Environmental Monitoring Report

Semi-Annual Report
For the period covered July to December 2016
Project Number: 47381-002
May 2017

SRI: Mahaweli Water Security Investment Program

Final Report (Annexes 6 to 7)

Prepared by Ministry of Mahaweli Development and Environment with the assistance of Program Management, Design and Supervision Consultant (Joint Venture Lahmeyer International GmbH – GeoConsult ZT GmbH) for Democratic Socialist Republic of Sri Lanka and the Asian Development Bank.

Democratic Socialist Republic of Sri Lanka
Ministry of Mahaweli Development and Environment

Mahaweli Water Security Investment Program

SEMI-ANNUAL ENVIRONMENTAL MONITORING REPORT

Period : July - December 2016

May 2017

Program Management, Design and Supervision Consultant

LAHMEYER INTERNATIONAL | GC GEOCONSULT | InfotechsIDEAS KNOWLEDGE. INNOVATION. SOLUTIONS | ENGINEERING CONSULTANTS (PVT.) LIMITED | NIRAS

SEMI-ANNUAL ENVIRONMENTAL MONITORING REPORT

Period: July - December 2016

ANNEX 6 : TOR FOR BASELINE DATA COLLECTION

o/copy 05/09/16

MAHAWELI WATER SECURITY INVESTMENT PROGRAM – TRANCHE 1

REQUEST FOR QUOTATION FOR WORKS (RFQW)

AS PER "ADB SHOPPING FOR WORKS" PROCEDURE

FOR THE BASELINE DATA COLLECTION OF SURFACE WATER, AIR QUALITY AND NOISE & VIBRATION, SUSPENDED SEDIMENT LEVELS

FOR

MINIPE ANICUT RAISING AND LEFT BANK CANAL REHABILITATION

(MLBCRP-ICB-1 & MLBCRP-NCB 1 TO 5 CONTRACT PACKAGES)

CONTRACT NO – PMDSC/CS01/WORKS 005

Table of Contents

List of Institutions to issue the RFP - MLBCRP Baseline Data collection and monitoring

	Tel :	Fax :	E-mail
Eng. W .R. K. Fonseka Senior Deputy Director Environmental Technology Section 120/4A , Wijerama Mawatha, Colombo 07	11-2379800	11-2379950 /011-2379905	sdd_ets@iti.lk
Mr. A. H Piyasiri Deputy Director General (Services) Energy &Environmental Management Centre National Engineering Research & Development Centre 2P / 17B, IDB Industrial Estate Ekala, Ja-Ela	011-5854374	011-5354597, 2236434	eemc@nerdc.lk
Ms. Sardhanee Dias Environmental Studies & Services Division National Building Research Organisation 99/1 Jawatta Road Colombo 05	112588946 (Ext. 617)	0112502611	sardhanee@yahoo.com
Dr. Jagath Manathunge Environmental Engineering Laboratory Department of Civil Engineering Faculty of Engineering Univeristy of Moratuwa Katubedda Moratuwa	0112650301 (2525) 0718045546		

REQUEST FOR QUOTATION FOR WORKS –
PMDSC/CS01/Works 005

Project Title: **Mahaweli Water Security Investment Program (MWSIP) – Tranche 1**

Source of Funding: **Asian Development Bank (ADB) & Government of Sri Lanka**

Contract Ref: **MMDE/MWSIP/ADB/3268-SRI/Consult/CS-01/PMDSC/ICB/2016/005**

Date of Issue of Request: **05 October 2016**

To: .....

.....

.....

.....

Sir/Madam:

1. The **Team Leader, Lahmeyer International GMbH of MWSIP** (Employer) hereby requests you to submit a RFQW for the following Works:

   "Baseline data collection on surface water quality, ambient air quality, noise & vibration, and suspended sediment levels prior to commencing construction work (commencing in October 2016)"

   for

   the **Minipe anicut raising and Left Bank Canal Rehabilitation (MLBCR)** of MWSIP – Tranche 1 **relevant to** MLBCRP-ICB-1 & MLBCRP-NCB-1 to 5 Contract Packages.

   The Request for Proposal for the above works includes:

Section 1	**Summary Sheet of the Instructions to the Contractor**
Section 2	**The Terms of Reference for the Investigations**
Section 3	**The BOQ for the above Works**
Section 4	**Drawings**
Section 5	**Form of Quotation and Form of Contract**

2. If you, however, have been associated with the firm that prepared the design, specifications, or engaged in the preparation of the Project or firm that will provide supervision of the Works, you will not be eligible to be selected for this work.
3. All the correspondence, documents related to this RQFQ exchanged between the Bidder and PMDSC shall be written in English. The RQFQ shall comprise with following documents listed below;
4. **Technical Proposal**: The Bidder needs to submit a brief Technical Proposal following the contents and Form Numbers mentioned in the below Table.

Form No	Description	Page limit
TECH – 1	**Contractor's Organization and Experiences** **A. Contractor's organization** **B. Contractor's experiences of handling similar assignments within last 5 years** **C. Standard laboratory facilities, equipments available and certificates obtained**	5
TECH – 2	**Descriptions of the Approach, Methodology and Work plan for performing the consultancy** **A. Technical Approach, methodology and selection of the team of experts for the each specified sector** (Please explain your understanding of the objectives of the assignment as outlined in the Terms of Reference (TOR), the technical approach, and the methodology including the standard laboratory techniques, testing equipments, machineries and instruments you would adopt for implementing the tasks to deliver the expected output(s); the degree of detail of such output; and describe the structure and composition of your team. Please do not repeat/copy the TOR in here) **B. Work Plan and Staffing** (Please outline the plan for the implementation of the main activities/tasks of the assignment, their content and duration, phasing and interrelations, milestones (including approvals by Technical Committee), and tentative delivery dates of the reports. The proposed work plan should be consistent with the technical approach and methodology, showing understanding of the TOR and ability to translate them into a feasible working plan and work schedule showing the assigned tasks for the relevant specialist.) **C. Comments (on the ToR, counterpart staff, facilities etc.)** (Your suggestions should be concise and to the point, and incorporated in your Proposal. Please also include comments, if any, on counterpart staff and facilities to be provided by client).	10
TECH – 3	**A. Work Schedule** **B. Staffing Schedule**	2
TECH - 4	**CVs of the selected experts for each sector (Short CVs showing the experiences of similar assignments)** • **Team Leader** • **Water Quality Specialist (Including sediment)** • **Air Quality Specialist** • **Noise & Vibration Specialist**	12

5. **The Technical Proposal** shall not include any financial information. A Technical Proposal containing financial details shall be declared non responsive.

6. **Financial Proposal:** It is expected to include Financial Proposal, for the work separately as per the ToR provided in the Section 2, justifying the technical proposal. To assist in the preparation of your price quotation, the required parameters of identified environmental components bill of quantities and drawings, form for submitting the quotation and a draft contract form are enclosed. You are advised to visit the site of the works at your own expense, and obtain necessary information for preparing your quotation.

7. You shall submit one original of the Technical Proposal and one original Price Quotation including with the Form of Quotation, and clearly marked "Original". In addition, you shall also submit one copy marked as "COPY".

8. The Bidder may request clarifications of any part of the RFQW only from **05 October 2016 to 17 October 2016**, excluding weekends. Any requests for clarifications must be sent through email transmission only to the email address Michael.Chegwin@de.lahmeyer.com

9. Submission, Opening and Evaluation: The Bidder shall submit a signed and complete Proposal comprising the documents and forms in accordance with Clause 4 and 6 (Technical and Financial Proposals). The submission can be done by mail or by hand. Any modifications, revisions, interlineations, erasures, or overwriting shall be valid only if they are signed or initialed by the person signing the Proposal.

10. The signed RFQW shall be marked "ORIGINAL", and its copies marked "COPY" as appropriate. The number of copies is as stated below;

    (1) **Technical Proposal:** one (1) original and 3 copies;

    (2) **Financial Proposal:** one (1) original.

    All copies shall be made from the signed original. If there are discrepancies between the original and the copies, the original shall prevail.

    The Proposal which are properly signed and sealed in an envelope and addressed to and delivered at the following address on or before the deadline:

Employer's Address : Team Leader,

Lahmeyer International GmbH,

Mahaweli Water Security Investment Program (MWSIP),

Ministry of Mahaweli Development and Environment (MMDE),

No. 493, T. B. Jayah Mawatha,

Colombo 10.

Telephone : 011-2675046, 011-2675047, 0112-675049

Fax : 011 2675039

11. You must have experience as the main Contractor in carrying out similar assignments of at least one work of the nature and complexity equivalent to the works included in this Request for Quotation over the last three years as evidenced by a client's certificate of completion, and provide evidence of availability of financial resources to successfully complete the works.

12. You shall submit only one quotation. Your quotation must be typed or written in indelible ink and shall be signed by you or your authorized representative. Without a signature in your Form of Quotation, your quotation will not be considered further.

13. **Proposals Evaluation:** PMDSC shall evaluate the Technical Proposals on the basis of their responsiveness to the TOR and the RFP, applying the evaluation criteria, sub-criteria, and point system described below;

I.	Contractor's general experience, capacity, technical knowhow and competence in the field covered by the TOR	**25**
II.	Adequacy of the proposed approach, methodology and work plan in responding to the TOR	**30**
III.	Experience and qualifications of the staff members to be assigned to the work	
a.	Water Quality Specialist (surface, ground water & sediment)	**15**
b.	Air Quality Specialist	**15**
c.	Noise & Vibration Specialist	**15**
	Total Points	**100**

14. **Technical Evaluation:** Each responsive Proposal will be given a technical score. A Proposal shall be rejected at this stage if it does not respond to important impacts of the RFP or if it fails to achieve the minimum technical score required to pass: 75.

15. In evaluating the quotations, the Employer will adjust for any arithmetical errors as follows:

    (a) where there is a discrepancy between amounts in figures and in words, the amount in words will govern;

    (b) where there is a discrepancy between the total price in the Bill of Quantities or the quoted amount indicated in the Form of Quotation, the total price in the Bill of Quantities shall govern;

    (c) where there is a discrepancy between the unit rate and the line item total resulting from multiplying the unit rate by the quantity, the unit rate as quoted will govern; and

    (d) if you refuse to accept the correction, your quotation will be rejected.

16. Your financial proposals shall be valid for a period of thirty (30) days from 19 October 2016 (deadline for submission of the quotation).

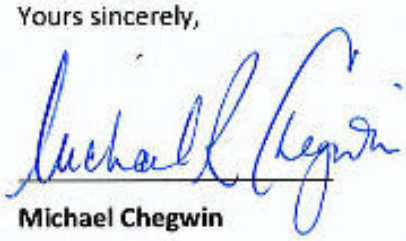
17. Your quotation in duplicate and written in English language shall be for the whole works and based on the "unit and total price indicated in the filled-in Bill of Quantities". Currency of quoted prices and payment shall be LKRs. The quotation shall include all duties, local taxes and other levies payable by the contractor in accordance with the local laws. In case of any discrepancy between the original and duplicate, the original shall prevail.

18. The Employer will award the contract to the Contractor whose quotation has been determined to be substantially responsive to this Request for Quotation with minimum technical score of 75 as per clauses 14 and who has offered the lowest evaluated price quotation. A quotation is not substantially responsive if it contains material deviations or reservations to the terms, conditions, and specifications in this Request for Quotation, and it will not be considered further. The Employer

will evaluate and compare both Technical Proposal and the Quotation determined to be substantially responsive.

19. If you withdraw your Quotation during the validity period and/or refuse to accept the award of a contract when and if awarded, then you will be excluded from the list of contractors for the project for two years.
20. The contract will be governed by the terms and conditions of the attached Form of Contract.
21. Your quotation including the brief Technical Proposal, Form of Quotation and filled Bill of Quantities should be submitted by **19 October 2016 at 3.00 p. m. (time)**. The bidders those who have obtained 75 or more marks during the Technical evaluation will be called for the Financial Proposal Opening in public in the presence of contractors' representatives who choose to attend at Office of the Team Leader, Lahmeyer International GmbH, Project Mahaweli Water Security Investment Program (MWSIP), Ministry of Mahaweli Development and Environment (MMDE), 493, T. B. Jayah Mawatha, Colombo 10.
22. The bidder whose quotation has been accepted will be notified of the award of contract through the Letter of Acceptance issued by the Employer within Fourteen (14) days from the date of submission of quotation.
23. The Employer intends to apply funds from the Asian Development Bank (ADB) for eligible payments under the Contract resulting from this RFQ.
24. Under ADB's Anticorruption Policy bidders shall observe the highest standard of ethics during the procurement and execution of such contracts. ADB will reject a proposal for award, and will impose sanctions on parties involved, if it determines that the bidder recommended for award or any other party, has engaged in corrupt, fraudulent, collusive, or coercive practices in competing for, or in executing, the Contract. At the time of submission of your quotation, you should not be in ADB's sanctions list.
25. Please confirm by fax/e-mail the receipt of this request and whether or not you will submit the price quotation(s).

Yours sincerely,



Michael Chegwin

Team Leader,

Lahmeyer International GmbH,

Mahaweli Water Security Investment Program (MWSIP),

Ministry of Mahaweli Development and Environment (MMDE)

SECTION 1: SUMMARY SHEET OF THE INSTRUCTIONS TO THE CONTRACTORS

1. Name of the work	**Baseline data collection of the identified environmental components (surface water quality, ambient air quality, noise & vibration, sediment deposition related to Minipe anicut raising and left bank canal rehabilitation (contract packages MLBCRP-ICB-1 & MLBCRP-NCB-1 to 5)**
2. Method of Selection	Lowest evaluated financial bid having technical score more than 75 as per clause 20 of RFQW
3. Officer in Charge	
4. Type of Contract	
5. Proposal submission deadline	
6. Proposal submission Contact person and address	
7. Expected date for the negotiations	
8. Expected date for the commencement of the services	

SECTION 2 –

TERMS OF REFERENCE FOR BASELINE DATA COLLECTION OF THE IDENTIFIED ENVIRONMENTAL COMPONENTS

(SURFACE WATER QUALITY, AMBIENT AIR QUALITY, NOISE & VIBRATION, SEDIMENT DEPOSITION)

MINIPE ANICUT RAISING AND LEFT BANK CANAL REHABILITATION

For

Contract Packages MLBCRP-ICB-1 & MLBCRP-NCB-1 to 5

MINISTRY OF MAHAWELI DEVELOPMENT AND ENVIRONMENT

BASELINE SURVEY OF ENVIRONMENTAL COMPONENTS

(SURFACE WATER QUALITY, AMBIENT AIR QUALITY, NOISE & VIBRATION, SEDIMENT DEPOSITION)

MINIPE LEFT BANK CANAL REHABILITATION PROJECT (74km)

OCTOBER 2016

No : 493, T.B. Jayah Mawatha, Colombo 10, Sri Lanka

Abbreviations

ASTM	American Society for Testing and Materials
BOQ	Bill of Quantities
CEA	Central Environmental Authority
DCPT	Dynamic Cone Penetration Test
EMoP	Environmental Monitoring Plan
EMP	Environmental Management Plan
ft	Feet
ICB	International Competitive Bidding
km	Kilometer
m	Meter
MCM	Million Cubic Meter
NCB	National Competitive Bidding
PIU	Project Implementations Unit.
PMDSC	Program Management, Design and Supervision Consultant
PMU	Program Management Unit
RQD	Rock Quality Designation
TBM	Tunnel Boring Machine
TOR	Terms of References
UCS	Uniaxial Compressive Strength

Table of Contents

List of tables

List of figures

A. Terms of Reference for Baseline Data Collection of the Identified Environmental Components (Surface Water Quality, Ambient Air Quality, Noise & Vibration, Sediment Deposition)

A.1. General

Mahaweli Water Security Investment Programme (MWSIP), implemented by the Ministry of Mahaweli Development and Environment Ministry of the Government of Sri Lanka (GoSL), is funded by the Asian Development Bank (ADB) (No. 47381-002-SRI (SF)), envisages to maximize the productivity of the Mahaweli River Basin (MRB) water resources, by transferring available water to the north central and north western dry zone areas for irrigation, drinking and commercial purposes. The updated Mahaweli Development Program (MDP) comprises three main individual investment projects namely:

i. Upper Elahera Canal Project (UECP)

ii. North Western Province Canal Project (NWPCP)

iii. Minipe Left Bank Canal Rehabilitation Project (MLBCRP)

Minipe Left Bank Canal Rehabilitation (MLBCR) Project, located downstream of the Randenigala Hydropower Complex on the Mahaweli River, will: (i) enhance upstream storage by heightening the headwork's weir by 3.5 meters for regulating generation inflows; (ii) construct new automatic electrically controlled intake gates on the left bank canal; (iii) construct new emergency spill weir on left bank canal; and (iv) rehabilitate the 74-km Minipe Left Bank Canal, including regulators, turnout and spill structures, to improve conveyance and reliability of service to existing farmers. The proposed project activities are planned to be implemented under 5 separate contract packages managed by PMDSC described below.

No.	Package-No.	Package Description
1	MLBCRP-ICB-1	Raising of Crest of Minipe Anicut and Water Control and Measurement Facilities
2	MLBCRP-NCB-1	Rehabilitation of Minipe LB Canal (0+000km to 30+140km)
3	MLBCRP-NCB-2	Rehabilitation of Minipe LB Canal (30+140km to 49+820km)
4	MLBCRP-NCB-3	Rehabilitation of Minipe LB Canal (49+820km to 63+650km)
5	MLBCRP-NCB-4	Rehabilitation of Minipe LB Canal (63+650km to 73+960km)

PMSDC has prepared an Environmental Management Plan (EMP) for Minipe Left Bank Canal Rehabilitation Project conforming to the Central Environmental Authority (CEA) requirements. The Environmental Monitoring Plan (EMoP) for the Project, incorporated in the EMP, requires to conduct an Environmental Baseline Survey (EBS) to determine the pre-project status in the benefit area related to environmental components, especially the ambient air, surface water, noise and vibrations, and the sediment deposition. The EBS shall gather the data as required in EMoP and report the prevailing status and propose measures to mitigate adverse impacts, especially in relation to the identified environmental components.

