Additional details sought by Expert Appraisal Committee in its 6th meeting held on 23 – 24 May 2016

I) Status of stage-1 forest clearance.

CSL had applied for stage-1 Forest clearance on 27 June 2016. The site inspection by Forest officials completed on 19 July 2016 and the case is presently under processing by DFO. Acknowledgement on uploading of online application is as follows:-

This is to acknowledge that a proposal seeking prior approval of Central Government under the Forest (Conservation) Act 1980 as per the details given below has been successfully uploaded on the portal of the Ministry of Environment, Forests and Climate Change Government of India.

1. Proposal No.	:	FP/KL/Others/20218/2016
2. Proposal Name	:	International Ship Repair Facility project of Cochin Shipyard Ltd., Kochi, Kerala
3. Category of the Proposal	:	Others
4. Date of Submission	:	27/06/2016

5. Name of the Applicant with Contact Details

Name	:	Eldho
Mobile No.	:	9895765807
State	:	Kerala
District	:	Ernakulam
Pincode	:	682015

6. Area Applied (ha.)	:	0

The proposal will be examined by the Nodal Officer, Forest (Conservation) Act, 1980 to assess its completeness.

(System Administrator)

FORM - A

Form for seeking prior approval of Central Government under section 2 of the Forest(Conservation) Act,1980 for Diversion of fresh forest area

PART - I

(To be filled up by User Agency)

A. General Details

A-1. Project Details

(i). Proposal No. : FP/KL/Others/20218/2016

(ii). Name of Project for which Forest Land is required : International Ship Repair Facility project of Cochin Shipyard Ltd., Kochi, Kerala

(iii). Short narrative of the proposal and Project/scheme for which the forest land is required : Cochin Shipyard Ltd. has taken over the existing marine workshop of Cochin Port Trust on 30 years lease for developing the same into an International Ship Repair Facility (ISRF) capable of repairing 84 vessels per annum

(iv). State : Kerala

(v). Category of the Project : Others

(vi). Shape of forest land proposed to be diverted : Linear

(vii). Estimated cost of the Project(Rupees in lacs) : 97000

(viii). Total Area of Forest Land proposed for diversion(in ha.): 0

(ix). Non-Forest Land required for this project(in ha.): 16.9

(x). Total period for which the forest land is proposed to be diverted(in years): 0

A-2. Details of User Agency

(i). Name : Cochin Shipyard Ltd

(ii). Address1 : Administrative Building, Perumanoor PO, Kochi Kerala

(iii). Address2 : Administrative Building, Perumanoor PO, Kochi Kerala

(iv). State : Kerala

(v). District : Ernakulam

(vi). Pin : 682015

(vii). Landmark : Perumanoor

(viii). Email address : siyad.ma@cochinshipyard.com

(ix). Landline Telephone No. : 484-2501268

(x). Fax No. : 484-2370897

(xi). Mobile No. : 9895765807

(xii). Website (if any) : cochinshipyard.com

(xiii). Legal status of User Agency : Central PSU

A-3. Details of Person Making Application

(i). First Name: Eldho

(ii). Middle Name: NIL

(iii). Last Name: John

(iv). Gender: Male

(v). Designation: General Manager (Infra Project

(vi). Address 1: Administrative Building, Cochin Shipyard Ltd. Perumanoor PO, Kochi Kerala

(vii). Address 2: Administrative Building, Cochin Shipyard Ltd. Perumanoor PO, Kochi Kerala

(viii). State: Kerala

(ix). District: Ernakulam

(x). Tehsil: NIL

(xi). Pin: 682015

(xii). Landmark: Perumanoor

(xiii). Email Address: siyad.ma@cochinshipyard.com

(xiv). Landline Telephone No.: 484-2501913

(xv). Fax No.: 2370897

(xvi). Mobile No.: 9895765807

(xvii). Copy of documents in support of the competence/authority of the person making this application to make application on behalf of the User Agency:

B. Details of land required for the Project

B-1. Details of proposal seeking prior approval of Central Government under the Act for diversion of forest land for the Project already submitted in the past

List of proposal submitted in Past							
S.no	**Proposal Status.**	**Proposal No.**	**Moef File No.**	**Area Proposed for Diversion(Ha.)**	**Area Diverted(Ha.)**	**Date of In-Principle Approval**	**Date of Final Approval**
NIL							

B

- Details of forest land proposed to be diverted

2.

B-2.1 Details of Divisions involved

Details of Divisions involved			
S.no	**Division Name**	**Forest Land(ha.)**	**Non-Forest Land(ha.)**
1.	Malayattoor	0	16.9

B-2.2 Details of Districts involved

District wise breakup			
S.no	**District Name**	**Forest Land(ha.)**	**Non-Forest Land(ha.)**
1.	Ernakulam	0	16.9

B-2.3 Village wise breakup

Villages wise breakup			
S.no	**Village**	**Forest Land(ha.)**	**Non-Forest Land(ha.)**
1	Thoppumpady	0	16.9

B-2.4 Component wise breakup

Component wise breakup			
S.no	**Component**	**Forest Land(ha.)**	**Non-Forest Land(ha.)**
1	ISRF Project Area	0	16.9

C. Maps of forest land proposed to be diverted

Division 1. : Malayattoor

(i). Area of forest land proposed to be diverted(in ha.) : 0 **(ii). :** Linear **(b). No. of Segments :** One

Segment wise details		
Segments	**Segment Area(in ha.)**	**Kml File of Segments**
1.	0	View File

(iii). Copy of Survey of India Toposheet indicating boundary of forest land proposed to be diverted:

(iv). Scanned copy of the Geo-referenced map of the forest land proposed to be diverted prepared by using GPS or Total Station:

D. Justification for locating the Project in forest land and details of alternatives examined:

(i). Copy of note containing justification for locating the Project in forest land:

(ii). Whether a copy of map indicating location of alternative examine is required to be provided: No

(a). Reason for not providing such map

Diversion of forestland not involved.

E. Employment likely to be generated

(i). Whether the Project is likely to generate employment ?: Yes

(ii). Permanent/Regular Employment(Number of persons): 550

(iii). Temporary Employment(Number of person-days): 1450

F. Displacement of People due to the Project, if any

(i). Whether Project involves displacement?: No

G. Details of Cost-Benefit analysis for the Project

(i). Whether the Project requires Cost-Benefit analysis?: No

H. Status of Environmental Clearance

(i). Whether the Project requires Clearance under the Environment (Protection) Act 1986 ? : Yes

(a). Status of the Environmental Clearance to the Project: EC under process

(ii). Environmental Clearance File No.: IA/KL/MIS/22905/2013

I. Status of Wildelife Clearance

(i). Whether the Project or a part thereof is located in any Protected Area or their Eco sensitive zone? : Yes

(a). Whether Project or a part thereof is located within a Protected Area ? : No

(ii). Status of approval of the Standing Committee of National Board for the Wildlife(NBWL) to the Project : Application under process

(a). Date of submission of proposals : 24 Jun 2016 **(b). Current status :** NIL

J. Applicability of special provisions governing Scheduled Areas

(i).Whether the Project or a part thereof is located in a Scheduled Area? : No

K. Status of settlement of rights under the Forest Rights Act,2006 on the forest land proposed to be diverted

(i). Whether the process for settlement of Rights under the Forest Rights Acts 2006 on the forest land proposed to be diverted has been completed? : Yes

(a). Copy of documentry evidence in support of settlement of rights under the Forest Rights Act,2006 on the forest land proposed to be diverted:

L. Details of land identified for Compensatory Afforestation

(i). Whether non-forest or Revenue forest land is required to be provided by User Agency?: Not Applicable

(ii). Whether the area of non-forest land or Revenue forest land required to be provided by User Agency for raising Compensatory Afforestation is less than area of forest land proposed to be diverted ?: Not Applicable

(iii) . Reason for not providing Non-Forest Land: Not Applicable

Additional information Details

Documents		
S.No	**Documents**	**Remarks**
1		

ii) Copy of application submitted for clearance from NBWL for Mangalavanam Bird Sanctuary.

CSL had applied for NBWL clearance on 24 June 2016. The site inspection by Forest Dept officials completed on 19 July 2016 and the case is presently under processing by DFO. Acknowledgement on uploading of online application is as follows:-

This is to acknowledge that a proposal seeking prior approval of Central Government under the Forest (Conservation) Act 1980 as per the details given below has been successfully uploaded on the portal of the Ministry of Environment, Forests and Climate Change Government of India.

