is approved by project implementation unit or project management unit.

⁷ All statutory clearance/s, no-objection certificates, permit/s, etc. should be obtained prior to award of contract/s. Attach as appendix all clearance obtained during the reporting period. If already reported, specify in the "remarks" column.

⁸ Specify statutory requirements: environmental clearance? Permit/consent to establish? Forest clearance? Workers/Labor permit, etc.

⁹ Example: Environmental Clearance requires ambient air quality monitoring, Forest Clearance/Tree-cutting Permit requires 2 trees for every tree, etc.

COMPLIANCE STATUS WITH THE ENVIRONMENTAL MANAGEMENT PLAN (refer to EMP tables in approved IEE/s)

- Confirm in IEE/s if contractors are required to submit site-specific EMP (SEMP)/construction EMPs (CEMP). If not, describe the methodology of monitoring each package under implementation.
- Provide over-all compliance of the contractors with SEMP/CEMP. This should be supported by contractors' monthly monitoring reports to PIU(s) and/or verification reports of PIU(s) or project consultants. **Include as appendix** supporting documents such as **signed** monthly environmental site inspection reports prepared by consultants and/or contractors.

Overall Compliance with SEMP/CEMP

Package No.	Status of SEMP/CEMP Implementation (Excellent/ Satisfactory/ Partially Satisfactory/ Below Satisfactory)	Action Proposed and Additional Measures Required

- Provide description based on site observations and records:
 - Confirm if any dust was noted to escape the site boundaries and identify dust suppression techniques followed for site/s.
 - Identify muddy water was escaping site boundaries or muddy tracks were seen on adjacent roads.
 - Identify type of erosion and sediment control measures installed on site/s, condition of erosion and sediment control measures including if these were intact following heavy rain;
 - Identify designated areas for concrete works, chemical storage, construction materials, and refueling. Attach photographs of each area.
 - Confirm spill kits on site and site procedure for handling emergencies.
 - Identify any chemical stored on site and provide information on storage condition. Attach photograph.
 - Describe management of stockpiles in each work site (construction materials, excavated soils, spoils, etc.). Provide photographs.
 - Describe management of solid and liquid wastes on-site (quantity generated, transport, storage and disposal). Provide photographs.
 - Provide information on barricades, signages, and on-site boards. Provide photographs.
 - Provide information on workers labor camp(s). Provide photographs.
 - Provide information on work-related accidents and incidents. Describe actions implemented.
 - Provide information on if there are any activities being under taken out of working hours and how that is being managed.
- Provide list of trainings on environmental safeguards, core labor standards, and OSH conducted during the reporting period. Include ADB-organized workshop, trainings, seminars, etc)

Trainings, Workshops and Seminars Conducted

Date	Topic	Conducted by	No. of Participants	No. of Participants	Remarks
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			(Total)	(Female)	

- Provide the monitoring results as per the parameters outlined in the approved EMP (or site-specific EMP/construction EMP when applicable).

Summary of Environmental Monitoring Activities (for the Reporting Period)¹⁰

Impacts (List from SEMP/CEMP)	Mitigation Measures (List from SEMP/CEMP)	Parameters Monitored (As identified in the SEMP/CEMP)	Method of Monitoring (Visual, Actual Sampling, etc)	Location of Monitoring (Provide GPS Coordinates) ¹¹	Date of Monitoring Conducted	Person Who Conducted the Monitoring
Design Phase						
Pre-Construction Phase						
Construction Phase						
Operational Phase						

MONITORING OF ENVIRONMENTAL IMPACTS ON PROJECT SURROUNDINGS

- Confirm records of pre-work condition of roads, agricultural land or other infrastructure prior to starting to transport materials and construction.

Package No.	Status of Pre-Work Conditions (Recorded / Not Recorded)	Baseline Environmental Conditions (air, water, noise) Documented (Yes / No)	Action Proposed and Additional Measures Required

- Provide information on monitoring activities conducted during reporting period. If not conducted, provide justification. Compare results with baseline and internationally recognized standards.¹²

¹⁰ Attach Laboratory Results and Sampling Map/Locations

¹¹ If GPS coordinate is not available, provide landmark(s) and/or chainage.

¹² ADB Safeguard Policy Statement (SPS) Appendix 1, para 33: During the design, construction, and operation of the project the borrower/client will apply pollution prevention and control technologies and practices consistent with international good practice, as reflected in internationally recognized standards such as the World Bank Group's Environment, Health and Safety Guidelines. These standards contain performance levels and measures that are normally acceptable and applicable to projects. When host country regulations differ from these levels and measures, the borrower/client will achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the borrower/client will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in the SPS.

Air Quality Monitoring Results

Site No.	Date of Testing	Site Location (Provide GPS Coordinates) ¹³	Parameters (as required by statutory clearances or as mentioned in the IEE)			Remarks
			PM10 µg/m3	SO2 µg/m3	NO2 µg/m3	

Water Quality Monitoring Results

Site No.	Date of Sampling	Site Location	Parameters (as required by statutory clearances or as mentioned in the IEE)						Remarks
			pH	Conductivity µS/cm	BOD mg/L	TSS mg/L	TN mg/L	TP mg/L	

Noise Quality Monitoring Results

Site No.	Date of Testing	Site Location	LAeq (dBA) (as required by statutory clearances or as mentioned in the IEE)		Remarks
			Day Time	Night Time	

INFORMATION DISCLOSURE AND CONSULTATIONS

- Confirm PMU/PIU/contractors provide project-related information to stakeholders, communities and/or affected people before and during construction works.¹⁴
- Provide information on consultations conducted during reporting period such dates, topics discussed, type of consultation, issues/concerns raised, safeguards team member present. Attach minutes of meetings (ensure English translation is provided), attendance sheet, and photos.

Date of Consultation	Location	Number of Participants (specify total, male and female)	Issues/Concerns Raised	Response to issues/concerns

GRIEVANCE REDRESS MECHANISM

- **Grievance Redress Mechanism.** Provide information on establishment of grievance redress mechanism and capacity of grievance redress committee to address project-related issues/complaints. Include as appendix **Notification of the GRM (package-wise if applicable)**.
- **Complaints Received during the Reporting Period.** Provide information on number, nature, and resolution of complaints received during reporting period.

¹³ If GPS coordinate is not available, provide landmark(s) and/or chainage.

¹⁴ Check EMP requirement on information disclosure. At a minimum, PIU thru the contractor should notify communities/affected persons/sensitive receptors 7 days and again 1 day before start of works.

Attach records as per GRM in the approved IEE. Identify safeguards team member/s involved in the GRM process. Attach minutes of meetings (ensure English translation is provided).

SUMMARY OF KEY ISSUES/CONCERNS IDENTIFIED DURING THE REPORTING PERIOD AND REMEDIAL ACTIONS

- Provide corrective action plan which should include all issues/concerns, actions required to be implemented, responsible entities, and target dates.

STATUS OF CORRECTIVE ACTIONS FROM PREVIOUS SEMR(S)

- Provide information on corrective actions to be implemented as reported in the previous SEMR(s). Include status of implementation of feedbacks/comments/suggestions as provided by ADB, if any.

Corrective Action Plan Status

Issues/Concerns	Corrective Action	Status	Remarks

APPENDIXES

- Photos
- Records of consultations
- Copies of environmental clearances and permits (if not provided in the previous SEMR)
- Environmental site inspection report (if not provided in the previous SEMR)
- Other