A.2. Scope of work

The objective of EBS is collection of quantitative & qualitative data on the environmental parameters, surface water, ambient air quality, sediment levels and noise and vibration under Baseline data collection prior to commencing construction work

The PMDSC, on behalf of MWSIP seeking a qualified institution to obtain their expert services to obtain baseline data as described above. The sampling and/or the analysis shall comply with the relevant regulations

published by the Central Environmental Authority (CEA). The key tasks identified to be performed, but not limited to those summarized in Table A.1 below.

Table A.1: Key tasks to be carried out under the consultancy service

Baseline Data Collection (03 Mts)
• Reconnaissance visit to carry out and identify sample locations and verify the parameters identified (Table A.2) for each environmental component, relating with the project interventions and the existing environmental conditions (land use, topographic conditions, environmental sensitivity etc.)
• Identify the most appropriate sampling and analysis techniques based on the most updated standardized testing method complying with the CEA requirements.
• Inception report preparation confirming sample locations, approach and methodology, staffing, deliverables and schedule covering study objectives
• Arrange scoping meetings to confirm the approach and methodology with the PMDSC /PMU/PIU prior to commencing the sample collection and obtain confirmation from the PMDSC /PMU, to proceed with the data collection
• Sample collection/ on site testing and analysis
• Submit test reports including the findings and recommendations as per the agreed report format within the scheduled period

The Contractor shall perform field works on surface water quality, ambient air quality, noise & vibration and sediment deposition, in-situ field and laboratory testing. He shall take representative samples where necessary (i.e. water) of above, transport the samples to his laboratory, perform tests on the following parameters as given in the Table A.2, on the samples and provide reports on all work done and results obtained as per the tasks given in the Table A.1, but being not limited to those.

Table A.2 : Identified Environmental Parameters to set the baseline conditions

Component	Parameter	Testing frequency
Ambient Air Quality	Particulate Matter (PM10 and PM 2.5) SO_2 NO_2 CO Wind rose	8 hourly and / or 24 hourly averaging category
Surface water	Temperature (°C), pH, Electrical Conductivity (µs/cm), DO (mg/l), BOD (mg/l), COD (mg O_2/L), TDS (mg/l), TSS (mg/l), Turbidity (NTU), E-coli, Oil & Grease, Dissolved Phosphorous, Total Kjeldahl Nitrogen, Iron, Chromium, Arsenic, Cadmium, Lead, Pesticides	As appropriate based on the existing standard testing method complying with the CEA requirements
Noise	Existing Noise Level	As per the provisions in the regulations (Gazette notification No. 924/12 of 23/05/1996 and

Component	Parameter	Testing frequency
		Its amendments (during Day and night)
Vibration	Existing Vibration level[1]	24 hr measurements
Sediment sampling	Surface and bottom, suspended sediment concentrations	To be decided

Given the investigative nature of the work, the Employer has, during the course of the Contract, the right to:

- order additional work, and/or
- reduce or cancel work items.

For payment purposes, both additional and reduced or cancelled work will be evaluated according to the rates in the Bill of Quantities and no change in any unit rate or price shall be permitted because of such addition or reduction/cancellation of work. The bidder should therefore ensure that each of his unit rates and prices is completely independent and balanced for the work activity concerned and contains the appropriate overhead and profit components.

In case of substantial additional or reduced work, the time schedule shall be adapted accordingly and be mutually agreed.

A.2.1. Locations of investigation

The sampling locations will be decided after awarding the contract followed by a reconnaissance visit to the project area and analyzing the project interventions and the existing environmental conditions (land use, topographic conditions, environmental sensitivity etc.). The total number of sample locations is given in the BOQ.

A.2.2. Sampling and Testing

The most appropriate and standard testing methods shall be used during the testing of identified parameters accepted by CEA, ASTM International and Sri Lanka Accreditation Board (SLAB). It is expected that the specific testing methodology and instrumentation, sampling procedure will be described in the technical proposal.

A.3. Reporting

The Contractor shall submit the following reports;

I. Inception Report - within 4 weeks of the commencement date

   Inception report shall mainly include the specific approach and methodology, identified sample locations (GPS), maps, justifying the reasons for the selection of such, testing methodologies and frequencies, work plan and the outline of the draft report considering the entire study area covering all 5 construction packages

[1] Amended ABOP Vibration standards published by CEA (2008) - parameters and testing frequencies shall be based on the interim standards (adopted by CEA) for vibration of the operation of machinery, construction activities and vehicle movement traffic

II. Draft Baseline Data collection report - within 10 weeks of the commencement date

Draft Baseline Data Collection Report shall contain the sample points including GPS locations and map, sample collection and testing methodology, test reports, detail analysis of the data describing the existing situation of the area, and conclusion and recommendations to be followed during the construction periods.

The Draft report shall include the test results, outcomes and recommendations of the baseline data collection in separate chapters for each contract package (ICB 1 and NCB 1-4 of MLBCR).

First a draft (soft copy) shall be submitted for review. For the final report shall incorporate amendments clarifying the Employer's comments on the draft. The final report shall be submitted in three copies together with a soft copy.

The report presentation should be precise and adequate and elaborated with figures, maps, graphs, photographs etc. wherever necessary including the annexes of the data as required representing each parameter.

III. Final report - by 12 weeks

A.4. Health and Safety

All activities performed during the course of the work undertaken by the Contractor under this contract shall be in accordance with the requirements of Health and safety protocols of the construction site/s in addition to the Health and Safety regulations of Sri Lanka. The Contractor shall be responsible for the safety of all activities on the Site.

A.5. Setting out

The work shall be carried out at locations as instructed by the Employer's Representative.

A.6. Personnel

A qualified and experienced Environmental Officer shall be assigned to the Project as Field Works Manager to manage and co-ordinate site investigation activities, laboratory testing, data processing and report production under the guidance of Environmental Specialist (National) of PMDSC.

A.7. Programme and Method Statement

The Contractor shall submit, together with the bidding documents, a work program and a method statement. This shall include a detailed description, including responsibilities, of all personnel, the number of investigation teams, the methodology and equipment necessary to carry out the works in accordance with this specification.

Prior to applying for permission to commence, the Contractor shall check the ground conditions and report (with evidence) to the Employer on the accessibility of test locations and suitability of ground conditions for the envisaged tests. Work shall not commence without the Employer's written permission.

A.8. Contractor's Personnel and Equipment

The Contractor shall provide all resources and equipment necessary to perform the works in a timely efficient manner to the satisfaction of the Employer in accordance with the Project Program.

Resources shall include, but not be limited to field and laboratory personnel, equipment, material supplies and labor necessary to complete the Works as defined in this TOR.

A.9. Permits, Licenses and Permissions

The Contractor shall obtain any permits and/or permissions necessary to access the investigation locations at all sites, e.g. permission from the wild life department.

The Contractor shall be responsible for compliance with any specific conditions and/or requirements imposed by all third parties that are associated with or affected by the Works.

A.10. Access to Investigation Locations

The Contractor is responsible for the construction of suitable access tracks as required to move the equipment and machinery.

A.11. Bid Price

The Bidder shall fill in rates and prices for all items of the Works described in the Bill of Quantities. An item for the Bidder enters no rate or price will not be paid for by the Employer when executed and shall be deemed to be covered by the other rates and prices in the Bill of Quantities.

A.12. Bill of Quantities

The Bill of Quantities is used to calculate the total Contract Price. The Contractor will be paid for the total amount of BOQ as per the payment schedule given in Sub Clause 2 of Form of Contract.

A.13. Time Period of Project

Three months

SECTION 3 –

BILL OF QUANTITIES

B. **BOQ for Baseline Data Collection of the Identified Environmental Components (Surface Water Quality, Ambient Air Quality, Noise & Vibration, Sediment Deposition)**

SUMMARY OF BILL OF QUANTITIES

Bill No.	General Summary	Amount (LKR)
Bill No. 01	Baseline Data Collection & Report preparation	
A	Total of Bills 01	
B	Contingencies (10% of A)	
C	**Sub Total (A + B)**	
D	Add Nation Building Tax (2%) of (C)	
E	Sub Total (C + D)	
F	Add Value Added Tax (11%) of E	
G	**Total Bid Price carried to Letter of Bid (including NBT & VAT)**	

....

Signature of Bidder Date

(Place common seal)

Table B.1. Bill of Quantity for Baseline Data Collection of the Identified Environmental Components (Surface Water Quality, Ambient Air Quality, Noise & Vibration, Sediment Deposition)

BILL NO. 01 – BASELINE DATA COLLECTION & REPORTING (03 MONTHS)

Item	Description	Unit	Quantity	Rate (LKR)	Amount (LKR)
1.1	**SURFACE WATER QUALITY –TESTING**				
1.1.1	Surface water Quality –Testing (All inclusive)	location	15		
1.2	**AIR QUALITY TESTING**				
1.2.1	Ambient Air Quality (all inclusive)	per day/location	10		
1.3	**NOISE & VIBRATION LEVELS**				
1.3.1	Existing Noise level 24-hr measurements (all inclusive)	per day/location	10		
1.3.2	Existing Vibration level 1-hr measurements (all inclusive)	location	10		
1.4	**SEDIMENT LEVELS**				
1.4.1	Surface suspended sediment concentrations (all inclusive)	sample	15		
1.4.2	Bottom suspended sediment concentrations (all inclusive)	sample	15		
1.5	**REPORT**				
1.5.1	Baseline Data Collection Report (Stage 1-4 and Anicut) Report	Lump sum	1		
1.6	**STAFF REQUIREMENTS**				
1.6.1	**Specialists**				
1.6.1.1	Surface Water Quality Specialist	Lump sum	1		
1.6.1.2	Air Quality Specialist	Lump sum	1		
1.6.1.3	Noise & Vibration Specialist	Lump sum	1		
1.6.2	Per diem during field visits	Lump sum	1		
1.7	**SUPPORT STAFF**				
1.7.1	Support Staff for all sampling and analysis	Lump sum	1		
1.7.2	Per diem during field visits	Lump sum	1		
1.8	**TRANSPORT**				
1.8.1	Transport Cost	Lump sum	1		
	Total for Bill No. 01 Baseline Data carried to SUMMARY OF BOQ				

Note: Any other cost required not specified in the BOQ shall be included under the Contractors unit rate.