1. Proposal No.	:	FP/KL/Others/747/2016
2. Proposal Name	:	International Ship Repair Facility project of Cochin Shipyard Ltd., Kochi, Kerala
3. Category of the Proposal	:	Others
4. Date of Submission	:	24/06/2016

5. Name of the Applicant with Contact Details

Name	:	Eldho
Mobile No.	:	9895765807
State	:	Kerala
District	:	Ernakulam
Pincode	:	682015

6. Protected Area (ha.)	:	0

The proposal will be examined by Wild Life Warden, Forest (Conservation) Act, 1980 to assess its completeness.

(System Administrator)

Wild Life Report

Form for seeking recommendation of Standing Committee of NBWL/SBWL.

PART - I & II

(To be filled up by User Agency)

A. General Details

A-1. Project Details

(i). Forest Clearance Required?: No

(ii). Proposal No. : FP/KL/Others/747/2016

(iii). Name of Project: International Ship Repair Facility project of Cochin Shipyard Ltd., Kochi, Kerala

(iv). Short narrative of the Project : Cochin Shipyard Ltd has taken over the existing marine workshop of Cochin Port Trust on 30 years lease for developing the same into an International Ship Repair Facility capable of repairing 84 vessels per annum.

(v). State : Kerala

(vi). Category of the Project : Others

(vii). Shape of project land : Linear

(viii). Distance of the project from the boundary of the Protected Area (in km.): 4.3

(ix). Estimated cost of the Project(Rupees in lacs) : 0

(x). Total period for which clearance is required (in year): 5

(xi). Total Project Area(in ha.): 16.9

(xii). Project Area under Protected Area (in ha.): 0

(xiii). Project Area under Non-Protected Area (in ha.): 16.9

A-2. Details of User Agency

(i). Name : Cochin Shipyard Ltd

(ii). Address1 : Administrative Building, Perumanoor PO, Kochi Kerala

(iii). Address2 : Administrative Building, Perumanoor PO, Kochi Kerala

(iv). State : Kerala

(v). District : Ernakulam

(vi). Pin : 682015

(vii). Landmark : Perumanoor

(viii). Email address : siyad.ma@cochinshipyard.com

(ix). Landline Telephone No. : 2501268

(x). Fax No. : 2370897 **(xi). Mobile No. :** 9895765807

(xii). Website (if any) : cochinshipyard.com

(xiii). Legal status of User Agency : Central PSU

A-3. Details of Person Making Application

(i). First Name: Eldho

(ii). Middle Name: NIL

(iii). Last Name: John

(iv). Gender: Male

(v). Designation: General Manager (Infra Project

(vi). Address 1: Administrative Building, Cochin Shipyard Ltd. Perumanoor PO, Kochi Kerala

(vii). Address 2: Administrative Building, Cochin Shipyard Ltd. Perumanoor PO, Kochi Kerala

(viii). State: Kerala

(ix). District: Ernakulam

(x). Pin: 682015

(xi). Landmark: Perumanoor

(xii). Email Address: siyad.ma@cochinshipyard.com

(xiii). Landline Telephone No.: 2501913

(xiv). Fax No.: 2370897

(xv). Mobile No.: 9895765807

(xvi). Upload a copy of documents in support of the competence/authority of the person making this application to make application on behalf of the User Agency: Annexure copy of documents in support of the competence

B. Details of Land required for the Project

B-1. Details of Protected Area

B-1.1 No. of Divisions involved in Protected Area

Division wise details of land			
S.no	**Division Name**	**Protected Area Name**	**Project Area under Protected Area**
1.	Malayattoor	Mangalavanam Bird Sanctuary	0

B-1.2 Details of Districts involved

District wise breakup			
S.no	**District Name**	**Project Area under Protected Area(ha.)**	**Project Area under Non-Protected Area(ha.)**
1.	Ernakulam	0	16.9

B-1.3 Component wise breakup

Component wise breakup			
S.no	**Component**	**Project Area under Protected Area(ha.)**	**Project Area under Non-Protected Area(ha.)**
1	ISRF	0	16.9

C. Maps of protected area

Division 1. : Malayattoor

(i). Project Area under Protected Area (in ha.) : NIL

(ii). Nature of the Project : Linear

(iii). No. of Segments : One

Patch/Segment wise details		
Segments	**Protected Area of segment(in ha.)**	**KML file of protected area of segment**
1.	0	View File

(iv). copy of Survey of India Toposheet indicating boundary of protected area: Annexure Survey of India Toposheet

(v). scanned copy of the Geo-referenced map of the protected area prepared by using DGPS or Total Station: Annexure scanned copy of the Geo-referenced map

D. Justification for locating the Project in protected area and details of alternates examined :

(i). copy of note containing justification for locating the Project in protected area: Annexure Justification

(ii). Whether a copy of map indicating location of alternative examined is required to be provided: No

(a). Reason for not providing such map Proposed project is within the existing premises

E. Employment likely to be generated

(i). Whether project is likely to generate employment ?: Yes

(a). Permanent/Regular Employment(Number of persons): 550

(b). Temporary Employment(Number of person-days): 1450

F. Displacement of People due to the project, if any

(i). Whether project involve displacement?: No

G. Status of Environmental clearance

(i). Whether the Project requires Clearance under the Environment (Protection) Act 1986 ? : Yes

(a). Status of the Environmental Clearance to the Project : EC under process

(ii).Environmental Clearance File No.: IA/KL/MIS/22905/2013

H. Whether proposal is for investigation/survey

(H-2). Details of the Bio diversity Impact Assessment report in case the proposal involves use of more than 50 ha. NP/WLS.

(a).Copy of the Bio diversity Impact Assessment report: Annexure Copy of Bio diversity Impact Assessment report

(H-3). Information on the projects undertaken by the proponent agency in the past in Protected Areas

(a).Upload file: Annexure Information on the projects undertaken by the proponent agency in the past in Protected Areas

(H-4). Details regarding compliance of the conditions on each proposal

(a).Upload file: Annexure Details regarding compliance of the conditions on each proposal

(H-5).Whether any matter related to the project is sub judice in any court of law?: No

Documents		
S.No	**Uploaded Additional Info. Files**	**Remarks**
1	Additional Info.	

III) **2 ha. land area to be identified for mangroves afforestation.**

COCHIN SHIPYARD LIMITED

PROPOSAL FOR MANGROVE AFFORESTATION

1. Introduction

Cochin Shipyard Limited (CSL) is in the process of obtaining Environmental Clearance for the International Ship Repair Facility (ISRF) project from the Ministry of Environment, Forests and Climate Change (MoEFCC). In this connection, Expert Appraisal Committee (EAC) during deliberation of the ISRF project had insisted to identify 2 ha land area for mangrove afforestation.

2. Background

ISRF project is proposed to be set up in the 16.9 ha of land area taken over on lease for a period of 30 years from M/s Cochin Port Trust. There exists two small isolated mangrove patches in the project area having spread area 92.8 sq. M & 93.8 sq. M. These mangroves (15 nos. plants in total) may have grown due to the sediment deposit near to the slipway area where quay wall is not present. The species of mangroves are *Acanthus Ilicifolius* and *Rhizophora sps*. No threatened category of flora species as per the International Union for Conservation of Nature and Natural Resources (IUCN) exists in the project area. For the development of Ship repair facility, 15 nos mangroves as mentioned above, need to be felled.

Fig-1: View of mangroves in the project area

3. Area indentified for Mangrove Afforestation - Munroe Thuruth

Area identified for mangrove afforestation is Munroe Thuruth (Munroe Island). The place is named in honour of Resident Colonel John Munro of the former Princely State of Travancore. Munroe Thuruth occupies an area of 13.37 sq. km and is located at the confluence of Ashtamudi Lake and the Kallada River, in Kollam district, Kerala, South India. The island, accessible by road, rail and inland water navigation, is about 25 km from Kollam by road and about 25 km from Karunagapally. As per the 2011 Indian census, the administrative village of Mundrothuruth (which includes nearby small villages as well) has a total population of 10380, consisting of 5128 males and 5252 females and has a population density of 776.