SECTION 4 –

DRAWINGS

Figure 1: I - General Layout and land use Plan of MLBCR Stage 1 project area

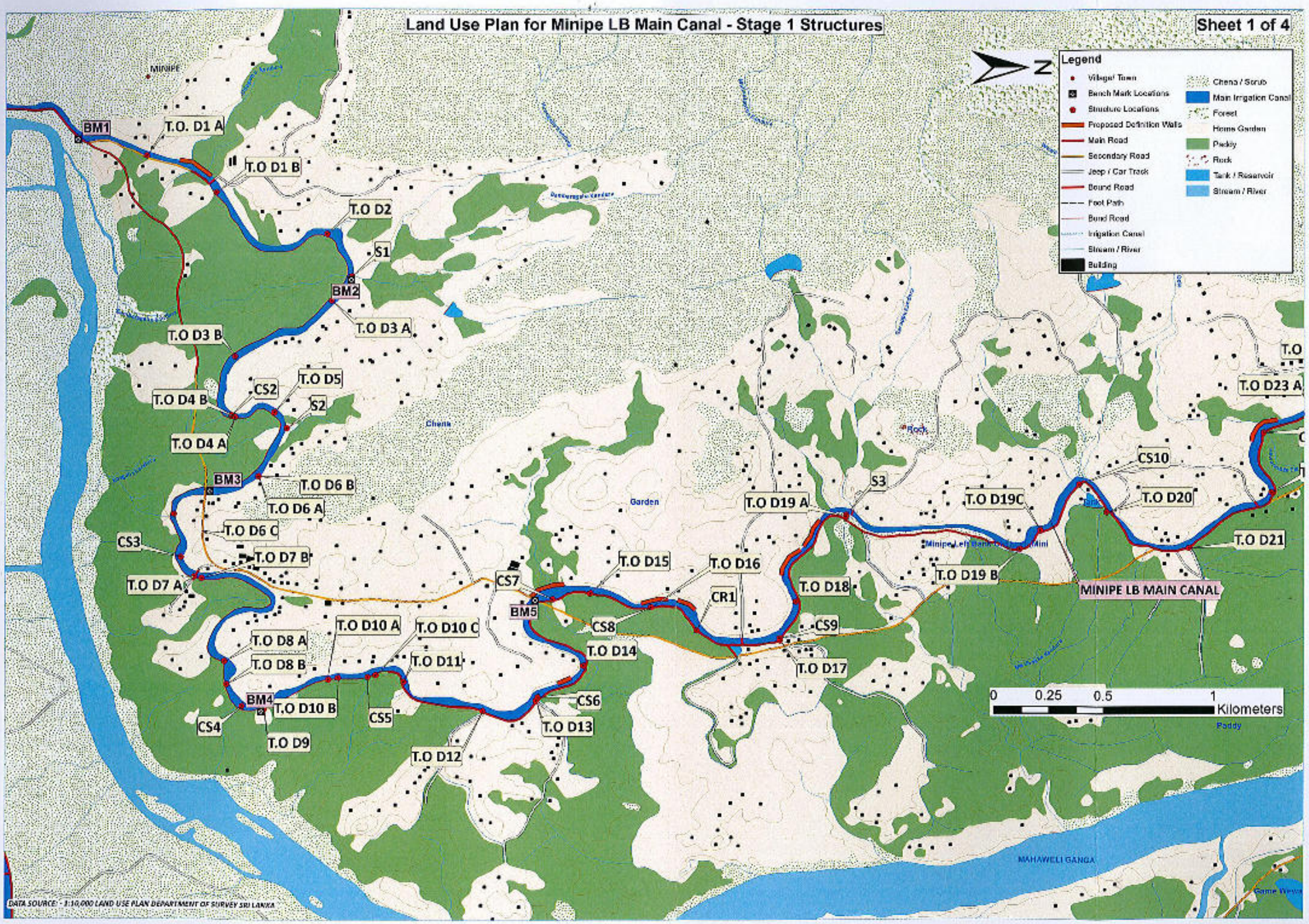


Figure 2: II - General Layout and land use Plan of MLBCR Stage 1 project area

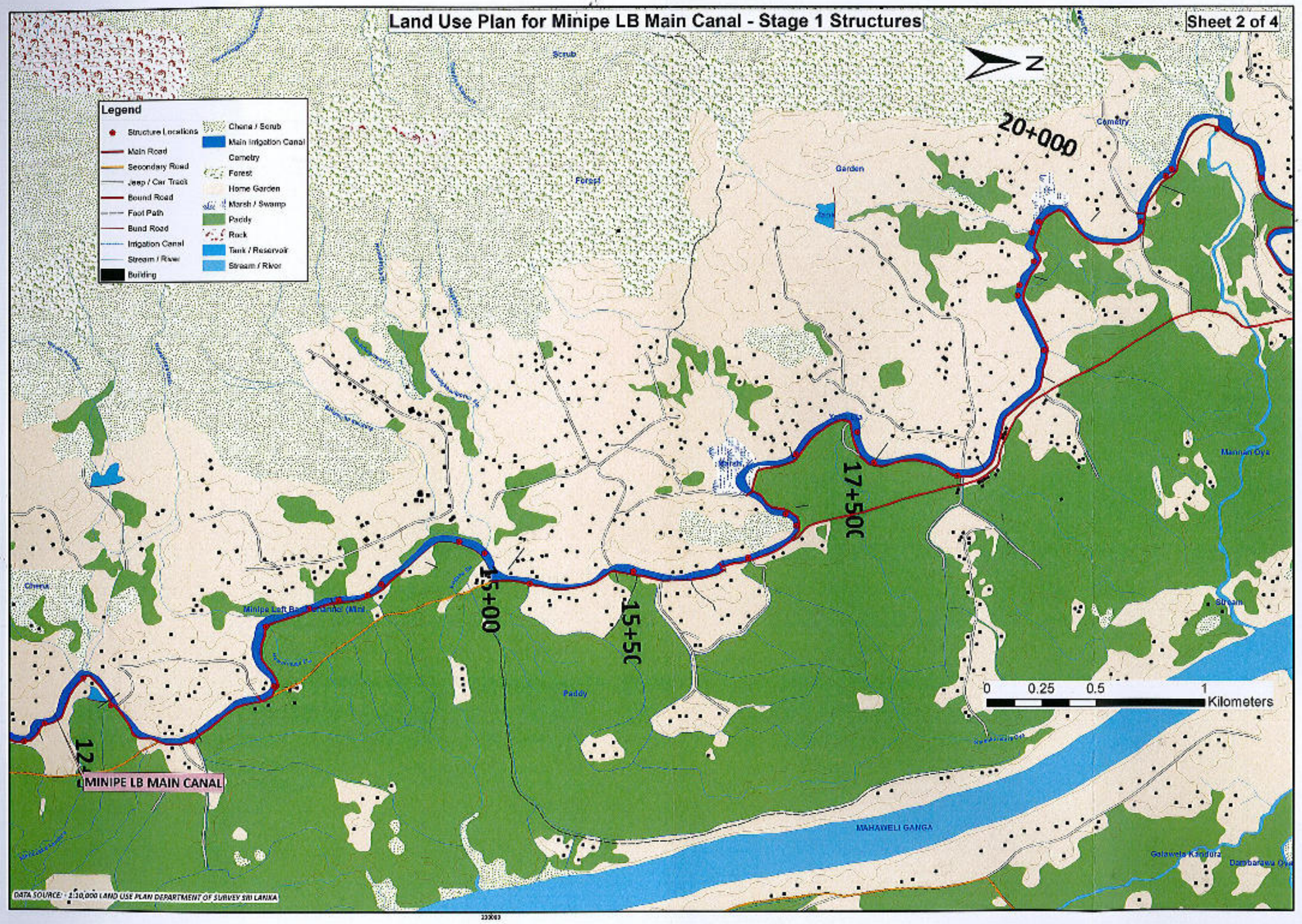


Figure 3: III - General Layout and land use Plan of MLBCR Stage 1 project area

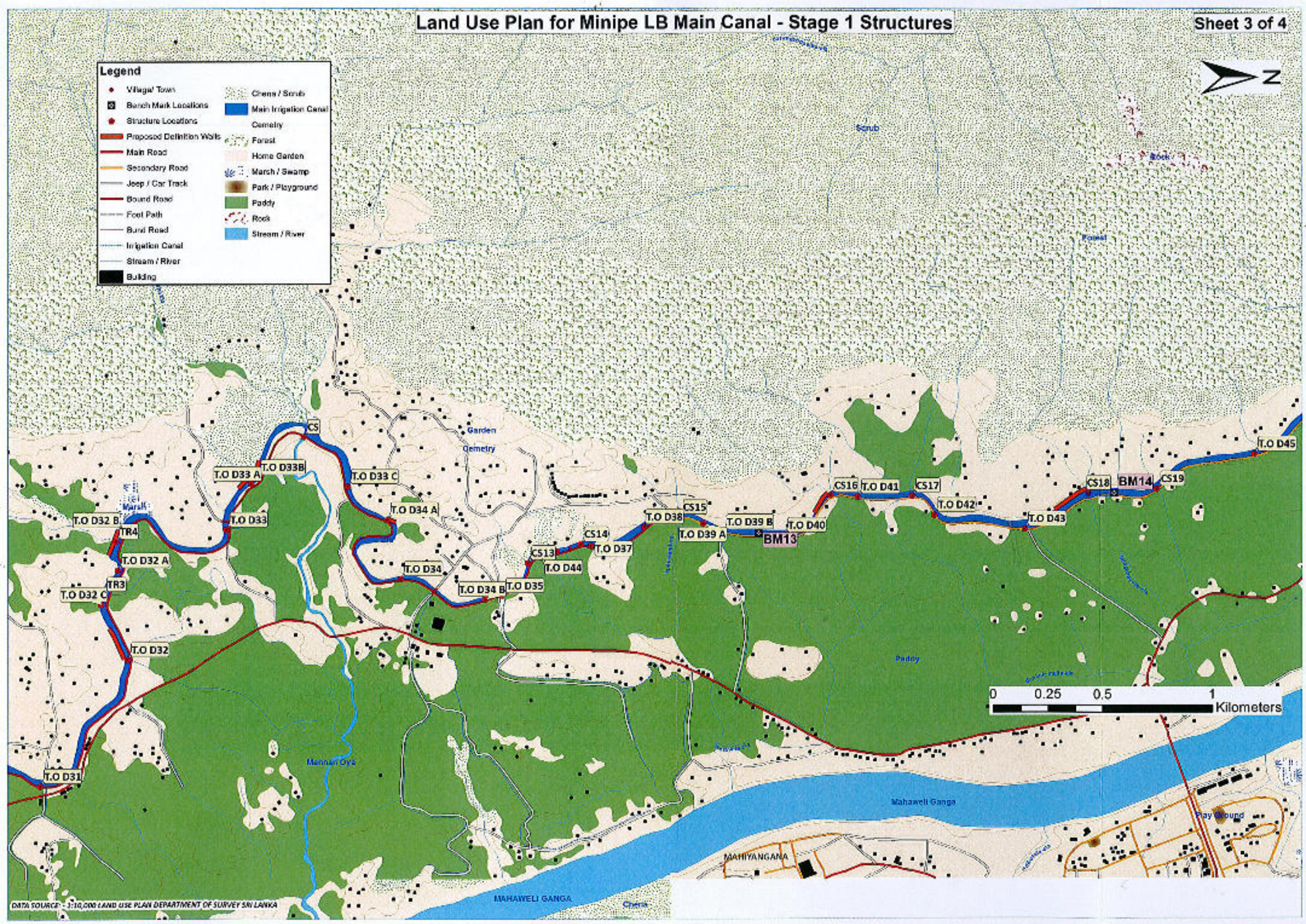


Figure 4: IV - General Layout and land use Plan of MLBCR Stage 1 project area

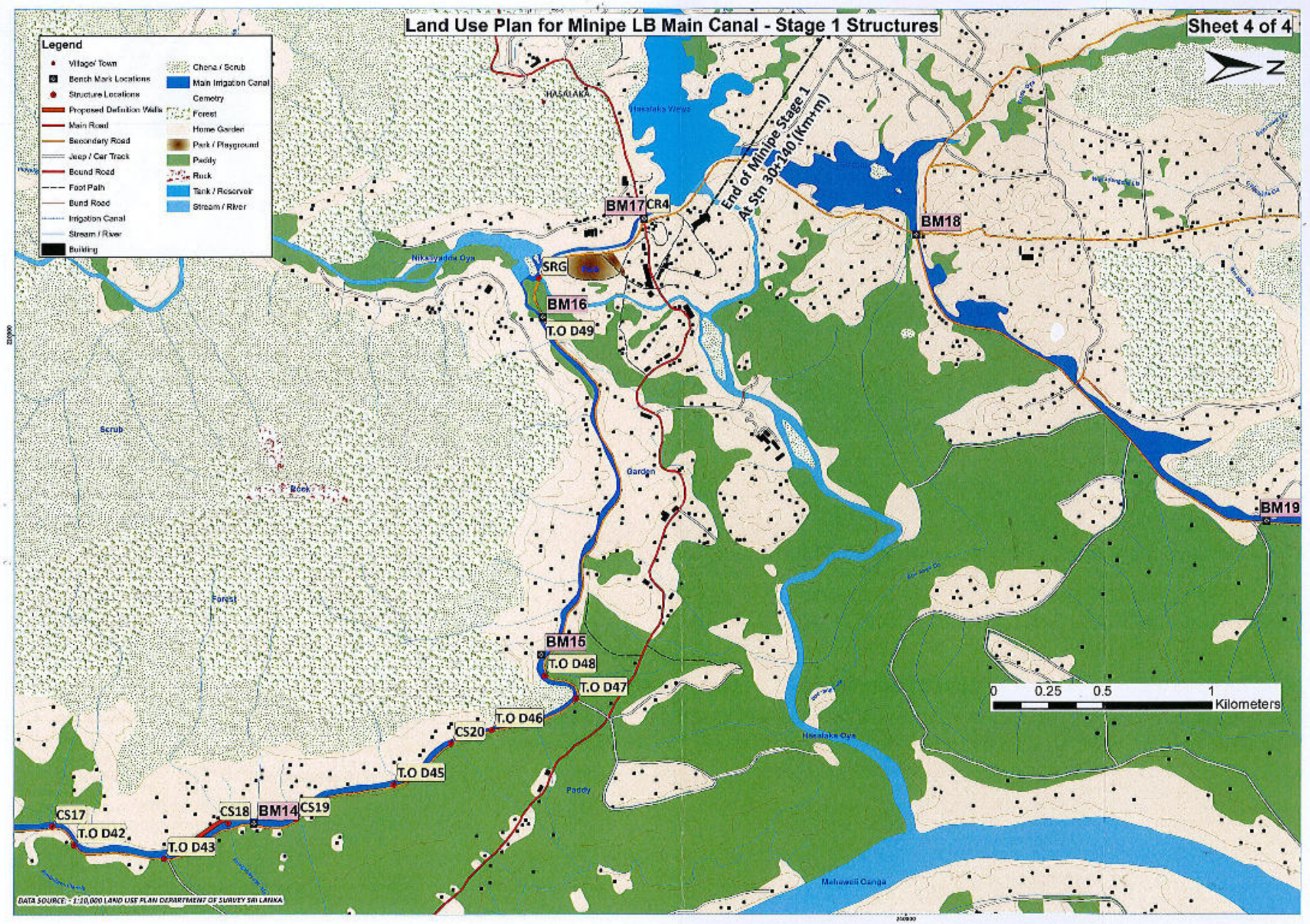


Figure 5: I - General Layout and land use Plan of MLBCR Stage 2 project area

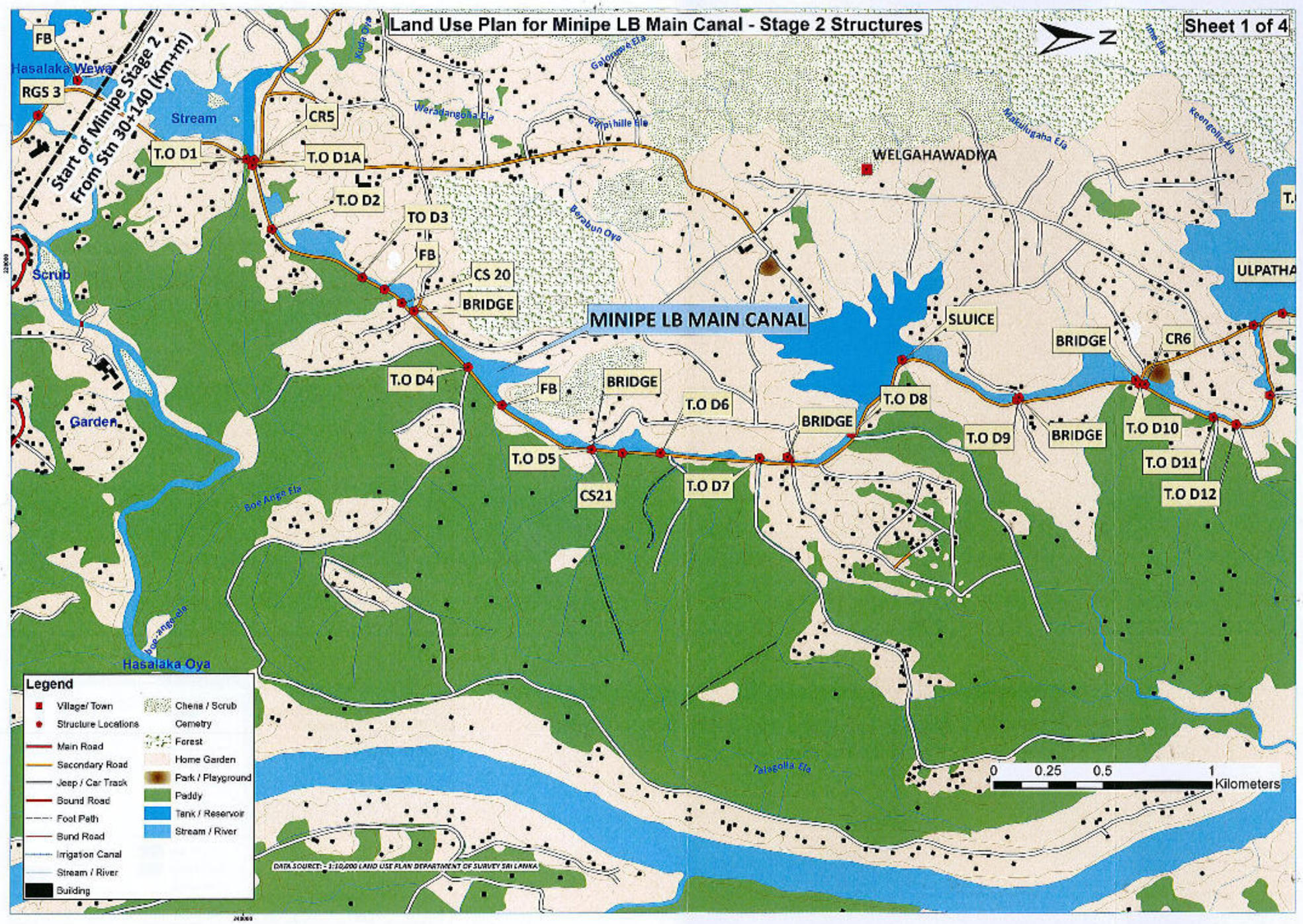


Figure 6: II - General Layout and land use Plan of MLBCR Stage 2 project area

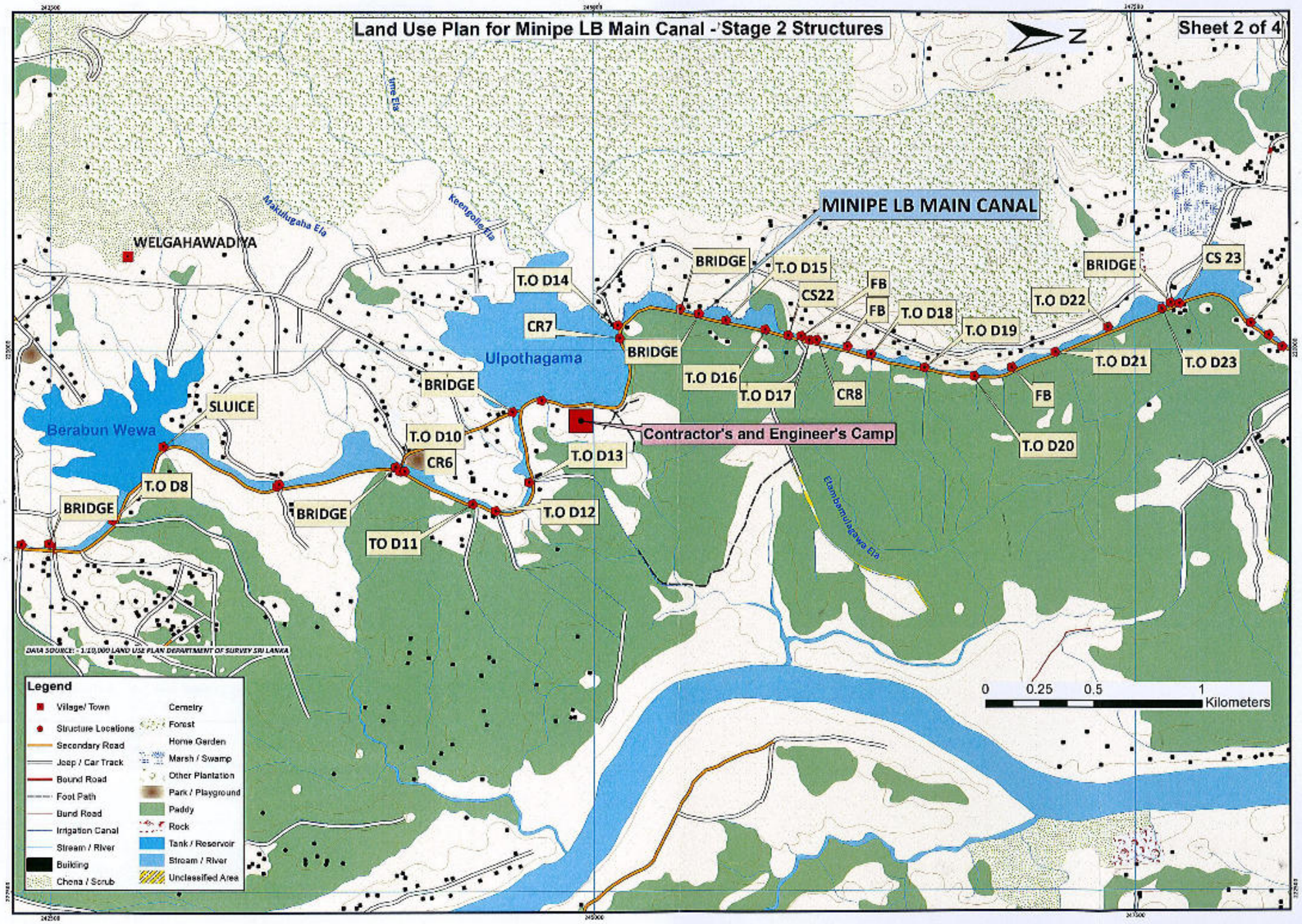


Figure 7: III - General Layout and land use Plan of MLBCR Stage 2 project area

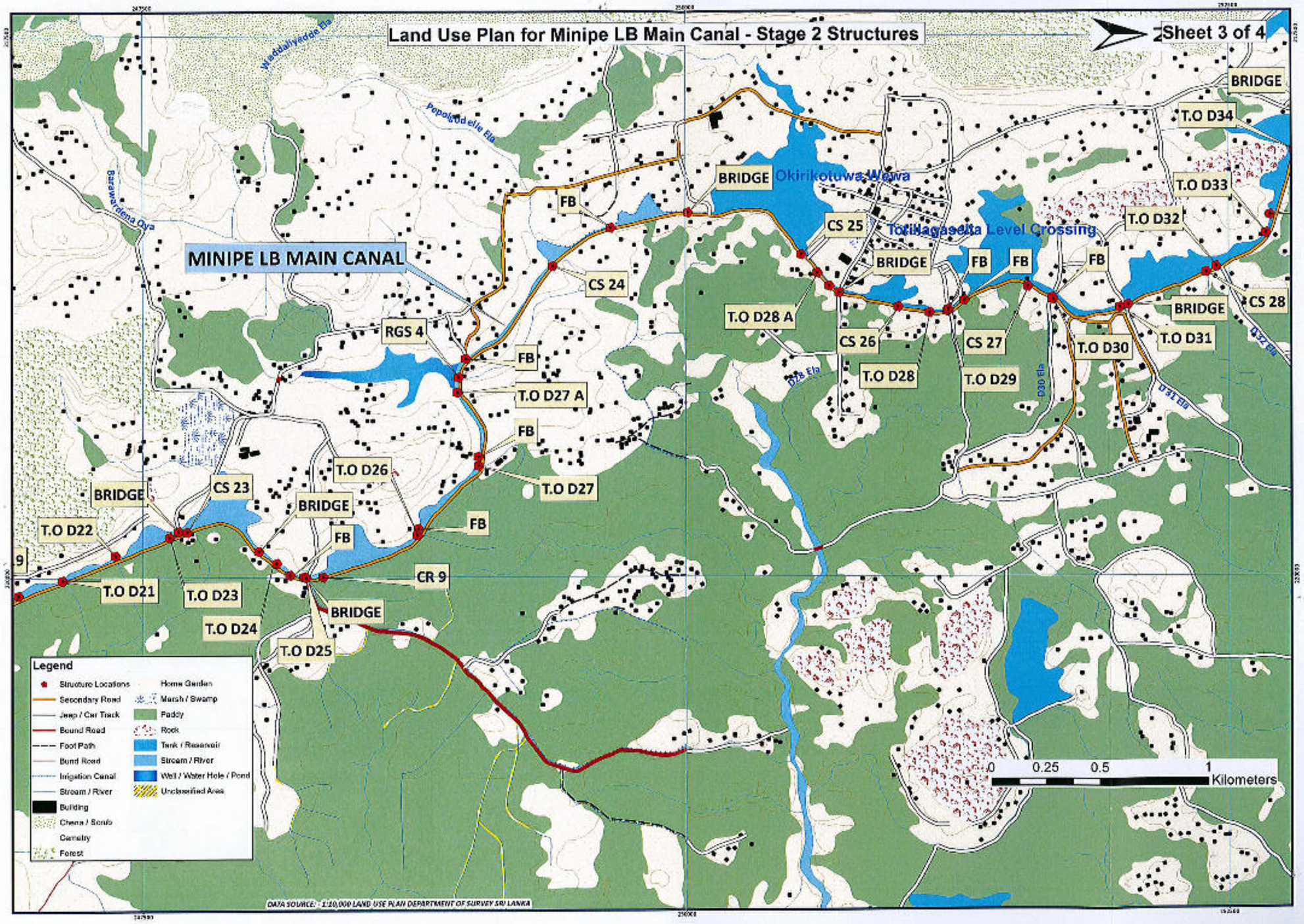


Figure 8: IV - General Layout and land use Plan of MLBCR Stage 2 project area

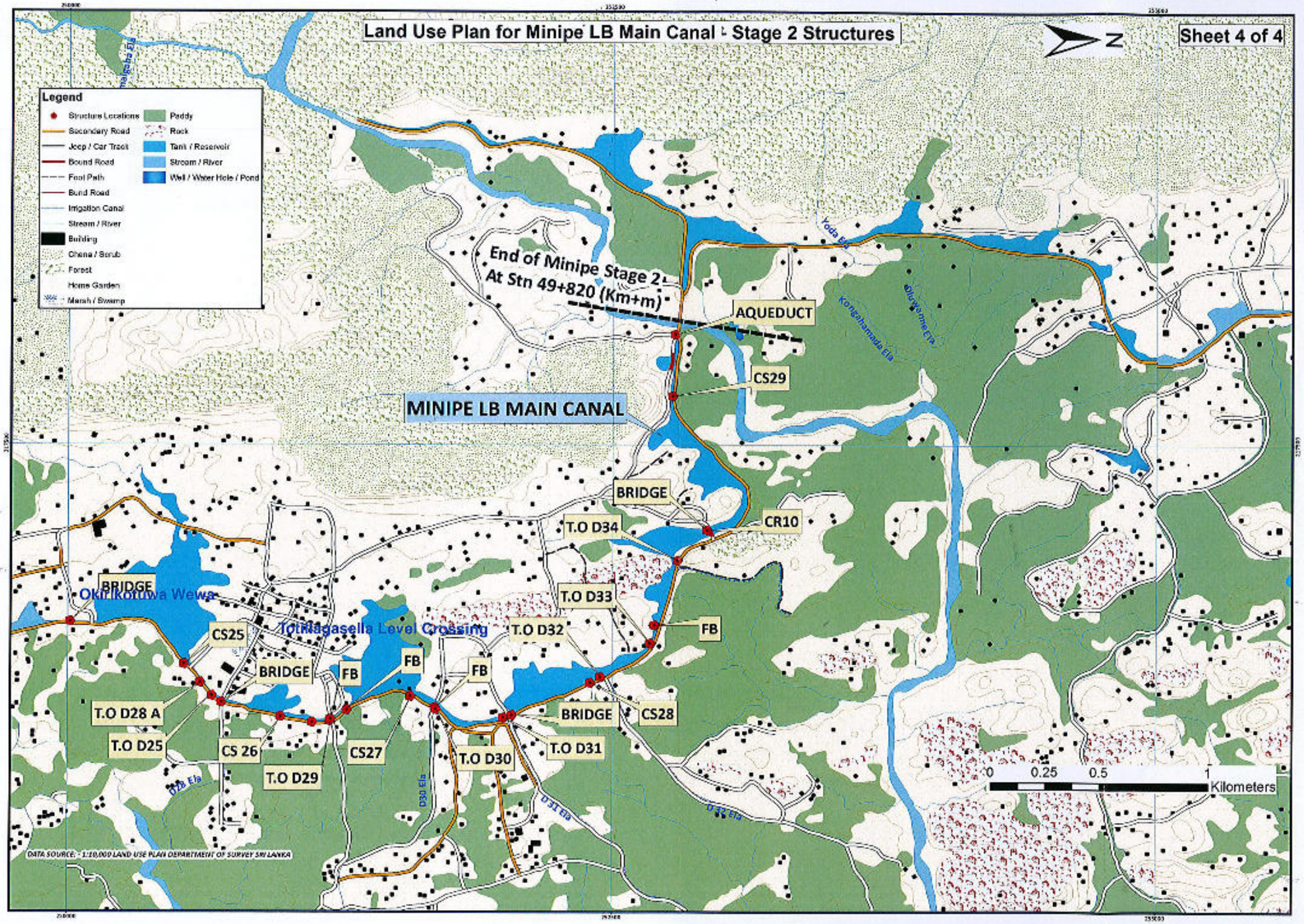


Figure 9: I - General Layout and land use Plan of MLBCR Stage 3 project area

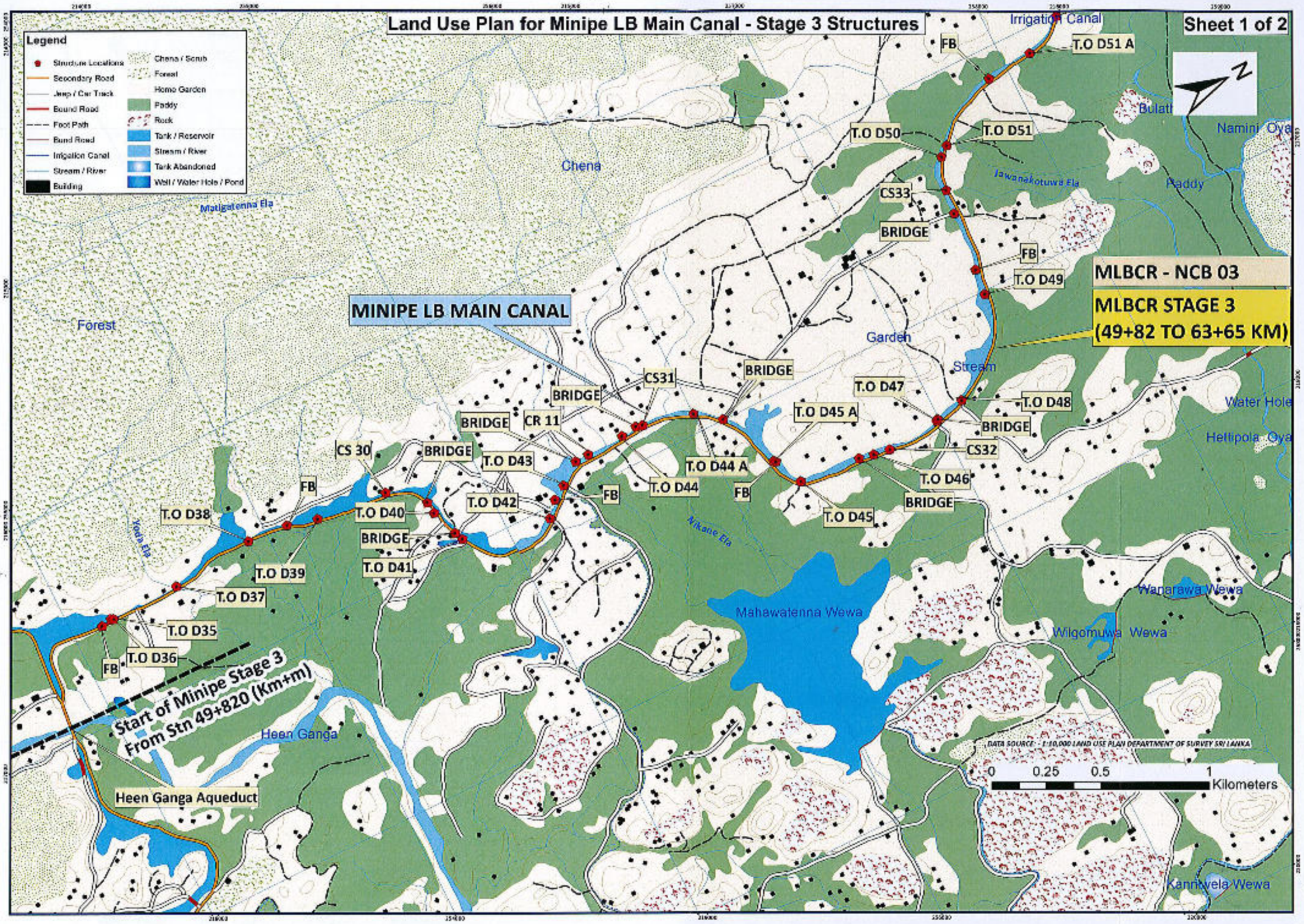


Figure 10: II - General Layout and land use Plan of MLBCR Stage 3 project area

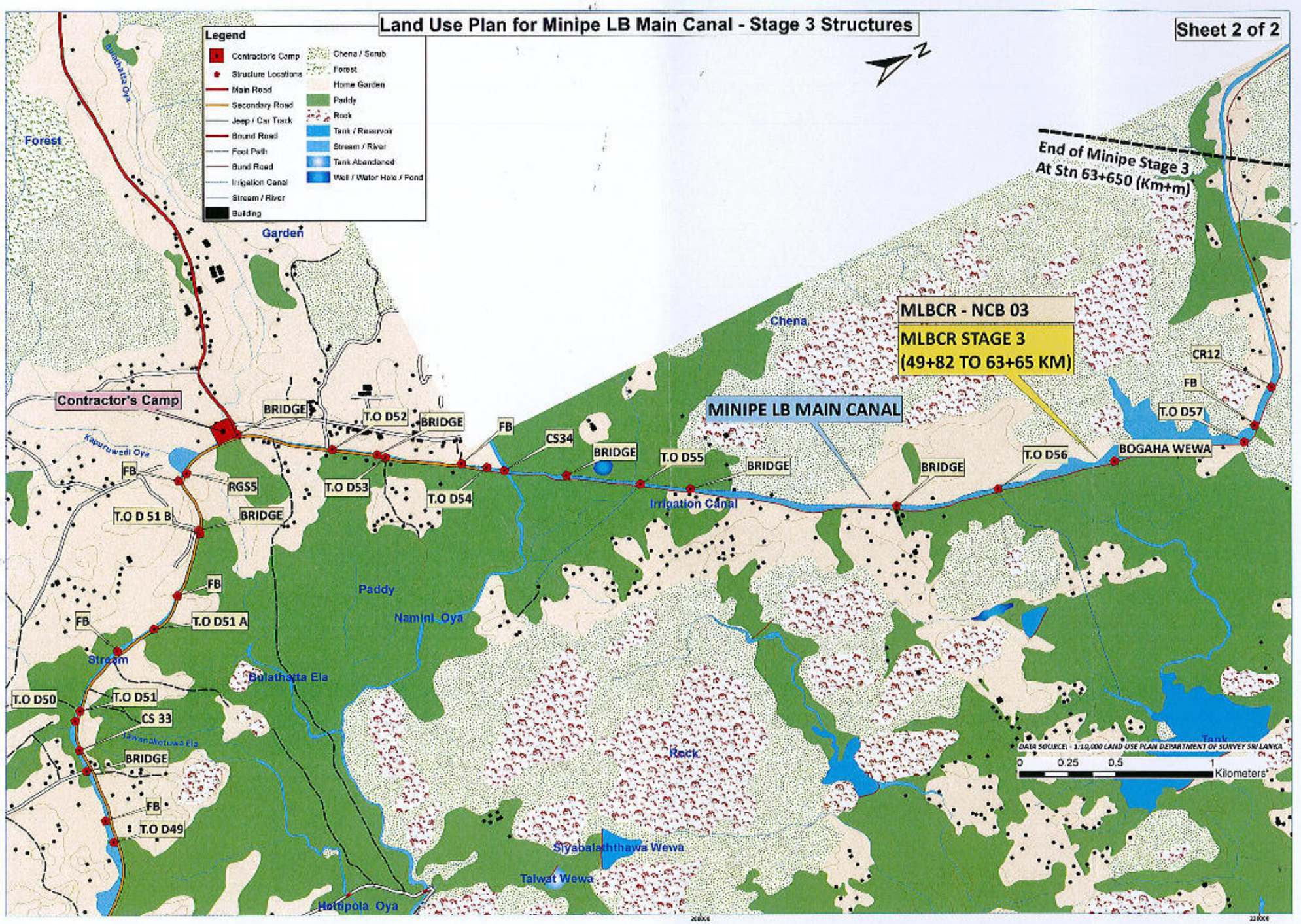


Figure 11: I - General Layout and land use Plan of MLBCR Stage 4 project area

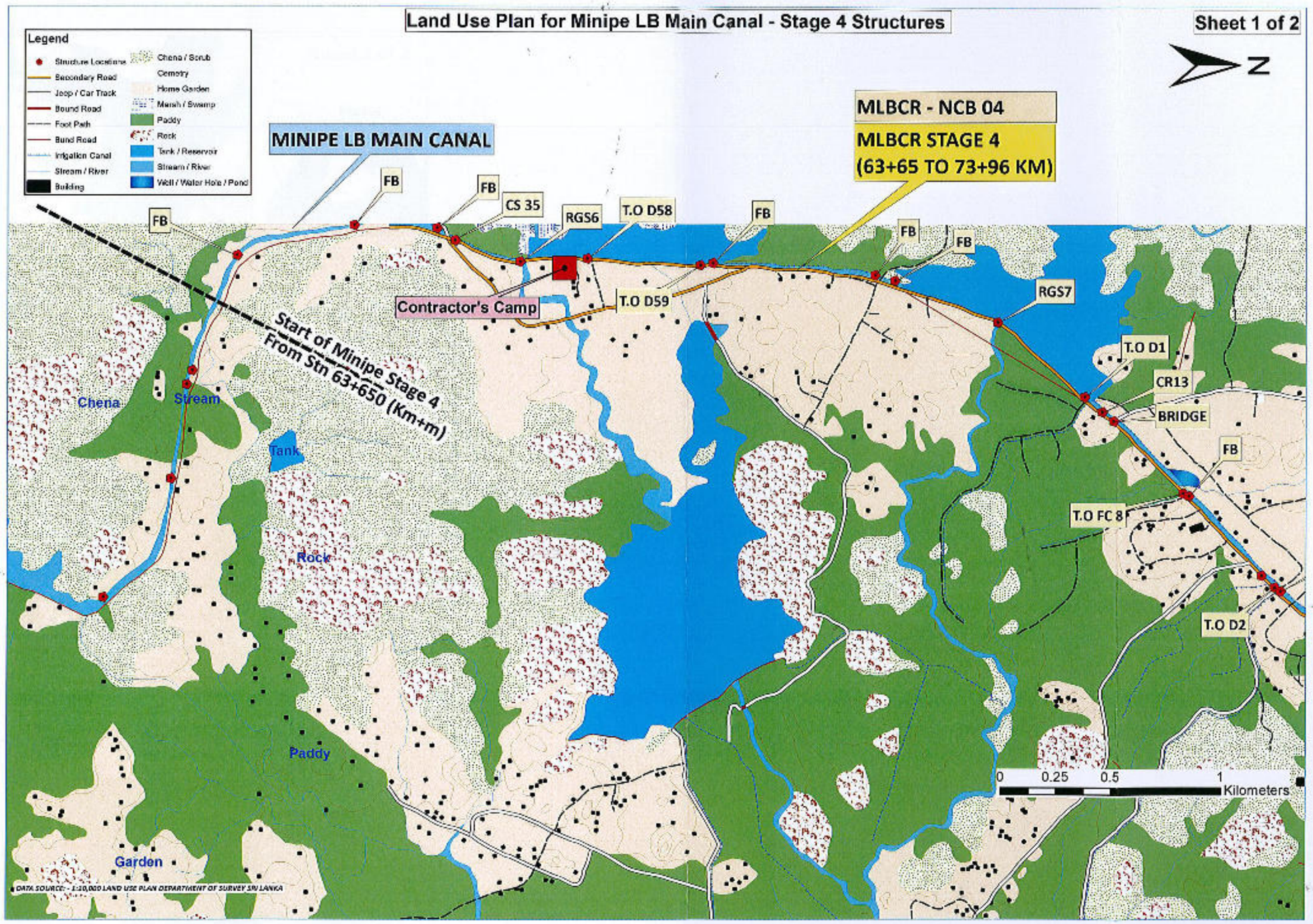
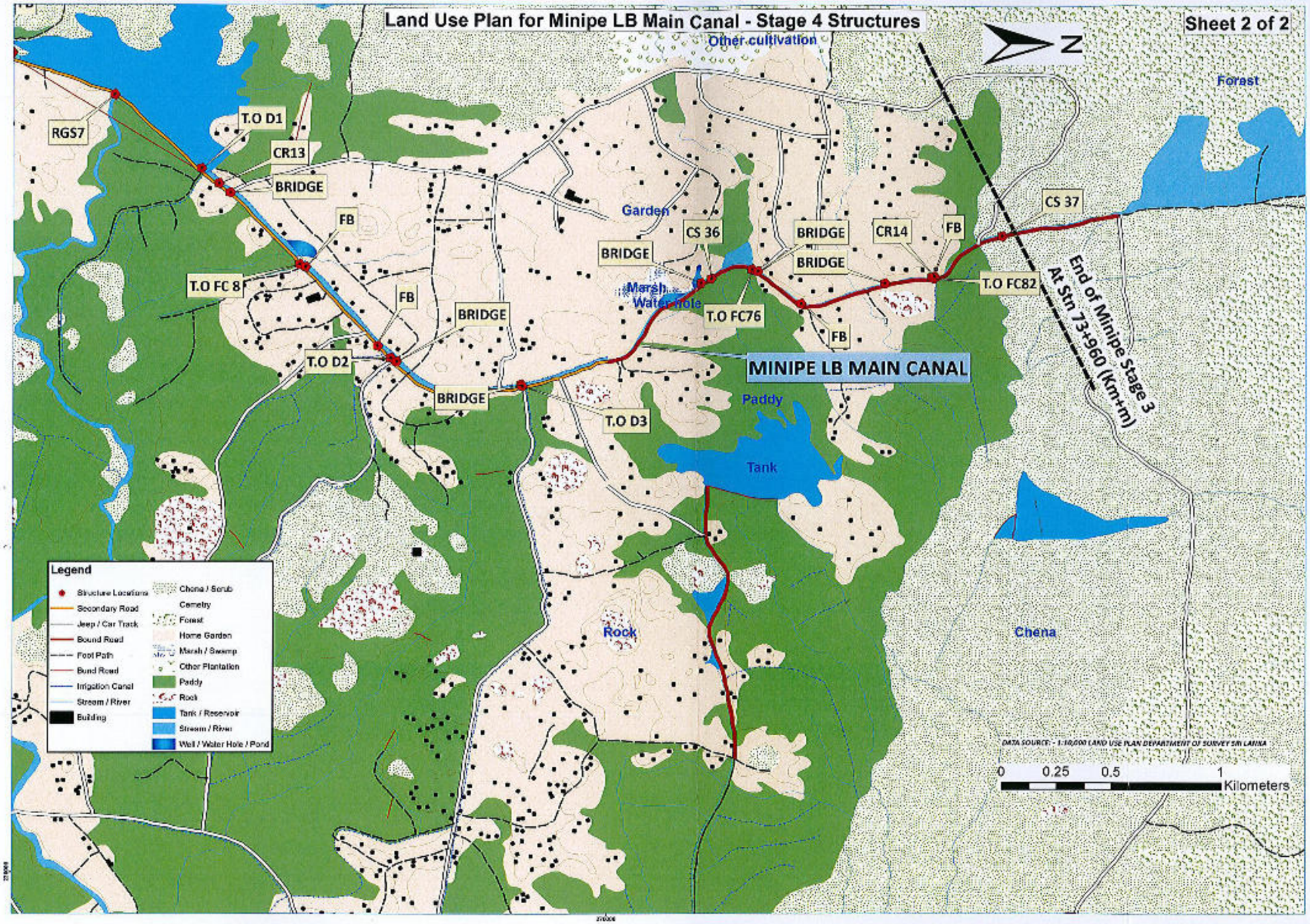


Figure 12: II - General Layout and land use Plan of MLBCR Stage 4 project area



SECTION 5 –

FORM OF QUOTATION AND FORM OF CONTRACT

FORM OF QUOTATION

_____(Date)

To: **Team Leader,**

Lahmeyer International GmbH,

Mahaweli Water Security Investment Program (MWSIP),

Ministry of Mahaweli Development and Environment (MMDE),

No. 493,

T. B. Jayah Mawatha,

Colombo 10.