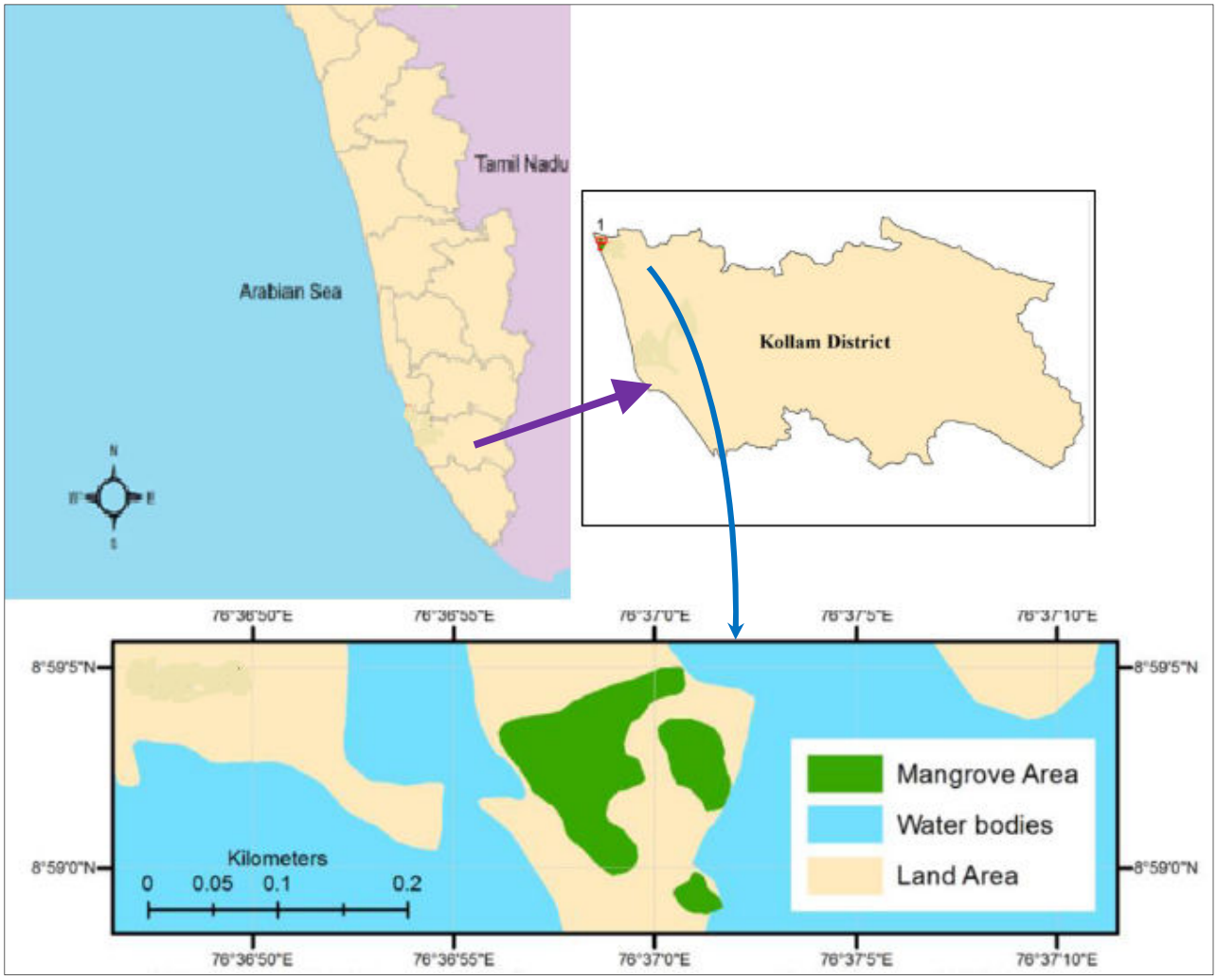


Fig-2: Geographic location - Munroe Thuruth

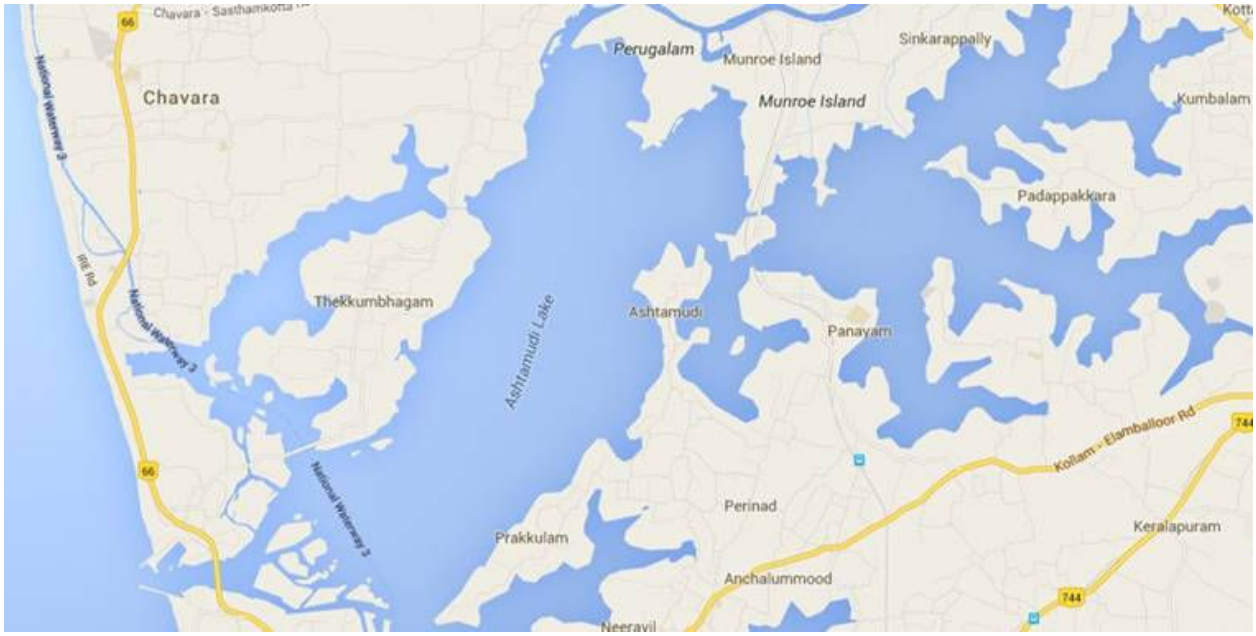


Fig-3: Google Map - Munroe Thuruth

Fig-4: Munroe Thuruth – An aerial view

4. Munroe Thuruth – Environmental Issues

Recently, Munroe Thuruth islands are reported as sinking. According to local authorities, this is due to rising sea level and erosion. The authorities of Munroe Thuruth Grama Panchayat, under which these islands fall and political activists, therefore had sought assistance from global conservation organizations to deal with the “alarming” situation. It is reported that the shrinking tiny islands, ranging from one acre to over one hectare, were earlier inhabited by humans. But now people are leaving certain areas of these tiny islands, as they find it very difficult to survive since their houses are sinking and saline water has invaded the localities.

Fig-5: Sunken houses at Munroe Thuruth

It is reported that the houses here, with their eternally moistened walls and paints peeled off, have sunk two to four feet. There are crevices on the walls from constant tidal variations. The coconut trees around the water-filled fields and slushy walkways look bare and diseased. The escalating levels of saline water from the rising sea level and the construction of Kallada dam that obstructed the flow of fresh water in the Ashtamudi lake have also caused the decline of paddy cultivation and aqua farms in Munroe Thuruth.

As reported in the regional and national dailies, the villagers are divided in their opinion on the reasons for the current situation. While some attribute it to the tsunami in 2004, some others think it is largely man-made. Environmental activists hold global warming mainly responsible for the change. Construction of the Kallada dam three decades ago, destruction of mangroves, illegal sand mining from the Kallada river, continuous vibrations caused by the trains that pass by the island are other reasons the activists and villagers attributes to the sinking of the island.

With the low-lying areas of the island now under the threat of submergence during high tides, over 200 families have departed because their houses have been flooded permanently. The saline water intrusion and reduced availability of drinking water plus severe drainage problems, including non-working toilets have created major concerns.

DECCAN Chronicle dated 29 July 2015

Not so curious case of the sinking island

C CORRESPONDENT
OLLAM, JULY 27

is not global warming hat would lead to the disap- arance of Munroe island stated by a central gency, but post-tsunami ctonic shift and dam con- ruction, according to Mr ainudeen Pattazhi, scien- st from Kollam.

Munroe Thuruthu is a uster of islands with an ea of 13.4 square kilome- e in the Ashtamudi lake tuated near the Arabian a on the one side and allada river on the other. a recent phenomenon, e islands were flooded uring the high tide denot- g the axial lowering of e land mass. Kidapram, andramkani, Pattom Thuruth, Nenmeni, and Velingolam in the island were badly affected by the water level rise.