We offer to execute the **Environmental Baseline Data Collection of surface water quality, Air quality, Noise & Vibration, Sediment Concentrations (Surface & Bottom) in Minipe Left Bank Canal Rehabilitation Project of MWSIP – Tranche 1 as per the Terms of Reference given in Section 1 & BOQ given in Section 3 in** accordance with the Conditions of Contract (in the Form of Contract) accompanying this Quotation for the Contract Price of---------- (amount in words and numbers)---------- (name of currency)----------.We propose to complete the Works described in the Contract within a **period of 03 (three) months** from the Date of award of the Contract.

This Quotation and your written acceptance will constitute a binding Contract between us. We understand that you are not bound to accept the lowest or any Quotation you receive.

We hereby confirm that this Quotation complies with the Validity of the Offer required by the proposal documents.

We have not been associated with the firm that prepared the design and specifications of the contract that is subject of this request for quotation.

We are not in the ADB sanctions list.

Authorized Signature : _____

Name and Title of Signatory : _____

Name of Contractor : _____

Address : _____

Phone Number : _____

Fax Number, if any : _____ _____

Email address (optional) : _____ _____

FORM OF CONTRACT

Name of Country: **Sri Lanka**

Project Name: **Mahaweli Water Security Investment Program – Tranche 1**

Name of Contract: _____

Contract Number: _____

This Contract is made this _____ day of _____ 2016 between _____ on the one part (hereinafter called the Employer) and _____ (hereinafter called the Contractor) on the other part.

Whereas the Employer has called for quotations for (name and identification number of the contract) and the Contractor has submitted a quotation for the above work and the Employer has accepted the Contractor's Quotation dated _____ for the execution and completion of such works and the remedying of any defects therein.

Now this Contract witnesses as follows:

1. The Contractor hereby covenants to execute the works fully described in the Bill of Quantities included in the Contractor's Quotation which constitute an integral part of this Contract (as Annex 1] in a professional and workmanship like manner in accordance with the following Conditions of Contract:

a) Submission of the deliverable as given in Terms of Reference (ToR) (A.3.)

b) The Employer reserves the right to terminate the contract due to unsatisfactory performance 21 days after giving a written notice. If the Contract is frustrated by the outbreak of war or by any other event entirely outside the control of either the Employer or the Contractor, the Engineer in charge shall certify that the contract has been frustrated. In such an event, both the Employer and Contractor will have a right to terminate the contract by giving 21 days notice to the other party without any financial repercussions on either side. Payments after termination or frustration shall consider the value of work completed and materials delivered by the Contractor, and the advance payment made by Employer;

c) No part of the works shall be subcontracted without prior approval of the Employer.

d) New items of work performed as ordered by the PMDSC in charge will be paid at the mutually agreed rate and in case of any disagreement between the Contractor and the Team Leader of PMDSC the latter will fix the unit rates that will be binding on the Contractor;

e) The Law governing the contract shall be applicable laws of _____ (Employer's country);

f) The Contractor shall be responsible for the safety of all the activities on the Site.

g) During execution of works the Engineer in charge, _____, (name) will carry out inspection of works at site to certify that works are executed by the Contractor in accordance with the specifications and required quality as per specifications. Engineer in charge will reject works not performed to the required specifications and the Contractor shall take immediate actions to rectify all defects in accordance with subparagraph (a) above.

h) Either party may terminate the Contract by giving a 21 days notice to the other for unforeseen events such as wars and acts of Gods such as earthquake, floods fires etc. In such case the payments will be made to the date of termination of contract;

i) The Contractor is responsible for all taxes, duties, levies, etc. in accordance with the laws of the _____ (country); and

j) The disputes between the Employers and the Contractor arising between them under or in connection with the Contractor shall be resolved amicably. In the event the dispute remains unresolved either party may refer the dispute to Institute of Engineers Sri Lanka (name the authority in the country such as Engineering Institute, Legal Institute, ect.) in accordance with the law governing the contract.

2. In consideration thereof the Employer covenants to pay the Contractor the contract price of ___ (in words and figure) in the following manner and installments.

(i). Initial payment of 15% of Contract price shall be made upon the approval of Inception Report by PMDSC and PMU.

(ii). 2nd payment of 60% of the Contract price shall be made on submission of Draft Baseline Survey Report for all 5 packages including weir, approved by the PMDSC and PMU.

(iii). Final payment of 25% shall be made on submission of Final Report and approved by the PMDSC and PMU.

In witness whereof the parties thereto have caused this Contract to be executed the day and year first before written.

Signature and seal of the Employer:	Signature and seal of the Contractor:
FOR AND BEHALF OF	FOR AND BEHALF OF
_____	_____
Name of Authorized Representative	Name of Authorized Representative

Technical Proposal Forms

Form	Description	Page limit
TECH - 1	Contractor's Organization and Experiences A. Contractor's organization B. Contractor's experiences of handling similar assignments within last 5 years C. Standard laboratory facilities, equipments available and certificates obtained	5
TECH - 2	Descriptions of the Approach, Methodology and Work plan for performing the consultancy A. Technical Approach, methodology and selection of the team of experts for the each specified sector B. Work Plan and Staffing C. Comments (on the ToR, counterpart staff, facilities etc.)	10
TECH - 3	A. Work Schedule B. Staffing Schedule	2
TECH - 4	CVs of the selected experts for each sector (Short CVs showing the experiences of similar assignments) • Team Leader • Water Quality Specialist (including sediment) • Air Quality Specialist • Noise & Vibration Specialist	12

FORM TECH 1

CONSULTANT'S ORGANIZATION AND EXPERIENCES

{A brief description of the Consultant's Organization and an outline of the recent experiences of the consultant that is most relevant to the assignment}

A. Consultant's organization

{Provide here a brief description of the background and organization of your company, and - in case of a joint venture - of each member for this assignment, including organizational chart, a list of Board of Directors, and beneficial ownership.}

B. Consultant's experiences of handling similar assignments within last 5 years

{List Only previous similar assignments related to the ToR which are successfully completed within last 5 years.}

Duration	Assignment Name / description of the key features of the assignment	Name of the client and country of the assignment	Approximate contract value (in LKR amount paid to your firm)	Role on the assignment

C. Standard laboratory facilities, equipments available and certificates obtained

{brief description of the resources, laboratory facilities, equipments and standard/new technologies available to complete the proposed consultancy, professional resource persons available with the firm, certificates and awards obtained for the laboratory services and performances justifying the capabilities to handle the expected tasks successfully under the assignment}

FORM TECH 2

DESCRIPTIONS OF THE APPROACH, METHODOLOGY AND WORK PLAN FOR PERFORMING THE CONSULTANCY

A. Technical Approach, methodology and selection of the team of consultants for the each specified sector

(Please explain your understanding of the objectives of the assignment as outlined in the Terms of Reference (TOR), the technical approach, and the methodology including the standard laboratory techniques, testing equipments, machineries and instruments you would adopt for implementing the tasks to deliver the expected output(s); the degree of detail of such output; and describe the structure and composition of your team. Please do not repeat/copy the TOR in here)

B. Work Plan and Staffing

(Please outline the plan for the implementation of the main activities/tasks of the assignment, their content and duration, phasing and interrelations, milestones (including approvals by Technical Committee), and tentative delivery dates of the reports. The proposed work plan should be consistent with the technical approach and methodology, showing understanding of the TOR and ability to translate them into a feasible working plan and work schedule showing the assigned tasks for the relevant specialist.)

C. Comments (on the ToR, counterpart staff, facilities etc.)

(Your suggestions should be concise and to the point, and incorporated in your Proposal. Please also include comments, if any, on counterpart staff and facilities to be provided by client)

FORM TECH 3

A. WORK SCHEDULE

No.	Activity	Months		
		1	2	3

{List the deliverables with the breakdown of the activities required to complete the assignment as per the ToR. For phased assignments, indicate the activities, delivery reports, and bench marks separately including the time period required for the approvals}

B. STAFFING SCHEDULE

	Position	Name	Months			Man Months		
			1	2	3	Field	Office	Total
1	**Key Staff**							
i	Team Leader							
ii	Water Quality Specialist							
iii	Air Quality Specialist							
iv	Noise & Vibration Specialist							
2	**Support Staff**							

Full time ——————

Part time ▪▪▪▪▪▪▪▪

FORM TECH 4

CVS FOR THE KEY SPECIALISTS

(CVs of the key experts proposed indicating their most recent similar assignments undertaken, educational and other professional experiences related to their field of expertise)

1.	PROPOSED POSITION FOR THIS PROJECT	:	
2.	NAME	:	
3.	DATE OF BIRTH	:	
4.	NATIONALITY	:	
5.	EDUCATION (The years in which various qualifications were obtained must be stated)	:	
6.	OTHER TRAINING	:	
7.	LANGUAGE & DEGREE OF PROFICIENCY	:	
8.	MEMBERSHIP IN PROFESSIONAL SOCIETIES	:	
9.	COUNTRIES OF WORK EXPERIENCE	:	
10.	EMPLOYMENT RECORD	:	(Starting with present position, list in reversed order <u>every employment held</u> and state the start and end <u>dates</u> of <u>each employment</u>)
	FROM:		TO:
	EMPLOYER	:	(Clearly distinguish your "employer" as an employee of the firm from a "client" for whom you have worked as a consultant or an adviser)
	POSITION HELD AND DESCRIPTION OF DUTIES	:	
11.	DETAILED TASKS ASSIGNED (In this column, list tasks one by one and support each task by project experience in the right hand side column)		WORK UNDERTAKEN THAT BEST ILLUSTRATES CAPABILITY TO HANDLE TASKS ASSIGNED. (in this column, list project name, location, year, position held, i.e., Team Leader, Hydrologist, Agricultural Economist, etc. and exact duties rendered and time spent on each project.)
12.	CERTIFICATION		

I understand that any willful misstatement described herein may lead to my disqualification or dismissal, if engaged.

_____ Date: _____

Signature of expert (Day/Month/Year)

_____ Date: _____

Signature of Authorized (Day/Month/Year)

Name: .....

Position: .....

ANNEX 7 : ECOLOGICAL SURVEY FOR UEC-ICB-1

Recommendations on Priority Areas Identified for Commencement of Constructions in the Upper Elahara Canal Project

Package I (Moragakanda Reservoir to Kongetiya Tank) Human Elephant Conflict Management Plan for Upper Elahara Canal Project MMDE / MWSIP/ ADB/ UECP/ 3267-3268-SRI / Consult / HECM / NCB / 2016 /004

December 2016

Report submitted by IUCN Sri Lanka Country Office to Mahaweli Water Security Investment Program of the Ministry of Mahaweli Development and Environment as part of the consultancy service deliverables for the 'Human Elephant Conflict Management Plan for Upper Elahera Cnal Project MMDE / MWSIP/ ADB/ UECP/ 3267-3268- SRI / Consult / HECM / NCB / 2016 /004'

Cover picture – Channel trace of UEC project package 1. Naalin Perera @IUCN Sri Lanka

Table of Contents

ABBREVIATIONS

BrR	Breeding Resident
CEA	Central Environmental Authority
NCS	National Conservation Status
CR	Critically Endangered
CR (PE)	Critically Endangered (possibly extinct)
DD	Data Deficient
EN	Endangered
END	Endemic Species
IAS	Invasive Alien Species
IUCN	International Union for Conservation of Nature
NT	Near Threatened
SpS	Species Status
VU	Vulnerable
WV	Winter Visitor

1. INTRODUCTION

1.1 Project Background

The Upper Elahera Canal (UEC) project of North Central Province Canal Stage 1 involves a trans-basin diversion of Mahaweli water to the North Central and Northern provinces.

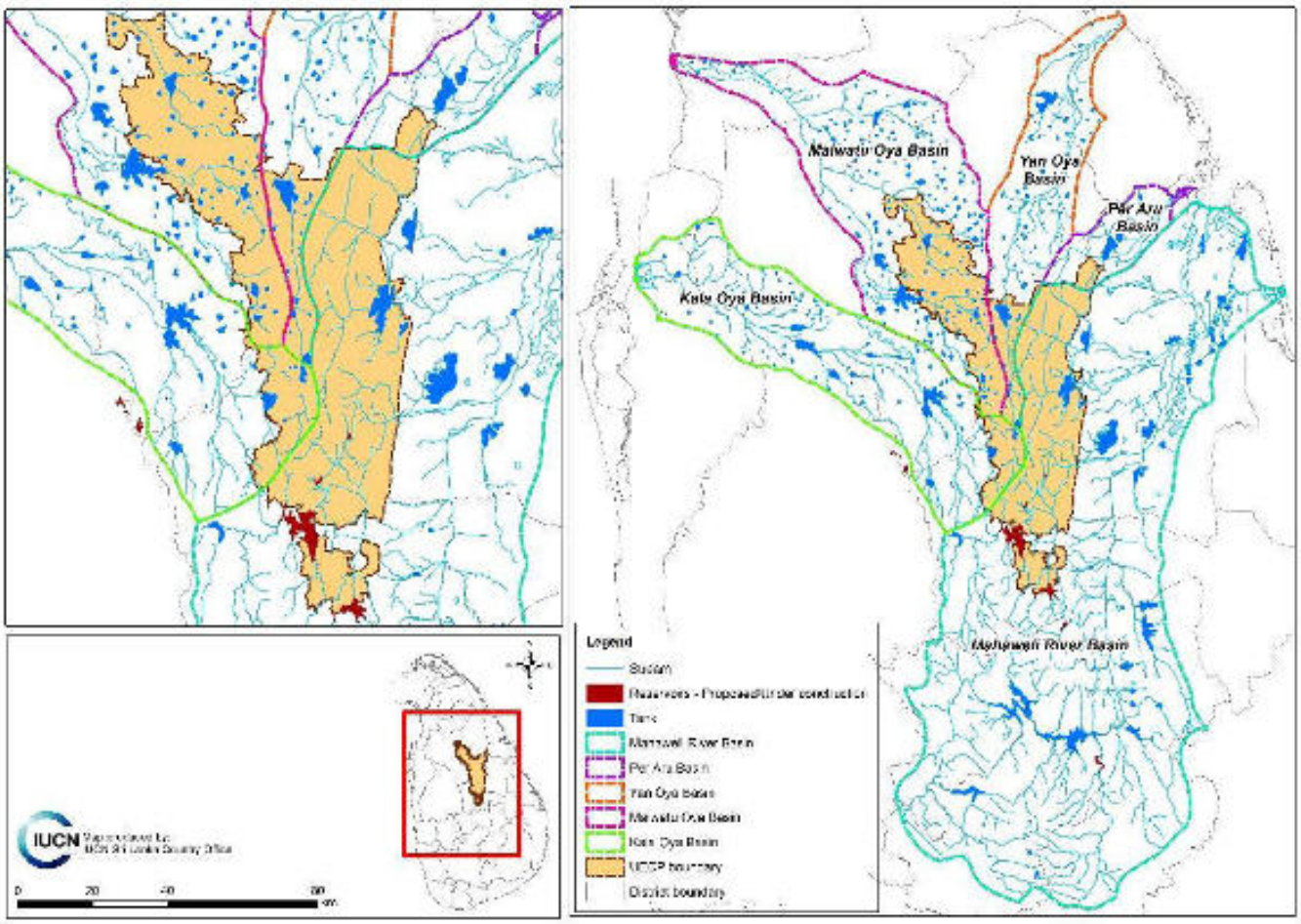


Figure 1. Location of the UEC Project

Water will be transferred from the Kalu Ganga reservoir to Moragahakanda, by the Kalu Ganga Moragahakanda Transfer Canal (KMTC). The Upper Elahera Canal (UEC) will then transfer water from Moragahakanda to Mahakanadarawa, via Mannankattiya Reservoir and Eru Wewa. It also will discharge water to Hurulu Wewa.

The main objective of the project is to provide increased water supplies to about 10,000 ha of land in water-deficit areas in the North Central Province of Sri Lanka. The water diverted will be used to augment three tanks in the upper Malwathu Oya basin and one in the Yan Oya basin. This augmentation will increase the cropping intensity of approximately 10,000 ha of land from the current level of 1.2 to 1.8 once the project is completed in 2021. The targeted cultivation areas are the command areas of:

- Mannakkattiya Reservoir (Malwathu Oya basin);
- Eru Wewa (Malwathu Oya basin);
- Mahakanadarawa Reservoir (Malwathu Oya basin); and
- Hurulu Wewa (Yan Oya basin).

1.2 Environmental impacts of the UEC project

Whilst the above activities will enhance the water availability for agriculture, thereby increasing agricultural production, as well as improving the socio-economic status of communities, the project will also have significant short and long-term environmental impacts, especially on the wildlife that inhabits the project affected area.