Mr. Sainudeen in his study noted that some areas situated as high as three metres above water level before tsunami had dipped to 0.5 to 1 metres after the catastrophe. This is due to the downward movement of minor tectonic plates in the area caused by the tsunami, according to Mr. Sainudeen. He also points out that dam construction along the upstream of Kallada river had contributed to this as the area is a delta formation of the river. He demanded that this place should be declared as a national calamity site.

Salinity intrusion of the Ashtamudi Lake at Munroe Turuthu. — DC

A house that sank 2 metres due to the tectonic shift

THE HINDU - 6 Jan 2016

TKM team starts study on Munroe islands

SPECIAL CORRESPONDENT

KOLLAM: Experts from the TKM College of Engineering began a study into the problems arising out of the recent phenomenon of submergence of some of the delta islands of Munroethuruthu.

The islands are a tourist attraction and are also thickly populated.

The situation had been creating panic among islanders.

The low-lying areas of Pattamthuruthu, Kidapram, Kandramkari, and Nenmeni are the most affected areas.

The expert team is led by Gouri Antharjanam, head of the Department of Civil Engineering. Principal Prof Ayoob said that the study was being undertaken at the initiative of the Munroethuruthu grama panchayat authorities.

> Study is into the recent submergence of some of the delta islands

Premilinary visit

The team made a preliminary visit to the problem-hit areas on Monday and held discussions with the residents. Many complained about the sinking of their houses and serious erosion to their properties.

The team felt that engineering solutions to protect the land and to tackle problem could be considered. However, this necessitates some detailed deliberations and studies.

The expert team gave hope on the emergence of suitable solutions that would ease the fears of the people, said Pallavi Gopalakrishnan, a student from the area.

Other members of the team were Sunil Kumar, Sirajudeen, Mohamed Aseem, Sruthi R Krishnan, Amal Azad, and Udayakumar, all professors of the college.

Business Line

Tiny islands in Kollam 'sinking'

PRESS TRUST OF INDIA
Kochi, July 17

Some tiny islands formed by the backwaters of scenic Ashtamudi Lake and the Kallada river in Kollam district are sinking due to rising sea level and erosion, according to local authorities.

The authorities of Munroe Thuruth Gram Panchayat, under which these islands fall, have sought assistance from global conservation organisations to deal with the "alarming" situation.

Panchayat officials said the shrinking tiny islands, ranging from one acre to over one hectare, were inhabited by humans. But now people were leaving these tiny islands as they find it difficult to survive here as saline water has invaded the localities.

President of the Munroe Thuruthu Grama Panchayat, Binu Karunakaran, said they are facing a crisis as there are not much funds to adopt scientific measures to save "the sinking islands" which are part of the panchayat.

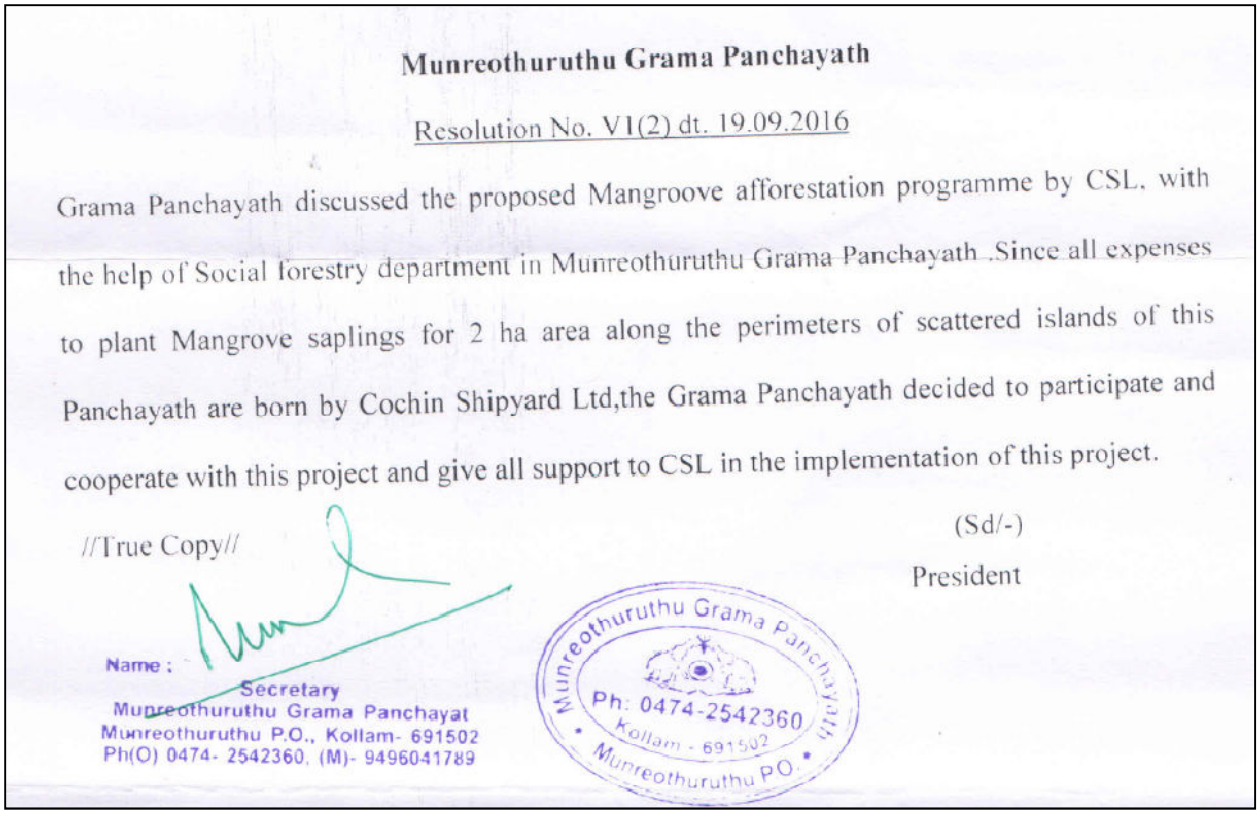
The Munroe Thuruth Grama Panchayat comprises eight medium-sized islands and several small islands.

5. CSL visit to Munroe Thuruth

CSL team visited Munroe Thuruth on 9 Sept 2016 and had interaction with the Panchayat Authorities.

Fig-6: Site visit photos - Munroe Thuruth

Panchayat Authorities had informed their willingness to be a part of the compensatory mangrove afforestation programme. Resolution passed by Panchayat for this effect on 19 Sept 2016 is as shown below:-



Munreothuruthu Grama Panchayath

Resolution No. VI(2) dt. 19.09.2016

Grama Panchayath discussed the proposed Mangroove afforestation programme by CSL, with the help of Social forestry department in Munreothuruthu Grama Panchayath .Since all expenses to plant Mangrove saplings for 2 ha area along the perimeters of scattered islands of this Panchayath are born by Cochin Shipyard Ltd,the Grama Panchayath decided to participate and cooperate with this project and give all support to CSL in the implementation of this project.

(Sd/-)

President

//True Copy//

Name :

Secretary

Munreothuruthu Grama Panchayat

Munreothuruthu P.O., Kollam- 691502

Ph(O) 0474- 2542360, (M)- 9496041789

Munreothuruthu Grama Panchayath

Ph: 0474-2542360

Kollam - 691502

Munreothuruthu P.O.

Fig-7: Resolution passed by Munroe Thuruth Panchayat

6. Meeting with Social Forestry Division

CSL proposal is to carry out 2 ha compensatory mangrove afforestation with the assistance of Social Forestry Division, Kerala Forest Department. Accordingly, a joint meeting of Forest, Panchayat & CSL officials was held at the office of Assistant Conservator of Forests (ACF), Social Forestry Division, Kollam on 29 Sept 2016. In the meeting, President of Munroe Thuruth Grama Panchayat informed that 3.5 ha area suitable for mangrove afforestation is available within panchayat premises and their intention is to set up a mangrove park and thereby promotion of tourist activities within the region.

Detailed Project Proposal would be prepared by ACF by Oct 2016 and all expenses for 2 ha compensatory mangrove afforestation would be borne by CSL. Minutes of Meeting dated 29 Sept 2016 is attached for reference.

SA1-1844/2016 27 Sept 2016

Minutes of meeting held at the office of Assistant Conservator of Forests, Social Forestry Division, Kollam on 27 Sept 2016 in connection with the Compensatory Mangrove Afforestation proposed by M/s Cochin Shipyard Limited at 2 ha area of Munroe Thuruth Panchayat, Kollam District.