During the formulation of the EIA, several mitigation changesmeasures were incorporated made project design to minimise impacts on the environment, such as (i) decreasing the length of the UEC within protected areas and where ever the terrain was steep (ii) changing the design from open canals to buried tunnels within protected areas and iii) changing from drilling and blasting to use of a tunnel boring machine for tunnel excavation, which has less negative environmental impacts than blasting.

However, both the KMTC and the UEC will pass through protected areas under the jurisdiction of both the Forest Department (FD) and the Department of Wildlife Conservation (DWC) and therefore, will have a substantial influence on the wildlife in the area. Sixty-eight percent of the UEC canal passes through protected areas. These are Elahera-Giritale Sanctuary, Minneriya Giritale Nature Reserve, Minneriya National Park (under the jurisdiction of the Department of Wildlife Conservation) and Hurulu Forest Reserve (under the jurisdiction of the Forest Department). Of these, the Elahera-Giritale Sanctuary will be most affected, as 40% of the canal trace passes through this sanctuary as an open canal or cut and cover sections. Here 120 ha of natural habitat will be lost (1% of the entire sanctuary). However, Minneriya National Park and Hurulu Forest Reserve are the least affected as in these areas the trace is an underground tunnel.

Based on the findings of the EIA study conducted for the NCP canal project and inception report submitted by IUCN in September 2016 three major impacts on wildlife have been identified.

These include:

Loss of habitat

The construction of the two major canals and associated structures will result in an estimated 160 ha of habitat loss in the Elahera-Giritale Sanctuary; as well as 15 ha in Minneriya National Park. In addition to this, impacts on Minneriya –Giritale Nature Reserve and Minneriya National Park due to construction activities are not significant. The canal will pass as an underground tunnel in parts of the Elehera –Giritale Sanctuary, Minneriya –Giritale Nature Reserve and along the border of Minneriya National Park.

Habitat fragmentation and loss of critical species

The project will result in the establishment of the KMTC and the UEC with estimated lengths of 9.2 km and 65.5 km respectively. Establishment of these canals will have two main impacts on the wildlife that is found in the habitats traversed by the open canal sections. Firstly, it will impair the free movement of terrestrial species, as the canal will function as a direct physical barrier. Secondly, animals attempting to cross the canal may fall into the canal, resulting in injury or death to such animals. The establishment of the canal other than the tunnel sections will also result in removal of vegetation present along the canal trace. These areas may be inhabited by critical species (rare, endemic or threatened species),

which are incapable of moving out of these areas without human assistance and therefore, will perish resulting in local or total extirpation of such species.

Escalation of Human-elephant Conflict

The area that will receive water under the project can be classified as a medium Human-elephant Conflict (HEC) area, especially the command areas of the Mahakanadarawa, Hurulu Wewa, Manakkatiya Wewa and Eru Wewa that will receive increased irrigation water under the project and the settlements and cultivations located near the Elahera-Giritale Sanctuary. The UEC project, which will enhance irrigation water availability in for the Hurulu wewa, Eru Wewa and Manakkatiya Wewa, will result in a change in the cropping intensity in the command areas of these tanks and therefore will lead to an escalation of the human-elephant conflict, which, in turn, will result in the reduction of the project benefits.

Therefore, one of the conditions imposed by the project approving agency — the Central Environmental Authority (CEA) — during project approval is to prepare and implement a Human-elephant Conflict Management Plan (HECMP), with a special emphasis on mitigation of human-elephant conflict in the area. The project proponent, in turn, contracted IUCN, Sri Lanka Country Office to prepare the said HECMP which will be completed in June 2017.

However, since the project proponent has indicated that work under the package I (a 3 km stretch from Moragahakanda reservoir or Kongetiya tank), needs to be undertaken before the completion of HECMP, it was agreed to undertake some of the work that should be done during stage 2 of the WMP such as translocation and transplanting of animal and plant species that are of conservation significance that inhabits the area affected by the project will be undertaken during Stage 1. Therefore, this study was undertaken to investigate the area affected by the package I (a 3.5 km stretch from Moragahakanda reservoir or Kongetiya tank), to determine whether there are any critical habitats or species in the areas impacted by the construction work under package 1 and if so to make changes in the construction corridor to avoid the impact and failing that to translocate/ transplant any critical species to a suitable location(s).

1.3 Objective

Objective of the present study is to identify whether the area affected by package I (a 3.5 km stretch from Moragahakanda reservoir or Kongetiya tank) will have a significant impact on critical habitats or species and if such an impact (s) was identified, to provide recommendations to avoid or minimize such impacts.

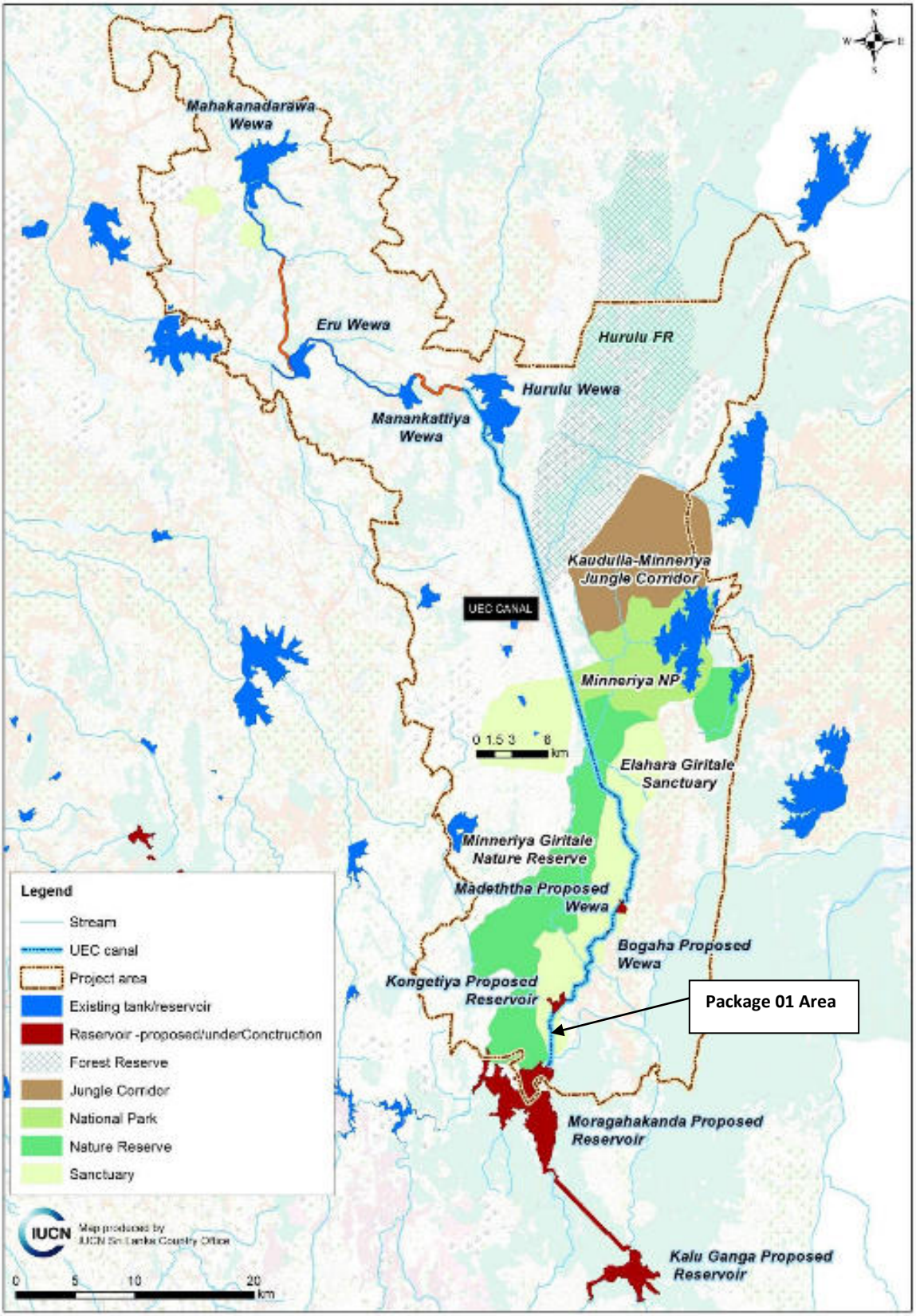


Figure 1. UEC trace with package 01 area

2. METHODOLOGY

The aim of this study has been to identify the anticipated impacts that would arise due to habitat clearance in order to establish the 3.5 m long segment of the Upper Elahara Canal starting from Moragahakanda reservoir to Kongetiya Tank under package 1.

The total length of the canal trace established under package 1 is 3.5 km long of which the first 0.75 km will pass through an already cleared or disturbed area for the construction work of Moragahakanda reservoir. The impacts arising due to this segment is already covered by the wildlife management plan of the Moragahakanda reservoir project and therefore not considered under this activity. The field investigations were carried out in the rest of the canal trace up to the Kongetiya tank.

Flora

Floral species found along the trace of the proposed UEC canal from Moragahakanda reservoir to Kongetiya Tank was studied. Species identification was based on the current field identification books listed in Table 1 as well as comparison with herbarium specimens.

Table 1: Key references used for the identification and classification of flora

Subject	Source
Invasive species	MoE 2015
Taxonomic identification	Ashton *et al.* 1997; Dassanayake and Fosberg (1980 - 1991); Dassanayake *et al.* (1994-1995); Dassanayake and Clayton (1996 -1999), Senaratne, 2001; Vlas and Vlas, 2008 & 2013.
Medicinal value	Sugathadasa *et al.* 2008.
Plant classification and conservation status	MoE, 2012.

Fauna

Faunal species were recorded by direct observation in most cases supplemented with indirect observations. Aquatic fauna as well as aquatic associates faunal species was studied based on visual observations made from the banks of the stream. Seasonal streams which cross the canal trace was filled with water due to heavy rains that prevailed during the sampling period, triggering upstream migration of fish that were observed in abundance in isolated pools. Such, fish was identified based on visual observations or when this was not possible they were collected using hand nets for the purpose of identification. Species identification was done by using the most recent field identification guides listed in Table 2.

Table 2: Key references used for the identification and classification of fauna

Subjects		Reference Source
Species Identification	**Aquatic snails**	Raheem and Naggs, 2006
	Dragonflies	Bedjanic *et al.* 2007; Bedjanic *et al.* 2014.
	Butterflies	D' Abrera, 1998; Jayasinghe *et al.,* 2013.
	Reptiles	Somaweera, 2006; Somaweera and Somaweera, 2009
	Birds	Harrison, 1999; **Warakagoda, et al., 2012**
	Mammals	Phillips, 1935; Kotagama and Goonatilake, 2013.
Nomenclature		MoE, 2012.
Conservation status		MoE, 2012.

Species Prioritization

The critical species such endemic and/or threatened species of plants and animals that show low mobility observed in the area that is identified for land clearing or seasonal streams whose flow regime is likely to be disturbed were evaluated to identify whether any of these species require translocation or transplantation to a safer site before commencing the construction work. The process of selection of priority species is a means by which species are shortlisted for translocation or transplanting. This is done based on a multi criteria analysis. For each criterion, a score is assigned based on several sub criteria. Each species was scored against the criteria, and those that receive a higher score are chosen for translocation/ transplantation.

Criteria used for flora

1. **Status of the species:** indigenous (1); common endemic or common new spp. (2); restricted endemic or restricted new spp. (3) point endemic or point new spp. (4).
2. **Distribution**: island wide (0), 4 bioclimatic zones (1); 3 bioclimatic zones (2); 2 or 1 bioclimatic zones (3); 1 Bioclimatic zone and restricted to project area (4).
3. **Use value**: Non-use (0); crop wild relative (3); other use (3); crop wild relative and other use (4)
4. **Conservation**: Nationally NT (1); Nationally DD/NE (2); Nationally VU (3); Nationally EN (4); Nationally CR (5); Nationally CR (PE) (6); Globally NT (1.5); Globally DD/NE (2.5); Globally VU (3.5); Globally EN (4.5); Globally CR (5.5); Globally CR (PE) (6.5).

Criteria used for fauna

1. **Status of species:** indigenous (1); common Endemic or common new spp. (2); restricted Endemic or restricted new spp. (3); point endemic or point new spp. (4).

2. **Distribution**: islandwide (0); 4 bioclimatic zones (1); 3 bioclimatic zones (2); 2 or 1 bioclimatic zones (3); 1 bioclimatic zone and restricted to project area (4).
3. **Impact of Project**: Positive impact (-2); no impact (0); negative impact (+2).
4. **Conservation**: Nationally NT (1); Nationally DD/NE (2); Nationally VU (3); Nationally EN (4); Nationally CR (5); Nationally CR (PE) (6); Globally NT (1.5); Globally DD/NE (2.5); Globally VU (3.5); Globally EN (4.5); Globally CR (5.5); Globally CR (PE) (6.5)

Species that receive a score of 10 or above based on the above analysis should be translocated or transplanted to suitable safer location. The methodology that should be followed for translocation or transplantation of species is given in Annex III.

3. Results

Based on the field surveys, EIA report and literature review following wildlife related issues have been identified.

A. loss of habitat

Approximately 12.5 hectares of habitats will be destroyed due to clearance of forest land within the Elehara-Giritale Sanctuary. Following habitat types have been identified along the canal trace that will be established under package 1.

1. Moist-mixed evergreen forests (Intermediate Forest)
2. Grasslands
3. Seasonal Streams
4. Rock outcrop forests
5. Scrublands

B. Habitat fragmentation and loss of critical species

The 2.5 kilometer stretch of canal (approximately 50 meter wide) that passes through the natural vegetation will be temporally fragmented. However, since this section is designed to be built as a cut and cover section the fragmentation effect will take place only during the construction phase of the project.

C. Impact on critical Species

A total of 147 faunal species and 131 plant species were recorded along the canal trace that will be impacted due to the construction work under the package 1 of the UEC project. The fauna recorded included 22 endemic species and 11 threatened species including one Critically Endangered species of fish *Devario cf. aequipinnatus*.

Table 3. Summary of faunal species observed in the areas affected by the package I of UECP

Taxonomic Group	Recorded from Sri Lanka										
	Total	Native	Endemic	Migrant	Exotic	CR (PE)	CR	EN	VU	NT	DD
Land snails	4	4	2	0	0	0	0	2	0	1	0
Dragonflies	7	7	0	0	0	0	0	0	0	2	0

Taxonomic Group	Recorded from Sri Lanka										
	Total	Native	Endemic	Migrant	Exotic	CR (PE)	CR	EN	VU	NT	DD
Butterflies	33	33	1	0	0	0	0	0	1	1	0
Crabs	1	1	1	0	0	0	0	1	0	0	0
Fishes	3	3	2	0	0	0	1	0	1	0	0
Amphibians	3	3	1	0	0	0	0	1	0	0	0
Reptiles	9	9	5	0	0	0	0	1	0	1	0
Birds	74	56	9	9	0	0	0	0	0	3	0
Mammals	13	12	1	0	0	0	0	1	2	2	0
Total	147	137	22	9	0	0	1	6	4	10	0

The 131 plant species recorded along the canal trace included 9 species that are endemic to Sri Lanka and 14 species listed as nationally threatened. Further, 9 species of exotic plants including 2 invasive alien plant species were also recorded. The detailed list of flora and fauna observed in the area that will be directly impacted due to construction work under package 1 are given in Annex 1 and 2 respectively.

Critical Species analysis:

Fauna: Altogether 12 species of fauna that are listed as endemic or threatened and will not be able to move out from the zone of disturbance without assistance was subjected for the critical species analysis (refer table 4). Four species of fauna were identified as species that require translocation from the area that will be subjected to vegetation clearance.

Table 4. Species prioritization for Endemic and/or Threatened Animal Species

Species Name	Common Name	End.	Con. Status	Dist.	Impact	Total
Euplecta layardi	Land Snail	2	3	3	2	10
Cyclophorus involvulus	Land Snail	0	3	3	2	8
Theobaldius parma	Land Snail	2	3	3	2	10
Oziothelphusa minneriyaensis	Freshwater Crab	2	4	2	2	10
Devario cf . aequipinnatus	Knuckles Danio	2	5	2	0	9

Species Name	Common Name	End.	Con. Status	Dist.	Impact	Total
Garra ceylonensis	Stone sucker	1	2	1	0	4
Microhyla mihinthalai	Red narrow mouth frog	1	0	1	0	2
Calotes ceylonensis	Painted lip lizard	1	1	2	2	6
Otocryptis nigristigma	Black spotted kangaroo lizard	1	0	2	2	5
Eutropis greeri	Bronze-green little skink	1	2	2	2	7
Lankascincus fallax	Common lanka skink	1	0	1	2	4
Rhinophis philippinus	Cuvier's earth snake	2	4	3	2	11

Flora: Altogether 21 species of plants that are listed as endemic or threatened was subjected for the critical species analysis (refer table 5). Only a single plant species was identified as species that require transplantation from the area that will be subjected to vegetation clearance.