Participants:-

M/s Cochin Shipyard Limited. (CSL)

- Shri. Arif A G, Senior Manager (Infra Projects) -- (Sd)
- Shri. Siyad M A, Manager (Infra Projects) – (Sd)

Munroe Thuruth Grama Panchayat

- Shri. Binu Karunakaran, President, Munroe Thuruth Grama Panchayat – (Sd)
- Shri. T F Joseph, Secretary, Munroe Thuruth Grama Panchayat – (Sd)

Social Forestry Division

- Shri. Koshy John, Assistant Conservator of Forests, Social Forestry Division, Kollam – (Sd)

1. Meeting commenced at 11.00 am. Officials from CSL explained regarding the International Ship Repair Facility (ISRF) project. It was further informed that CSL is presently in the process of obtaining Environmental Clearance for the project from the Ministry of Environment, Forests & Climate Change (MoEFCC). However, in lieu of felling 15 nos. mangrove plants located in the project area, MoEFCC had insisted CSL to carry out 2 ha Compensatory Mangrove Afforestation at suitable location. In this regard, Munroe Thuruth Grama Panchayat President informed that 2 ha area suitable for mangrove afforestation is available within the panchayat premises. Accordingly, CSL had issued a letter # PROJ/ISRF/701/13 dated 13 Sept 2016 to Principal Chief Forest Conservator, Social Forestry Division.

2. In the meeting, President of Munroe Thuruth Grama Panchayat informed regarding the availability of 2 ha area suitable for mangrove afforestation with in panchayat premises as 'Kayal Purambokku' and further assured that all efforts will be

made for allotting this land for the proposed mangrove afforestation. It was further stated that intention of Panchayat is to set up a Mangrove Park and thereby promotion of tourist activities in the region. In view of the above, President promised all necessary support of the panchayat for successful implementation of mangrove afforestation programme. CSL officials, in reply informed that all expenses to carry out 2 ha compensatory mangrove afforestation will be borne by Cochin Shipyard Limited and further requested Assistant Conservator of Forests (Social Forestry Division), Kollam to prepare a Project Proposal.

3. ACF informed that approximately 1500 nos. mangrove saplings are required to carry out afforestation in 2 ha area and therefore, Social Forestry Division intends to set up a mangrove nursery within the panchayat premises for the collection and production of different species of mangrove saplings. CSL officials assured that fund for mangrove afforestation will be transferred to the account of Forest Department. ACF informed that a Detailed Project Proposal for 2 ha Compensatory mangrove afforestation programme will be prepared by 15 Oct 2016.

4. Meeting concluded at 12.30 pm.

27 Sept 2016

Assistant Conservator of Forests
Social Forestry Division, Kollam

പങ്കെടുത്തവർ :

1) Siyad M.A, Manager (Infra Projects), Cochin Shipyard Ltd.
2) A.G. Asif, Sr. Manager (Infra Projects), Cochin Shipyard Ltd
3) Binu.K president Munroe Island
4) J.E. Joseph, Secretary, Munroe Island
5) Koshy John, Asst. Conservator of Forests, Social Forestry, Kollam

****

IV) Select ambient air quality stations as per upwind and down wind direction.

V) Recheck ambient air quality for 1 month data.

Ambient Air Quality & Monitoring Locations

One month ambient air quality monitoring was carried out by Cochin Shipyard Limited through M/s Enviro Design Ecolabs, Kochi during the period mid Aug to mid Sept 2016. Ambient air quality stations were selected as per upwind and down wind direction for rechecking ambient air quality data for one month as insisted by EAC of MoEFCC.

Five (5) Sampling stations were selected in the study area of 10 km radius in and around the project site for air quality monitoring. The monitoring location details are delineated in Table 1.1. The Monitoring locations are shown in Figure: 1.1

Table 1.1 Details of Ambient Air Quality Monitoring Locations

Sl.No.	Location Code	Location Name	Coordinates	Description (Land use)	Position with respect to project site
					Direction
1	AAQ1	Project Site	N 09° 56'42.8'' E 076°16' 4.3''	Port Area	Project Site
2	AAQ2	Cochin Shipyard Staff Quarters, Panampilly Nagar	N 09° 57'04'' E 076°17' 51.2''	Residential Area	ENE
3	AAQ3	Indian Maritime University Campus, Thevara	N 09° 55'42.5'' E 076°17' 12.3''	Open Scrub	SSE
4	AAQ4	Near Fort Kochi Beach	N 09° 57'49.4'' E 076°14' 17.4''	Recreational Land	WNW
5.	AAQ5	Near North Railway Station, SRM Road, Ernakulam	N 09° 59'39.6'' E 076°17' 11.7''	Residential Area	NNE

Source: CSL

The predominant wind direction is from WNW followed by from W and NW.

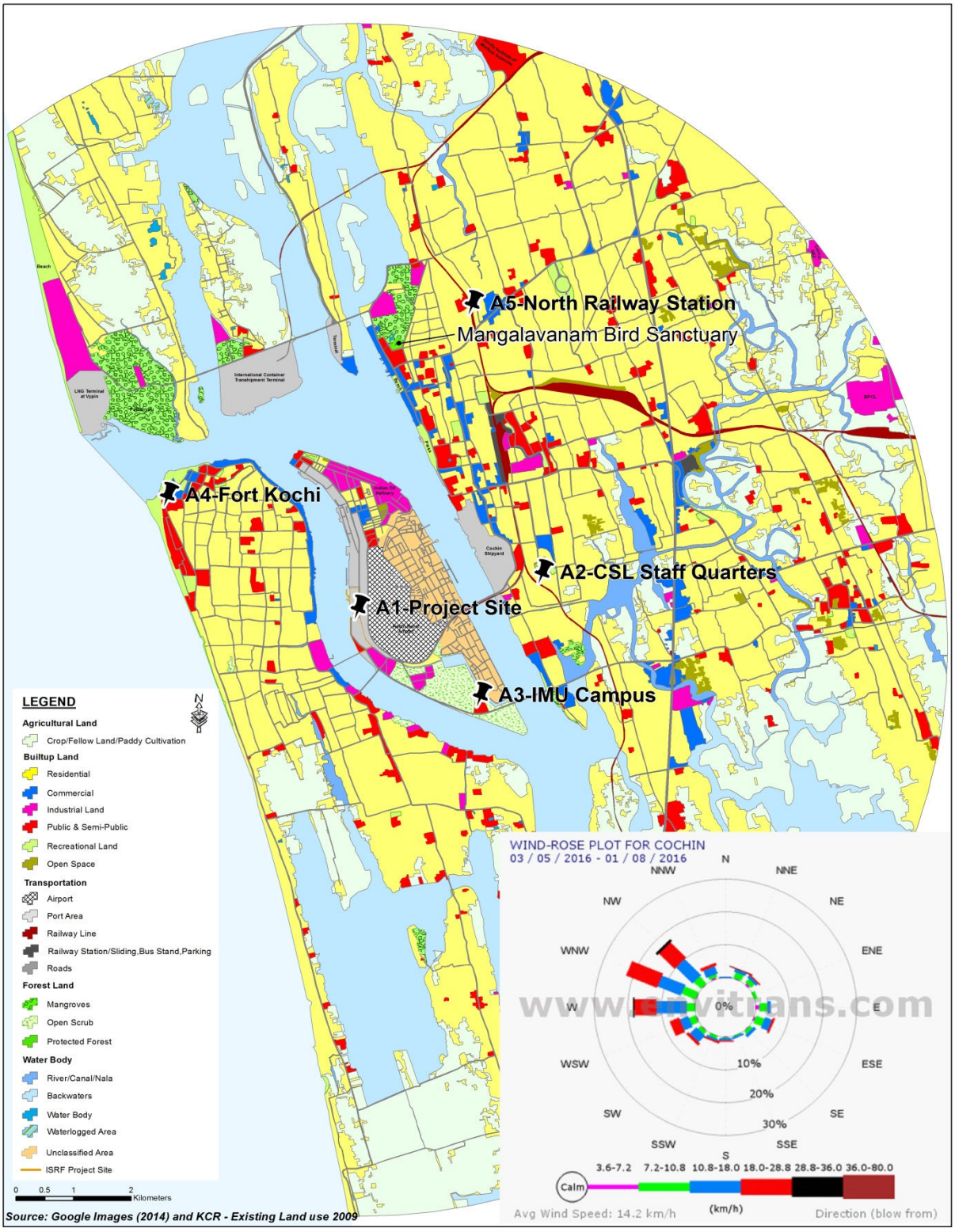


Fig: 1.1 Map Showing locations of Monitoring Stations for Ambient Air Quality

Monitoring Methodology

Carbon Monoxide (CO) samples were collected for the duration of eight hours and PM_{10} & $PM_{2.5,}$ SO_2 & NOx samples were collected for 24 hour duration as per the National Ambient Air Quality (NAAQ) Standards, 2009. High Volume Air Samplers, Respirable Dust Samplers and impingers with trapping solutions were used to collect samples. Photographs show ambient air quality sampling. The method of analysis for different air quality parameters are as follows:

Sl. No.	Parameters	Unit	Method
1.	Sulphur dioxide	$\mu g/m^3$	IS: 5182 (Pt 2):2001
2.	Nitrogen dioxide	$\mu g/m^3$	IS: 5182 (Pt 6) : 2006
3.	Particulate matter (Size less than 10µm)or PM_{10}	$\mu g/m^3$	IS 5182(Pt 23) :2006
4.	Particulate matter 2.5 (Size less than 2.5µm)or $PM_{2.5}$	$\mu g/m^3$	CPCB Guidelines
5.	Carbon Monoxide (8hrs)	mg/m^3	IS: 5182 (Pt 10): 1999

Results & Discussion

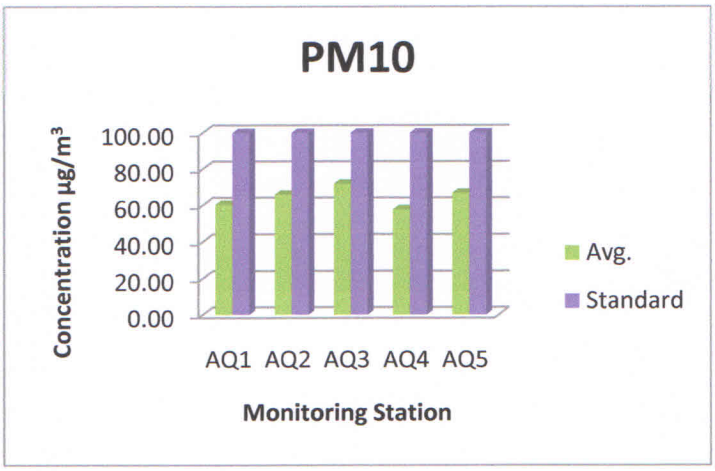
The summary of ambient air quality monitoring result is as given below:

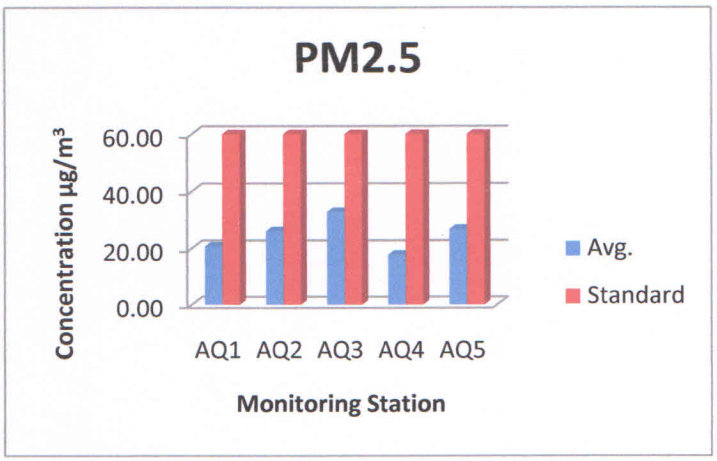
PARAMETER	Concentration of Air Pollutants ($\mu g/m^3$)						
		AQ1	AQ2	AQ3	AQ4	AQ5	CPCB LIMIT
PM2.5	Avg.	20.65	26.03	32.78	17.75	26.70	60
	Max.	23.90	30.40	37.20	19.00	30.10	
	Min.	17.50	21.80	28.60	16.60	23.60	

PARAMETER	Concentration of Air Pollutants (µg/m³)						
		AQ1	AQ2	AQ3	AQ4	AQ5	CPCB LIMIT
PM10	Avg.	60.33	65.86	71.94	57.69	66.74	100
	Max.	65.30	77.20	78.30	61.70	71.20	
	Min.	54.30	59.80	60.40	52.40	57.30	
SO_2	Avg.	10.29	12.95	12.96	11.09	11.40	80
	Max.	11.30	14.60	13.80	11.80	13.30	
	Min.	9.10	11.40	11.40	10.30	10.70	
NO_x	Avg.	14.91	13.61	13.81	13.84	14.38	80
	Max.	17.30	14.60	14.80	16.80	15.90	
	Min.	13.40	12.70	11.90	10.60	11.90	
CO	Unit: Milligram/cu.M						
	Avg.	1.11	0.86	1.06	0.75	1.23	2
	Max.	1.30	1.00	1.20	0.90	1.40	
	Min.	1.00	0.70	0.90	0.60	1.00	

Source: CSL

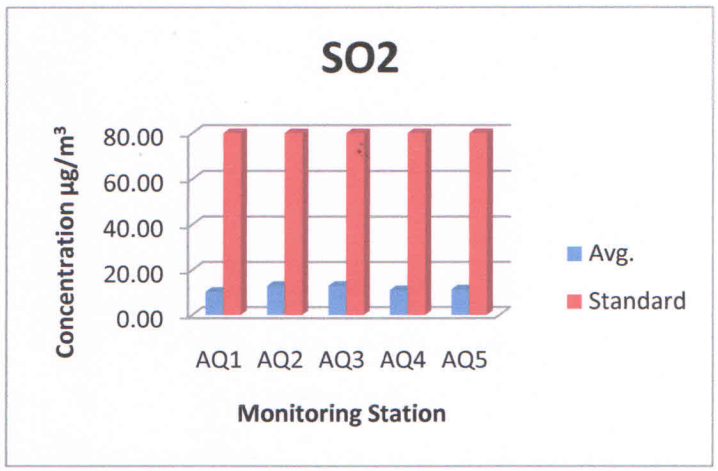
Particulate Matter 10 (PM_{10}): The level of PM_{10} recorded during the additional monitoring at various sampling locations varied between 52.40 to 78.30 µg/m3, which is well below the prescribed NAAQS standard of 100 µg/m3. Comprehensive result of various sampling locations shows that AQ3 presents the highest values and AQ4 has lowest value. Graph shows the mean concentration of PM_{10} at different sampling locations.





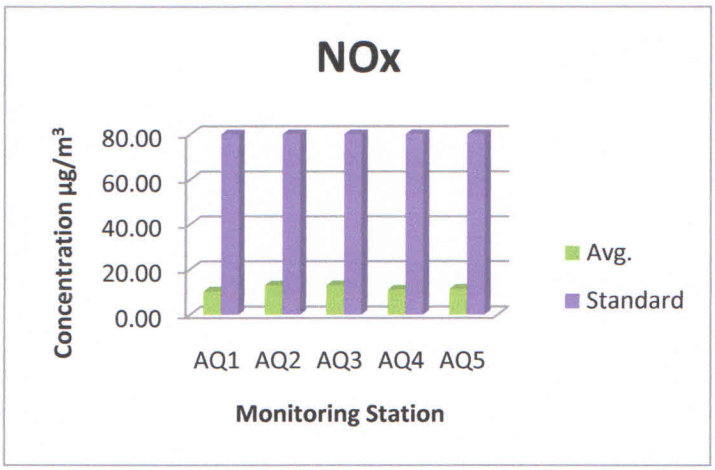
Particulate Matter 2.5 (PM 2.5): The PM 2.5 values have been measured at the monitoring locations and are found well below the NAAQ Standard (2009) of 60 g/m3. The highest value was recorded 37.20µg/m3 in at AQ3 and lowest seasonal value of16.6 µg/m3

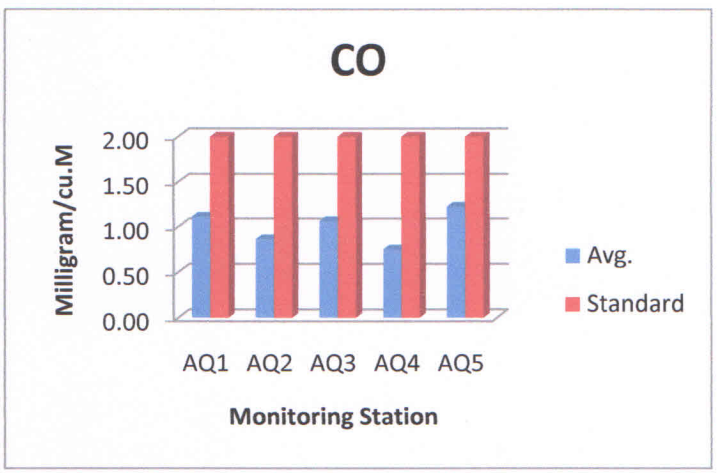
was recorded in AQ4. Graph shows the mean concentration of PM 2.5 at different sampling locations.