Table 5. Species prioritization for Endemic and/or Threatened Plant Species

Family	Species	Common Name	Status	Dist	Use	Con. St.	Total
Achariaceae	*Hydnocarpus venenata*	Makulu	1	1	0	0	2
Amaryllidaceae	*Crinum latifolium*	Goda manel	0	1	0	3	3
Anacardiaceae	*Mangifera zeylanica*	Atamba	1	1	3	0	5
Annonaceae	*Uvaria sphenocarpa*		1	0	0	0	1
Begoniaceae	*Begonia cordifolia*	Gal-ambala	0	1	0	3	4
Celastraceae	*Cassine congylos*		1	2	0	3	6
Celastraceae	*Salacia oblonga*	Himbutu	0	1	3	4	8
Ebenaceae	*Diospyros ebenoides*	Kalu-habaraliya	1	1	3	4	8
Ebenaceae	*Diospyros ebenum*	kaluwara	0	1	3	4	8
Fabaceae	*Dendrolobium triangulare*		0	3	3	4	10
Fabaceae	*Derris parviflora*	Kala-wel	1	1	0	0	2

Family	Species	Common Name	Status	Dist	Use	Con. St.	Total
Loganiaceae	*Strychnos benthamii*		1	1	0	1	3
Loganiaceae	*Strychnos potatorum*	Ingini	0	0	3	3	6
Orchidaceae	*Vanda spathulata*		0	3	0	3	6
Phyllanthaceae	*Margaritaria indica*	Karawu	0	1	0	3	4
Phyllanthaceae	*Sauropus rigidus*	Ginihiriya	1	0	0	1	2
Rubiaceae	*Canthium puberulum*		1	1	0	1	3
Rubiaceae	*Psilanthus wightianus*		0	1	0	3	4
Rutaceae	*Chloroxyclon swietania*	Burutha	0	1	3	3	7
Sapotaceae	*Manilkara hexandra*	Palu	0	1	3	3	7
Zingiberaceae	*Curcuma oligantha*		0	1	3	3	7

D. Escalation of Human-Elephant Conflict

Based on the previous observations of the EIA report of project and observations made during the present study, high elephant presence was observed in the canal trace. The free movement of these elephants is significantly affected due to the construction work of the Moragahakanda reservoir and settlements in the Elahera area. Construction of UEC will further aggravate this situation as it will create a bottle neck in the elephant corridor established between the Elehara-Girithale Sanctuary and forested areas of the Moragahakanda. Total width of this bottle necked stretch is approximately 500 meters and the Moragahakanda project office complex is located towards western end of this area. Naula-Elahera road is also located in this narrow forested area that elephants can use to cross over to the Elehara-Girithale Sanctuary. Therefore, the existing level of human-elephant conflict is likely to escalate due to proposed land clearance activities that will be carried out under the package 1 of UEC.

Map 2 - Map showing the bottle neck created for elephant movement and the possible impact of the UEC package 1 on the free movement of Elephants

RECOMMENDATIONS TO MITIGATE POTENTIAL IMPACT ON THE WILDLIFE INHABITING THE PROJECT AFFECTED AREA OF THE PACKAGE 1 OF UECP

A. Mitigation measures for the impact on habitats

- Habitat destruction should be minimized during the construction period and it is proposed to use existing road network as much as possible to access the canal trace.
- Restore habitats with native species is vital after the construction work. It is recommended to establish the same habitat types that existed on the canal trace before the vegetation clearance is undertaken for construction work during the restoration phase. For example grassland areas should not be converted to forest after the constructions, but restored as grasslands.
- If natural waterways or seasonal streams are affected due to construction work the streams should be restored to the preconstruction state after the construction work. Contractors should map the stream path using a GPS to facilitate identification of the original stream path after construction work is completed.
- It is recommended to implement Invasive Alien Plant species control/management programme during and after the construction period. A special emphasis should be given to control of IAS during the post project restoration period.

B. Mitigation measures for Habitat fragmentation and loss of critical species

Fragmentation of Habitat:

The fragmentation effect will be limited to the construction period as this section of the canal will be cut and cover type. Therefore, once the construction is completed the canal trace should be restored once the construction is completed.

Loss of critical species:

Based on the critical species analysis four species of animals and one plant species observed in the canal trace was identified as species that require translocation/transplantation. However, it is recommended that during vegetation clearing if an animal that is not listed below but would need assistance to move out of the disturbance area should be translocated out of the canal trace opportunistically. Since the canal trace is established inside a protected area translocation or transplantation can take place within the Elehara-Girithale Sanctuary. It is recommended that this translocation/ transplantation should be done on the right bank, beyond 1 km from the channel trace, an area which is less likely to be disturbed due to construction activity. It should be noted that translocation of animals should be done immediately prior to vegetation clearance is undertaken to prevent recolonization of the cleared areas.

Species Name	Common Name	Remarks
Euplecta layardi	Land Snail	This species is nocturnal and therefore night sampling may be required
Theobaldius parma	Land Snail	This species is nocturnal and therefore night sampling

Species Name	Common Name	Remarks
		may be required
Oziothelphusa minneriyaensis	Freshwater Crab	Freshwater crabs live in seasonal streams even during the dry season. Therefore, stream bed will have to be explored to collect them.
Rhinophis philippinus	*Cuvier's earth snake*	Generally found underneath rocks and leaf litter Therefore, litter clearance and turning over rocks and logs on the forest floor will be required to collect this species
Dendrolobium triangulare		This is a rare plant species and translocation will have to be done during the wet season. If it is not possible the plant must be maintained in a nursery until the onset of the wet season

C. Mitigation measures for the Human-Elephant Conflict

It is recommend to implement the recommendations given in the EIA report to minimize the human elephant conflict.

- Supply roads and any other disturbances should be limited to the left bank of the proposed canal as that area already contains supply roads. Construction of the proposed supply roads on the right bank of the first two kilometers of the proposed package 1 area should be avoided as this may block the free movements of elephants leading to the escalation of the conflict.
- It is recommended to manage the Giant Mimosa infestation in the newly constructed tank under the package 1 area to increase the food availability to elephants.
- Strengthening and continuous monitoring of the electric fence which is located along the package 1 area.
- Establish a temporary electric fence around the excavated areas to avoid accidental falling of elephants into open ditches.
- Limit noise generating activities to day time to reduce disturbance to free movement of elephants.

Further to above recommendations, design features which have been already incorporated to UEC project will help to mitigate Human elephant conflict. Water bodies and ponding areas which are created by level crossings (Kongetiya. Bogaswewa and Madaththawa) incorporated into the UEC will help to improve the access to water for wildlife. The design modification that enables large animals to climbs down into the canal from the side of the protected area but preventing them from climbing out from the side of the settlement. Creation of small reservoirs for wildlife is especially important during the dry season.

The UEC, at some points, acts as a barrier to wild animals and act as a barrier to further encroachment by people into protected areas where the canal runs along the borders.

ANNEX 1 – DETAILED LIST OF FAUNA RECORDED IN PACKAGE 1 AFFECTED AREA OF THE UEC PROJECT

Mollusks

Family	Scientific Name	SpS	CoS	0m to 900m	900m 2900m	2900m 3800m
Ariophantidae	*Euplecta layardi*	END	EN	0	1	0
Cyclophoridae	*Cyclophorus involvulus*	IND	EN	0	1	1
Cyclophoridae	*Theobaldius parma*	END	EN	0	1	1
Cyclophoridae	*Pterocyclus cumingi*	IND	NT	0	1	1

Dragonflies

Family	Scientific Name	English Name	SpS	CoS	0m 900m	900m 2900m	2900m 3800m
Libellulidae	*Lathrecista asiatica*	Pruinosed Bloodtail	IND	NT	0	1	1
Libellulidae	*Orthetrum sabina*	Green Skimmer	IND	LC	0	0	1
Libellulidae	*Brachythemis contaminata*	Asian Groundling	IND	LC	0	1	1
Libellulidae	*Diplacodes trivialis*	Blue Percher	IND	LC	0	1	0
Libellulidae	*Neurothemis intermedia*	Paddyfield Paraspl	IND	NT	0	1	1
Libellulidae	*Pantala flavescens*	Wandering Glider	IND	LC	1	1	0
Libellulidae	*Tramea limbata*	Sociable Glider	IND	LC	1	1	0

Butterflies

Family	Scientific Name	English Name	SpS	CoS	0m 900m	900 2900m	2900 3800m
Papilionidae	*Graphium agamemnon*	Green jay	IND	LC	0	1	1
Papilionidae	*Pachliopta aristolochiae*	Common rose	IND	LC	0	1	1
Papilionidae	*Pachliopta hector*	Crimson rose	IND	LC	0	1	1
Papilionidae	*Papilio crino*	Banded peacock	IND	VU	0	1	1
Papilionidae	*Papilio demoleus*	Lime butterfly	IND	LC	0	1	1
Papilionidae	*Papilio polymnestor*	Blue mormon	IND	LC	0	0	1
Papilionidae	*Papilio polytes*	Common mormon	IND	LC	0	1	1
Pieridae	*Appias galane*	Lesser albatross	**END**	LC	0	1	0
Pieridae	*Catopsilia pomona*	Lemon emigrant	IND	LC	0	1	0
Pieridae	*Catopsilia pyranthe*	Mottled emigrant	IND	LC	0	1	0
Pieridae	*Cepora nerissa*	Common gull	IND	LC	0	1	1
Pieridae	*Delias eucharis*	Jezebel	IND	LC	1	1	1
Pieridae	*Eurema hecabe*	Common grass yellow	IND	LC	0	1	0
Pieridae	*Ixias pyrene*	Yellow orange tip	IND	LC	0	1	1
Nymphalidae	*Acraea violae*	Tawny costor	IND	LC	0	1	0
Nymphalidae	*Danaus chrysippus*	Plain tiger	IND	LC	0	1	1
Nymphalidae	*Danaus genutia*	Common tiger	IND	LC	0	0	1
Nymphalidae	*Euploea core*	Common crow	IND	LC	0	0	1
Nymphalidae	*Euploea klugii*	Brown king crow	IND	LC	0	0	1
Nymphalidae	*Euploea sylvester*	Double-banded crow	IND	NT	0	1	1
Nymphalidae	*Hypolimnas bolina*	Great eggfly	IND	LC	0	1	1
Nymphalidae	*Hypolimnas misippus*	Danaid Eggfly	IND	LC	0	0	1
Nymphalidae	*Junonia almana*	Peacock pansy	IND	LC	0	1	1
Nymphalidae	*Junonia atlites*	Grey pansy	IND	LC	0	1	1

Family	Scientific Name	English Name	SpS	CoS	0m 900m	900 2900m	2900 3800m
Nymphalidae	*Junonia iphita*	Chocolate soldier	IND	LC	0	1	1
Nymphalidae	*Junonia lemonias*	Lemon pansy	IND	LC	0	1	1
Nymphalidae	*Melanitis leda*	Common evening brown	IND	LC	0	0	1
Nymphalidae	*Neptis hylas*	Common sailor	IND	LC	0	0	1
Nymphalidae	*Parantica aglea*	Glassy tiger	IND	LC	0	1	1
Nymphalidae	*Tirumala limniace*	Blue tiger	IND	LC	0	1	0
Nymphalidae	*Ypthima ceylonica*	White four-ring	IND	LC	0	1	0
Lycaenidae	*Chilades lajus*	Lime Blue	IND	LC	0	1	0
Lycaenidae	*Leptotes plinius*	Zebra Blue	IND	LC	1		

Freshwater Crabs

Family	Scientific Name	SpS	CoS	0 to 900m	900 2900m	2900 3800m
Gecarcinucidae	*Oziothelphusa minneriyaensis*	**END**	EN	1	1	1

Freshwater Fishes

Family	Scientific Name	English Name	SpS	CoS	0m 900m	900 2900m	2900 3800m
Cyprinidae	*Devario cf . aequipinnatus*	Knuckles Danio	END	CR	0	1	0
Cyprinidae	*Garra ceylonensis*	Stone sucker	END	VU	0	1	0
Cyprinidae	*Rasbora microcephalus*	Thin line Rasbora	IND	LC	0	1	0

Amphibians

Family	Scientific Name	English Name	SpS	CoS	0m 900m	900 2900m	2900 3800m
Microhylidae	*Microhyla mihinthalai*	Red narrow mouth frog	**END**	LC	0	0	1
Dicroglossidae	*Euphlyctis cyanophlyctis*	Skipper frog	IND	LC	0	1	1
Dicroglossidae	*Zakerana shyadrensis*	Common paddy field frog	IND	LC	1	1	1

Reptiles

Family	Scientific Name	English Name	SpS	CoS	0m 900m	900 2900m	2900 3800m
Agamidae	*Calotes calotes*	Green garden lizard	IND	LC	0	1	0
Agamidae	*Calotes ceylonensis*	Painted lip lizard	END	NT	0	1	1
Agamidae	*Otocryptis nigristigma*	Black spotted kangaroo lizard	END	LC	0	0	1
Gekkonidae	*Hemidactylus frenatus*	Common house-gecko	IND	LC	0	0	1
Scincidae	*Eutropis greeri*	Lowland Bronzegreen little skink	END	NE	0	0	1
Scincidae	*Lankascincus fallax*	Common lankaskink	END	LC	0	1	0
Varanidae	*Varanus bengalensis*	Land monitor	IND	LC	0	1	0
Varanidae	*Varanus salvator*	Water monitor	IND	LC	0	1	0
Uropeltidae	*Rhinophis philippinus*	Cuvier's earth snake	END	EN	0	1	0

Birds

Family	Scientific Name	English Name	SpS	CoS	0m 900m	900 2900m	2900 3800m
Phasianidae	*Gallus lafayetii*	Sri Lanka Junglefowl	END	LC	0	1	1
Phasianidae	*Pavo cristatus*	Indian Peafowl	BrR	LC	0	1	1
Picidae	*Dinopium psarodes*	Sri Lanka Lesser Flameback	END	LC	0	1	0
Ramphastidae	*Megalaima zeylanica*	Brown-headed Barbet	BrR	LC	1	1	1
Ramphastidae	*Megalaima rubricapilla*	Crimson-fronted Barbet	Pro: END	LC	1	1	1
Ramphastidae	*Megalaima haemacephala*	Coppersmith Barbet	BrR	LC	1	1	1
Bucerotidae	*Ocyceros gingalensis*	Sri Lanka Grey Hornbill	END	LC	0	1	0
Bucerotidae	*Anthracoceros coronatus*	Malabar Pied Hornbill	BrR	LC	0	1	1
Alcedinidae	*Alcedo atthis*	Common Kingfisher	BrR	LC	0	1	0
Alcedinidae	*Pelargopsis capensis*	Stork-billed Kingfisher	BrR	LC	0	1	0
Meropidae	*Merops orientalis*	Green Bee-eater	BrR	LC	1	1	1
Meropidae	*Merops philippinus*	Blue-tailed Bee-eater	BrRWV	NE	1	1	1
Cuculidae	*Cuculus micropterus*	Indian Cuckoo	SU	NE	1	1	1
Cuculidae	*Cacomantis sonneratii*	Banded Bay Cuckoo	BrR	NT	0	0	1
Cuculidae	*Chrysococcyx maculatus*	Asian Emarald Cuckoo	WVa	NE	0	1	0
Cuculidae	*Eudynamys scolopacea*	Asian Koel	BrR	LC	0	1	0
Cuculidae	*Centropus sinensis*	Greater Coucal	BrR	LC	1	1	1
Psittacidae	*Psittacula krameri*	Rose-ringed Parakeet	BrR	LC	1	1	1
Apodidae	*Cypsiurus balasiensis*	Asian Palm Swift	BrR	LC	1	1	1
Hemiprocnidae	*Hemiprocne coronata*	Crested Treeswift	BrR	LC	1	1	1
Columbidae	*Streptopelia chinensis*	Spotted Dove	BrR	LC	1	1	1
Columbidae	*Chalcophaps indica*	Emerald Dove	BrR	LC	0	1	1
Columbidae	*Treron pompadora*	Pompadour Green-pigeon	Pro: END	LC	0	1	0
Columbidae	*Ducula aenea*	Green Imperial Pigeon	BrR	LC	0	0	1
Burhinidae	*Esacus recurvirostris*	Great Thick-knee	BrR	LC	0	1	0
Charadriidae	*Vanellus indicus*	Red-wattled Lapwing	BrR	LC	0	1	0
Accipitridae	*Haliastur indus*	Brahminy Kite	BrR	LC	0	1	0
Accipitridae	*Spilornis cheela*	Crested Serpent Eagle	BrR	LC	1	1	1
Accipitridae	*Ictinaetus malayensis*	Black Eagle	BrR	NT	0	1	0
Ardeidae	*Egretta garzetta*	Little Egret	BrR	LC	0	1	0
Ardeidae	*Ardea purpurea*	Purple Heron	BrR	LC	0	1	0
Ardeidae	*Casmerodius albus*	Great Egret	BrR	LC	0	1	0
Ardeidae	*Ardeola grayii*	Indian Pond Heron	BrR	LC	0	1	0
Chloropseidae	*Chloropsis jerdoni*	Blue-winged Leafbird	BrR	LC	1	1	1
Laniidae	*Lanius cristatus*	Brown Shrike	WV	NE	1	1	1
Artamidae	*Artamus fuscus*	Ashy Woodswallow	BrR	LC	0	1	0
Oriolidae	*Oriolus xanthornus*	Black-hooded Oriole	BrR	LC	1	1	1
Dicruidae	*Dicrurus caerulescens*	White-bellied Drongo	BrR	LC	0	1	1
Dicruidae	*Dicrurus paradiseus*	Great Racket-tailed Drongo	BrR	NT	0	0	1
Monarchidae	*Hypothymis azurea*	Black-naped Monarch	BrR	LC	0	1	1
Monarchidae	*Terpsiphone paradisi*	Asian Paradise-flycathcher	BrR/WV	LC	0	1	1
Corvidae	*Corvus levaillantii*	Large-billed Crow	BrR	LC	0	0	1
Campephagidae	*Coracina melanoptera*	Black-headed Cuckooshrike	BrR	LC	0	1	0
Campephagidae	*Pericrocotus flammeus*	Scarlet Minivet	BrR	LC	0	1	0
Campephagidae	*Tephrodornis pondicerianus*	Common Woodshrike	Pro: END	LC	0	1	1