Sulphur Dioxide (SO_2): The Sulphur dioxide concentrations at the observed monitoring stations were well below the NAAQ standard (2009) of 80 µg/m3. The results ranged between 9.10 and 14.60 µg/m3 all through the study period. The highest value of SO_2 recorded at AQ2. The lowest concentration was observed at AQ1. Graph shows the mean concentration of SO_2 at different sampling locations.

Nitrogen Dioxide (NOX): During the additional monitoring, observed concentration for NOx ranged between 10.60 µg/m3 and 17.30 µg/m3 meeting the NAAQ Standard, 2009 of 80 µg/m3. The highest value of NOx recorded at AQ1. The lowest concentration was observed at AQ4. The mean concentration of NOx at different stations is shown in the graph.





Carbon Monoxide (CO): During the study period, the observed concentration for CO ranged between 0.6 mg/m3 and 1.4 mg/m3 which are within the NAAQ Standard, 2009 of 2000 µg/m3. The highest value of CO recorded at AQ5. The lowest concentration was observed at AQ4.The mean concentration of CO at different stations is shown in the graph

VI) Plan for disposal of C & D waste as per new rules for C & D waste management

Construction and Demolition Waste (C&D Waste):

In order to make more effective and to improve the collection, segregation, recycling, treatment and disposal of solid waste in an environmentally sound manner, the Central Government has revised the existing rules and notified rules for Management of Construction and Demolition Waste on 29 March, 2016. The rules give emphasis on the roles and accountability of waste generators and various stakeholders, thrust to segregation, recovery, reuse, recycle at source, and management of construction and demolition waste.

As per the definition, C&D waste means the waste comprising of building materials, debris and rubble resulting from construction, re-modeling, repair and demolition of any civil structure.

The waste generators are any person or association of persons or institution, residential and commercial establishments including Indian Railways, Airport, Port and Harbor and Defense establishments who undertakes construction of or demolition of any civil structure which generate construction and demolition waste.
As per the rules, overall responsibility of proper management of construction and demolition waste will be with Cochin Shipyard Limited (CSL) who will get implemented the requirement of C&D waste Management rule 2016 through the contractor. C&D waste management plan is discussed in the following section.

CSL has an MOU in force with M/s Kerala Enviro Infrastructure Ltd (KEIL), the only designated hazardous waste disposal center in Kerala for disposal of the C&D waste as well Asbestos sheets waste which will be generated at the construction site during the demolition stage.

Source and Type of C&D Waste:

The source of C&D waste will be in connection with demolition of existing buildings in the project area as detailed in Chapter 2 of the EIA Report. About 24 structures, as summarized below are to be demolished for the proposed ISRF.

Sl.No.	Description	Area (m^2)
1	Old Canteen Shed	268.14
2	Garage (temporary)	74.34
3	Oil Stores (MS sub-stores)	83.16
4	AMS Marine Shed	265.08
5	Tea-shed	73.5
6	Cycle shed	116.28
7	Garage	85.36
8	store	11
9	Slipway	306.9
10	Boat shed	188.19
11	Warehouse complex (1825 sq.m X 2 Nos)	3650
12	Car shed	14.4
13	General store – tool store dry dock	1613.55

14	Repair shed	188.1
15	Punching room	109.96
16	Oil shed	161.08
17	Stores–Port work office	545.2
18	Shed	244.4
19	Toilet	18.14
20	Garage	22.62
21	Carbide shed	19.8
22	Punching shed	87.92
23	Gas store yard	41.4
24	Shed	78
Source: CSL		

C&D waste generation from the demolition of these structures is estimated to be 8500 cu m. Major components of C&D waste in the project will be Earth, Cement Concrete, Rubble, Reinforced Cement Concrete, steel, windows, Ventilator, Doors, and Steel. Details are as follows:

QUANTITIVE BREAKUP OF CONSTRUCTION & DEMOLITION WASTE			
Sl No.	**Item**	**Approximate Quantity of C&D waste**	
		(m^3)	**(T)**
A.	**Demolition Waste:**		
1	Earth filling in foundation	2750	4950
2	Cement Concrete	1200	2880
3	Masonry	3100	5580
4	Reinforced Cement Concrete	450	1125
5	Rubble	1000	2080
Total Demolition Waste		8500	16615
6	Asbestos Roof Waste	9818 m^2	80
B.	**Construction Waste:**		
6	Pile Muck	90000	112500
7	Cement Concrete (pile cut off)	1900	4750
Total Construction Waste		91900	

Source: CSL

Besides the above, there will be other type of waste which has been identified to be sold to the recyclers is as follows:

1.	Windows (1.5m x 1.2m)	42 No.	
2.	Ventilators (2.0m x 0.7m)	55 No.	
3.	Doors of size (2.1m x 0.9m)	10 No.	
4.	Reinforcement Steel		40 T
5.	Structural Steel		110 T

Source: CSL

The total waste generation will be 16695 T from the demolition of the identified building. It is considered that demolition of the structures will take maximum 120 days. The average waste generation per day will be about 139.13 ≅140 T/d. It is proposed that entire non-reusable demolition waste (5121 T) containing mainly concrete (4005 T) and 20% of masonry (1116 T) will be disposed of at KEIL landfill site.

It is expected that construction waste from pile muck and pile cut off will be generated during the construction spanning over a period of 730 days. The construction waste in form of Pile muck (112500 T)will be154.11t/d and cement concrete (4750 T) from pile cut off will be 6.5 T/d. the construction waste will be sent to KEIL landfill site.

There will be also hazardous waste generation from the removal of asbestos roof. Total quantity of the waste will be approximately 9818[1]m^2 i.e. 80 T about 53 m^3. It has to be removed properly and contractor shall arrange skilled approved agency for its removal. The storage, collection and disposal of Hazardous waste will be done as per Hazardous Waste Management Rules, 2016 and is discussed separately.

Management of C&D Debris

The management plan of C&D wastes covering the following is intended to ensure that wastes are managed in a proper manner to prevent any adverse impacts during the construction stage.

Storage of Construction and Demolition waste:

If the C&D waste are scattered around or dumped in open sites near the road, they not only cause obstruction to traffic but also add to the workload of the local body. Therefore, C&D wastes are best stored at source in identified Waste Management Area (WMA).

The contractor has to arrange storage facility for C&D waste for its disposal to KEIL Landfill.

- The C&D waste as the first step will be stored in designated waste management area in the project site by the contractor.
- Contractor will take all necessary measures to ensure that it does not mix with the municipal or other wastes (hazardous waste) or it will not be disposed to the surface water.
- An area of 8000 m^2 will be identified as designated waste management area.
- Reusable and non-reusable waste will be kept separately at the identified location.
- The contractor will make necessary arrangements like positioning of skips on 150mm raised platform for storing the C&D waste and will maintain records.
- The waste collection location will be located away from the CRZ area.
- Wind shields will be provided at site to minimize any wind-blown nuisance so that neither waste get scattered/littered nor become an eyesore.
- The pile muck will be generated at the rate of 154 T/d which will be stored in container skips (15 containers of 10m^3) for disposal.

[1] CSL

- In the storage area, drains shall be provided and the runoff shall be collected to prevent discharge of untreated wastewater to surface water body or becoming breeding ground for vector disease carriers due to water logging in construction area/camps. The wastewater will be collected and disposed to wastewater treatment system.
- Signboards and warning signboards will be placed at the identified locations in English and vernacular language
- The waste will be segregated at source into different heaps to reuse it, if it is identified as reusable item by the Engineer.
- Tree stumps, Windows (1.5m x 1.2m), Ventilators (2.0m x 0.7m), Doors of size (2.1m x 0.9m), Reinforcement Steel, Structural Steel, , electrical wires, conduits, etc. will be stored separately in the WMA for which is to be sold to the recyclers only.

Collection and Transportation:

Collection and transportation of C&D waste is an important aspect of the management plan and the contractor will be responsible for the proper disposal of C&D waste and shall not allow littering its C&D waste on roads/highways or its disposal to marine/surface water bodies which is strictly prohibited. The following suggested measures shall be adopted at construction site.