Family	Scientific Name	English Name	SpS	CoS	0m 900m	900 2900m	2900 3800m
Aegithinidae	*Aegithina tiphia*	Common Iora	BrR	LC	1	1	1
Muscicapidae	*Muscicapa daurica*	Asian Brown Flycatcher	WV	NE	1	1	1
Muscicapidae	*Cyornis tickelliae*	Tickell's Blue Flycatcher	BrR	LC	0	1	1
Muscicapidae	*Copsychus saularis*	Oriental Magpie Robin	BrR	LC	0	1	1
Muscicapidae	*Copsychus malabaricus*	White-rumped Shama	BrR	LC	1	1	1
Muscicapidae	*Saxicoloides fulicata*	Indian Robin	BrR	LC	1	0	1
Sturnidae	*Acridotheres tristis*	Common Myna	BrB	LC	0	1	1
Hirundinidae	*Hirundo rustica*	Barn Swallow	WV	NE	1	1	1
Hirundinidae	*Hirundo daurica*	Red-rumped Swallow	Pro: END	LC	1	0	0
Pycnonotidae	*Pycnonotus melanicterus*	Black-crested Bulbul	Pro: END	LC	0	1	0
Pycnonotidae	*Pycnonotus cafer*	Red-vented Bulbul	BrR	LC	0	1	1
Pycnonotidae	*Pycnonotus luteolus*	White-browed Bulbul	BrR	LC	0	1	1
Cisticolidae	*Prinia hodgsonii*	Grey-breasted Prinia	BrR	LC	0	1	0
Cisticolidae	*Prinia sylvatica*	Jungle Prinia	BrR	LC	0	1	1
Cisticolidae	*Prinia socialis*	Ashy Prinia	BrR	LC	0	1	1
Zosteropidae	*Zosterops palpebrosus*	Oriental White-eye	BrR	LC	0	0	1
Sylviidae	*Acrocephalus dumetorum*	Blyth's Reed Warbler	WV	NE	0	1	1
Sylviidae	*Orthotomus sutorius*	Common Tailorbird	BrR	LC	1	1	1
Sylviidae	*Phylloscopus trochiloides*	Greenish Warbler	WV	NE	0	1	1
Sylviidae	*Phylloscopus magnirostris*	Large-billed Leaf Warbler	WV	NE	0	1	1
Timalidae	*Pellorneum fuscocapillum*	Sri Lanka Brown-capped Babbler	END	LC	0	1	1
Timalidae	*Dumetia hyperythra*	Tawny-bellied Babbler	BrR	LC	1	0	0
Timalidae	*Turdoides affinis*	Yellow-billed Babbler	BrR	LC	0	1	1
Dicaeidae	*Dicaeum erythrorhynchos*	Pale-billed Flowerpecker	BrR	LC	1	1	1
Nectariniidae	*Nectarina zeylonica*	Purple-rumped Sunbird	BrR	LC	1	1	1
Nectariniidae	*Nectarina asiatica*	Purple Sunbird	BrR	LC	1	1	1
Motacillidae	*Dendronanthus indicus*	Forest Wagtail	WV	NE	0	0	1
Estrididae	*Lonchura striata*	White-rumped Munia	BrR	LC	1	1	1
Estrididae	*Lonchura punctulata*	Scaly-breasted Munia	BrR	LC	1	1	1

Mammals

Family	Scientific Name	English Name	SpS	CoS	0m 900m	900 2900m	2900 3800m
Cercopithecidae	*Semnopithecus priam*	Grey langur	IND	LC	1	1	0
Mustelidae	*Lutra lutra*	Otter	IND	VU	0	1	0
Elephantidae	*Elephas maximus*	Elephant	IND	EN	0	1	1
Bovidae	*Bubalus arnee*	Wild buffalo	IND	VU	0	0	1
Cervidae	*Axis axis*	Spotted deer	IND	LC	0	1	1
Cervidae	*Rusa unicolor*	Sambur	IND	NT	0	1	1
Cervidae	*Muntiacus muntjak*	Barking deer	IND	NT	0	1	1
Suidae	*Sus scrofa*	Wild boar	IND	LC	0	1	1
Tragulidae	*Moschiola meminna*	Sri Lanka mouse-deer	END	LC	0	1	1
Hystricidae	*Hystrix indica*	Porcupine	IND	LC	0	1	0
Sciuridae	*Funambulus palmarum*	Palm squirrel	IND	LC	1	1	1
Sciuridae	*Ratufa macroura*	Giant squirrel	IND	LC	0	1	1
Leporidae	*Lepus nigricollis*	Black-naped hare	IND	LC	0	1	1

ANNEX 2 – DETAILED LIST OF PLANTS RECORDED IN PACKAGE 1 AFFECTED AREA OF THE UEC PROJECT

Family	Species	Common Name	Status	NCS
Acanthaceae	*Barleria prionitis*	Katu Karandu	N	LC
Acanthaceae	*Elytraria acaulis*		N	LC
Acanthaceae	*Stenosiphonium cordifolium*	Bu nelu	N	LC
Achariaceae	*Hydnocarpus venenata*	Makulu	E	LC
Amaryllidaceae	*Crinum latifolium*	Goda manel	N	VU
Anacardiaceae	*Mangifera zeylanica*	Atamba	E	LC
Anacardiaceae	*Nothopegia beddomei*	Bala	N	LC
Annonaceae	*Alphonsea sclerocarpa*		N	NT
Annonaceae	*Miliusa indica*	Kekili Messa	N	LC
Annonaceae	*Polyalthia korinti*	Ul Kenda	N	LC
Annonaceae	*Uvaria sphenocarpa*		E	LC
Apocynaceae	*Calotropis gigantea*	Ela Wara	N	LC
Apocynaceae	*Carissa spinarum*	Heen-Karamba	N	LC
Apocynaceae	*Hemidesmus indicus*	Iramusu	N	LC
Apocynaceae	*Ichnocarpus frutescens*	Gerandi-Dul	N	LC
Apocynaceae	*Wattakaka volubilis*	Anguna	N	LC
Araceae	*Amorphophallus sylvaticus*		N	NT
Asparagaceae	*Asparagus racemosus*	Hatawariya	N	LC
Asteraceae	*Chromolaena odorata*	Podi singno maran	Ex	NE
Asteraceae	*Elephantopus scaber*	Eth adi	N	LC
Asteraceae	*Mikania cordata*	Wathu palu	Ex	NE
Asteraceae	*Vernonia cinerea*	Monorakudumbiya	N	LC
Asteraceae	*Xanthium indicum*	Wal-rambutang	N	LC
Begoniaceae	*Begonia cordifolia*	Gal-ambala	N	VU
Bignoniaceae	*Sterospermum colais*	Dunu-madala	N	LC
Boraginaceae	*Carmona retusa*	Heen-tambala	N	LC
Boraginaceae	*Cordia dichotoma*	Lolu	N	LC
Boraginaceae	*Ehretia laevis*		N	LC
Boraginaceae	*Heliotropium indicum*	Et-honda	N	LC
Capparaceae	*Crateva adansonii*	Lunuwarana	N	LC
Capparaceae	*Capparis rotundifolia*	Balal Katu	N	LC
Capparaceae	*Capparis zeylanica*	Wellangiriya	N	LC
Capparaceae	*Capparis sp.*			
Celastraceae	*Cassine congylos*		E	VU
Celastraceae	*Maytenus emarginata*		N	LC
Celastraceae	*Salacia oblonga*	Himbutu	N	EN
Colchicaceae	*Gloriosa superba*	Niyagala	N	LC
Combretaceae	*Terminalia arjuna*	Kumbuk	N	LC
Combretaceae	*Terminalia bellirica*	Bulu	N	LC
Commelinaceae	*Commelina diffusa*	Gira-pala	N	LC
Cucurbitaceae	*Momodica charantia*	Karavila	N	LC

Family	Species	Common Name	Status	NCS
Dioscoreaceae	*Dioscorea pentaphylla*	Katu-ala	N	LC
Dioscoreaceae	*Dioscorea sp.*			
Ebenaceae	*Diospyros ebenoides*	Kalu-habaraliya	E	EN
Ebenaceae	*Diospyros ebenum*	kaluwara	N	EN
Ebenaceae	*Diospyros malabarica*	Thimbiri	N	LC
Ebenaceae	*Diospyros oocarpa*	Kalu-Kadumberiya	N	NT
Ebenaceae	*Diospyros ovalifolia*	Kunumella	N	LC
Ebenaceae	*Diospyros vera*	Jabara	N	LC
Erythroxylaceae	*Erythroxylum moonii*	Bata-Kirilla	N	NT
Euphorbiaceae	*Croton aromaticus*	Wel-Keppetiya	N	LC
Euphorbiaceae	*Croton laccifer*	Keppetiya	N	LC
Euphorbiaceae	*Dimorphocalyx glabellus*	Weliwenna	N	LC
Euphorbiaceae	*Euphorbia antiquorum*	Daluk	N	LC
Euphorbiaceae	*Mallotus philippensis*	Hamparilla	N	LC
Euphorbiaceae	*Suregada lanceolata*		N	LC
Fabaceae	*Abrus precatorius*	Olinda	N	LC
Fabaceae	*Acacia caesia*	Hinguru-wel	N	LC
Fabaceae	*Bauhinia racemosa*	Maila	N	LC
Fabaceae	*Bauhinia tomentosa*	Kaha-Petan	N	LC
Fabaceae	*Cassia fistula*	Ehela	Ex	
Fabaceae	*Dendrolobium triangulare*		N	EN
Fabaceae	*Derris parviflora*	Kala-wel	E	LC
Fabaceae	*Erythrina fusca*	Yak-Earabadu	N	NT
Fabaceae	*Flemingia strobilifera*	Hampinna	N	LC
Hypoxidaceae	*Curculigo orchioides*	Bim thal	N	LC
Lamiaceae	*Hyptis suaveolens*	Ali thala	Ex	
Lamiaceae	*Gmelina asiatica*	Demata	N	LC
Lamiaceae	*Premna tomentosa*	Bu-Sera	N	LC
Lamiaceae	*Vitex altissima*	Milla	N	NT
Lauraceae	*Litsea glutinosa*	Bomi	N	LC
Loganiaceae	*Strychnos benthamii*		E	NT
Loganiaceae	*Strychnos potatorum*	Ingini	N	VU
Malvaceae	*Grewia damine*	Daminiya	N	LC
Malvaceae	*Grewia helicterifolia*	Bora-daminiya	N	LC
Malvaceae	*Helicteras isora*	Liniya	N	NT
Malvaceae	*Hibiscus micranthus*	Siriwedi babila	N	LC
Malvaceae	*Pterospermum suberifolium*	Welan	N	LC
Malvaceae	*Sida acuta*	Gas bebila	N	LC
Malvaceae	*Urena sinuata*	Heen-epala	N	LC
Meliaceae	*Azadirachta indica*	Kohomba	Ex	
Meliaceae	*Chukrasia tabularis*	Hulanhik	N	NT
Meliaceae	*Cipadessa baccifera*	Hal-Bembiya	N	LC
Menispermaceae	*Cissampelos pareira*	Diya-Mitta	N	LC
Moraceae	*Ficus microcarpa*	Panu-nuga	N	LC

Family	Species	Common Name	Status	NCS
Moraceae	*Streblus asper*	Geta-Netul	N	LC
Moraceae	*Streblus taxoides*	Gongotu	N	LC
Myrtaceae	*Syzygium cumini*	Ma-Dan	N	LC
Ochnaceae	*Ochna lanceolata*	Bo-Kera	N	LC
Oleaceae	*Chionanthus zeylanicus*	Geratiya	N	LC
Oleaceae	*Jasminum angustifolium*	Wal pichcha	N	LC
Orchidaceae	*Vanda spathulata*		N	VU
Phyllanthaceae	*Bridelia retusa*	Keta-Kela	N	LC
Phyllanthaceae	*Flueggea leucopyrus*	Katu pila	N	LC
Phyllanthaceae	*Margaritaria indica*	Karawu	N	VU
Phyllanthaceae	*Phyllanthus amarus*	Pitawakka	N	LC
Phyllanthaceae	*Phyllanthus polyphyllus*	Kuratiya	N	LC
Phyllanthaceae	*Sauropus rigidus*	Ginihiriya	E	NT
Picrodendraceae	*Mischodon zeylanicus*	Thammanna	N	LC
Poaceae	*Panicum maximum*	Gini tana / Rata tana	Ex	
Polygalaceae	*Polygala chinensis*		N	LC
Putranjiavaceae	*Drypetes sepiaria*	Wira	N	LC
Rhamnaceae	*Zizyphus oenopila*	Hin-Eraminia	N	LC
Rhizophoraceae	*Cassipourea ceylanica*	Pana	N	LC
Rubiaceae	*Benkara malabarica*	Pudan	N	LC
Rubiaceae	*Canthium coromandelicum*	Kara	N	LC
Rubiaceae	*Canthium puberulum*		E	NT
Rubiaceae	*Catunaregam spinosa*	Kukuruman	N	LC
Rubiaceae	*Haldina cordifolia*	Kolon	N	LC
Rubiaceae	*Ixora coccinea*	Rath-mal	N	LC
Rubiaceae	*Ixora pavetta*	Maha-Rathambala	N	LC
Rubiaceae	*Mitragyna parvifolia*	Helamba	N	LC
Rubiaceae	*Oldenlandia herbacea*	Wal koththamalli	N	LC
Rubiaceae	*Psilanthus wightianus*		N	VU
Rutaceae	*Atalantia ceylanica*	Yakinaran	N	LC
Rutaceae	*Atalantia monophylla*	Apassu	N	LC
Rutaceae	*Chloroxyclon swietania*	Burutha	N	VU
Rutaceae	*Glycosmis pentaphylla*	Dodan-Pana	N	LC
Rutaceae	*Pleiospermium alatum*	Tunpath-Kurundu	N	LC
Rutaceae	*Toddalia asiatica*	Kudu-Miris	N	LC
Sapindaceae	*Allophylus cobbe*	Kobbe	N	LC
Sapindaceae	*Dimocarpus longan*	Mora	N	LC
Sapindaceae	*Lepisanthes senegalensis*	Gal-kuma	N	LC
Sapindaceae	*Lepisanthes tetraphylla*		N	LC
Sapindaceae	*Schleichera oleosa*	Kon	N	LC
Sapotaceae	*Manilkara hexandra*	Palu	N	VU
Verbenaceae	*Lantana camera*	Ganda-pana	Ex	
Verbenaceae	*Stachytarpheta jamaicensis*	Balu-nakuta	Ex	
Verbenaceae	*Tectona grandis*	Thekka	Ex	

Family	Species	Common Name	Status	NCS
Vitaceae	*Cissus quadrangularis*	Heeressa	N	LC
Zingiberaceae	*Curcuma oligantha*		N	VU

ANNEX 3 – METHODOLOGY THAT SHOULD BE USED FOR TRANSPLANTING AND TRANSLOCATION OF SPECIES

Flora: Along the proposed canal trace

- The selected or prioritized plants have to be collected using the visual encounter method. The area targeted for construction should be criss-crossed to ensure that the entire area is examined. In this way, it is possible for the team to evaluate (look carefully for target plants) an area of 1-2 km^2 per day, depending on the habitat (For example, natural forests take longer while grasslands can be evaluated much faster).
- Each plant has to be tagged with a numbered metal tag, and the number and species noted against the location. Plants should be wrapped in poly bags and tied up.
- During the dry season collected plants have to be transported carefully to the project plant nurseries and maintained their till the onset of the wet season.

Selection of areas for transplanting:

- During the dry season, transplanting is not advisable as there is too little water available. Therefore, plants that have been collected should be maintained by a dedicated staff in nursery.
- Transplanting should be carried out during the wet season after careful examination of micro-locations. These sites should be listed and the list of plants in the nursery should be matched carefully with suitable habitats.
- Plants should then be clustered by location and transplanting be carried out in these locations.

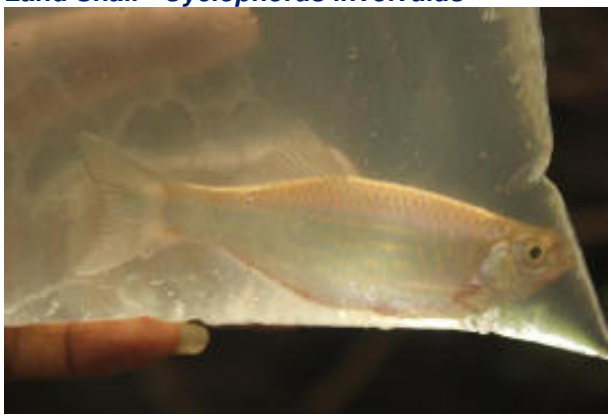
Fauna: Should be undertaken immediately prior to vegetation clearance is started. Further, in addition to prioritized faunal species, other less-mobile species that cannot move out of the area of disturbance should also be removed.

1. **Translocation site selection**: Along the canal trace where the forest clearing will be occurred.
2. **Gathering baseline data**: Habitat and microhabitat (especially for snails, earth snakes) preference of targeted species to be translocated should be identified
3. **Method of capture**: Fish can be collected using seine and hand nets. Other less mobile species has to be collected by hand.
4. **Method of translocation and release**: Collected individuals should be transferred to suitable receptacle and transported to the translocation site and released. Before releasing the animals, habitats and microhabitat requirement of all translocated species has to be clearly identified at least 1 km away from the right bank of the proposed canal.

ANNEX 4 – PICTURE CATALOGUE

Land Snail - *Cyclophorus involvulus*

Freshwater Crab - *Oziothelphusa minneriyaensis*



Knuckles Danio - *Devario cf . aequipinnatus*

Stone sucker - *Garra ceylonensis*

Cuvier's earth snake - *Rhinophis philippinus*

Common lankaskink – *Lankascincus fallax*

Yak Erabudu *(Erythrina fusca)* - A near threatened tree

An Orchid – *Vanda spathulata*

A rare legume- *Dendrolobium triangulare*

A Begonia species – *Begonia cordifolia*

Gaint Memosa - *Memosa pigra*

Tank habitat

Open Grassland habitat

Seasonal Stream

Seasonal Stream in wet condition

Forest in middle section of Pakage 01

Upstream migrated Stone sucker *Garra ceylonensis*

Final part of the package o1 of UEC

IUCN, International Union for Conservation of Nature

IUCN, International Union for Conservation of Nature was founded in 1948. IUCN helps the world find pragmatic solutions to our most pressing environment and development challenges. It supports scientific research, manages field projects all over the world and brings governments, non-government organizations, United Nations agencies, companies and local communities together to develop and implement policy, laws and best practice.

IUCN is the world's oldest and largest global environmental network - a democratic membership union with more than 1,000 government and NGO member organizations, and almost 11,000 volunteer scientists in more than 160 countries.

IUCN's work is supported by more than 1,000 professional staff in 60 offices and hundreds of partners in public, NGO and private sectors around the world. The Union's headquarters are located in Gland, near Geneva, Switzerland.

In Sri Lanka, through its Country Programme me the Union seeks to fulfill this mission in collaboration with its various Commission Members, National Committee Members and Partners in Sri Lanka. IUCN in Sri Lanka commenced its operations since August 1988.

Rhinophis philippinus **(Cuvier's earth snake)**
Endemic and Endangered (EN) species

INTERNATIONAL UNION
FOR CONSERVATION OF NATURE

Sri Lanka Country Office
No. 53 Horton Place
Colombo 7
Sri Lanka

Tel. +94 11 2682418, 2682488, 5734786
Fax +94 11 2682470
iucn.sl@iucn.org
http://www.iucn.org/srilanka