- The contractor will make all necessary arrangements with local authority or identified agency (KEIL) for collection, transportation and its disposal to the identified landfill site.
- The waste carrying vehicles will be covered with tarpaulin sheets and no overloading will be done to prevent spill.
- The contractor will deploy dedicated manpower like (environmental officer, Supervisors, operators, skilled labors etc.) for the waste management area.
- The following minimum equipment/machineries shall be deployed for the purpose of C&D waste management.
  - Skip containers of $4m^3$ – 6 Nos or as directed by Engineer.
  - Skip lifter with 12 T capacity – 2 Nos. or as directed by Engineer
  - JCB (backhoe loader) – 1 No. or as directed by Engineer
  - Tippers – 3 Nos. of 15 T capacity or as directed by Engineer
- Contractor will provide personnel protection equipment (PPE) such as helmets, safety shoes, gloves, masks, reflective jackets etc. to the workers working in the waste management area
- The C&D waste will be collected and transported to landfill site on daily basis to identified approved agency i.e. KEIL, to prevent any backlog.
- The contractor will maintain records of C&D waste generation, storage, reuse and disposal.
- Environmental expert of EMC will coordinate between KEIL and Contractor for regular removal of C&D Waste. Environmental expert will submit audit report weekly basis to CSL.

Recycling and Reuse[2]:

The use of these materials basically depends on their separation and condition of the separated material. A majority of these materials are durable and therefore, have a high potential of reuse. It would, however, be desirable to have quality standards for the recycled materials. The reusable items will be stored separately in the waste management area. It is proposed that earth and rubble will be reused in construction of roads. The following items of construction and waste will be reused.

C&D Waste Material	Reusable	Quantity	Storage Area requirement	Reuse
Earth filling in foundation	100%	2750 (m^3)	40m x 35m x 2.5m (H)	Planned to be reused in Roads
Rubble	100%	1000 (m^3)	40m x 20m x 2m (H)	Planned to be reused in Roads
Bricks / Blocks	80% of masonry	2480 (m^3)	10m x 10m x 2.5m^3	Planned to be reused building construction. eusable Bricks/blocks hall be segregated to ore separately.

Source: CSL

In order to reuse the above mentioned items, necessary quality checks are to be made and arrangements shall be made by the contractor to reuse the C&D waste. Tender document for construction works will be issued accordingly.

Hazardous Wastes from Roofing:

Asbestos roofing sheets which are hazardous waste (Waste Category No. 14) will be dismantled from the roof. Total quantity of the waste will be approximately 9818[4]m^2 i.e. 80 T about 53 m^3. This dismantling activity will last about 30 days. Therefore, waste generation will be at the rate of 2.67 T/d. The storage, collection and disposal of Hazardous waste will be done as per Hazardous Waste Management Rules, 2016. These sheets shall be removed only by the authorized agency.

Asbestos – Dismantling, Collection, Storage & Disposal

Asbestos waste is a hazardous waste and need to be stored separately in Hazardous Waste management Area.

- Mixing of Asbestos waste with other wastes shall not be allowed in any case
- Warning signs and notices shall be placed around the area.
- Access to site should be controlled.
- Water sprayer shall be used to prevent dust emission

[2] CSL
[3] 500 bricks can be stored in 1m^3 stack
[4] CSL

- Use of Gumboots, gloves, masks, safety goggles etc. shall be used by the personnel working in this access controlled area.
- Respiratory protective equipment will be used.
- All asbestos waste will be adequately identified by markings on the receptacles
- Contractor shall collect asbestos sheets wastes in lockable waste containers, which will be labeled with warning stickers (Asbestos Waste Container)
- Breaking of the sheets should be avoided or minimized.
- Place small pieces in fully enclosed asbestos waste container.
- Asbestos waste awaiting disposal will be stored in such a way that it is not liable to damage, likely to cause spillage.
- Separate covered area will be provided for the storage of asbestos sheets in the Hazardous waste management area. Asbestos sheets will be stored there on the 150 mm above the maximum flood level raised cement concrete platform Proper enclosures / wrapping will be provided over the sheets to eliminate the probability of dust release into the environment.
- A closed area of 100 m x75 m will be identified for storing HW wastes generated from asbestos sheets for its disposal to KEIL landfill site. The waste shall be disposed to landfill site on daily basis. However, a storage area for storing asbestos waste for a maximum of period of 90 days shall be arranged at construction site during construction stage.
- Good housekeeping will be maintained around the storage areas.
- Signboards showing precautionary measures to be taken, in case of normal and emergency situations should be displayed at appropriate locations.
- Loading and unloading of wastes in storage sheds will only be done under the supervision of the well trained and experienced staff using PPEs (Gumboots, gloves, masks, safety goggles etc.)
- Doors and approaches of the storage area should be of suitable sizes for entry of fork lift and firefighting equipment.
- A record of hazardous waste generation, storage and disposal will be maintained.
- Packaging, labelling and transport of asbestos sheet wastes will be done in accordance with the provisions of the rules issued by the Central Government under the Motor Vehicles Act, 1988 and other guidelines issued from time to time.
- The following arrangement[5] for Transportation shall be made at construction site.
  - Asbestos waste, whether loose or in sealed containers, will be transported to the disposal site in such a way that no asbestos dust is emitted into air during transport.
  - Actions to be taken in the event of accidental spillage will be made known to the drivers of vehicles carrying asbestos waste, in writing and also carried in the vehicle so that in the event of accident making, the driver incapable of action, the rescue or fire brigade team will know about the actions to be taken.

[5] IS 11768 (1986): Recommendations for disposal of asbestos waste material

Landfilling:

As discussed above, Kerala Enviro Infrastructure Ltd (KEIL) has agreed for collection and disposal of construction and demolition waste and Asbestos sheet waste. KEIL is a public limited company and is located at the industrial hub, Ambalamedu at 20 km away in the eastern side of Kochi.

This facility is functioning in 50 acres of land purchased in the name of Government of Kerala from FACT – Cochin Division and leased to KEIL for 50 years.

The landfill site has well equipped laboratory, common storage and physical treatment area having 1800m^2 with impervious lined floor for temporary storage area of hazardous waste and having secured landfill constructed as per CPCB guidelines.

As identified above, entire non-reusable demolition waste (5121 T) containing mainly concrete (4005 T) and 20% of masonry (1116 T) will be disposed of at KEIL landfill site. Besides this, the construction waste of Pile muck (154 T/d) and cement concrete (4750 T) from pile cut off will also be disposed to Ambalamedu landfill site of KEIL.

The hazardous waste generated due to removal of asbestos roof sheets will be disposed to the KEIL landfill which is an authorized agency for collecting the same.

Fig: KEIL landfill site

Budgetary Cost Estimates

During construction stage, contractor will make necessary arrangements, man power for proper collection and disposal of the C&D Waste.

However, CSL is already having memorandum of understanding with KEIL for disposal of their waste and hence no further estimates are required for this.

Summary of C&D Waste Management Plan

Summary of Construction and disposal waste is as follows:

QUANTITIVE BREAKUP OF CONSTRUCTION & DEMOLITION WASTE			
Sl No.	**Item**	**Quantity**	**Disposal**
A.	**Demolition Waste:**		
1	Earth filling in foundation	2750m^3	Reused in Road work
2	Cement Concrete	1200 m^3	To KEIL landfill at Ambalamedu, Kochi
3	Masonry	3100 m^3	20% of Masonry waste will be disposed to KEIL landfill at Ambalamedu, Kochi and balance 80% will be reused.
4	Reinforced Cement Concrete	450 m^3	To KEIL landfill at Ambalamedu, Kochi
5	Rubble	1000 m^3	Reused in Road work
6	Windows (1.5m x 1.2m)	42 No.	Sold to recyclers
7	Ventilators (2.0m x 0.7m)	55No.	Sold to recyclers
8	Doors of size (2.1m x 0.9m)	10No.	Sold to recyclers
9	Reinforcement Steel	40 T	Sold to recyclers
10	Structural Steel	110 T	Sold to recyclers
11	Asbestos Sheet – Hazardous Waste	9818m^2 (53m^3 or 80T)	To KEIL landfill at Ambalamedu, Kochi
B.	**Construction Waste:**		
11	Pile Muck	90000	To KEIL landfill at Ambalamedu, Kochi
12	Cement Concrete (pile cut off)	1900	To KEIL landfill at Ambalamedu, Kochi

****

VII) Explore the possibility to use Solar Energy

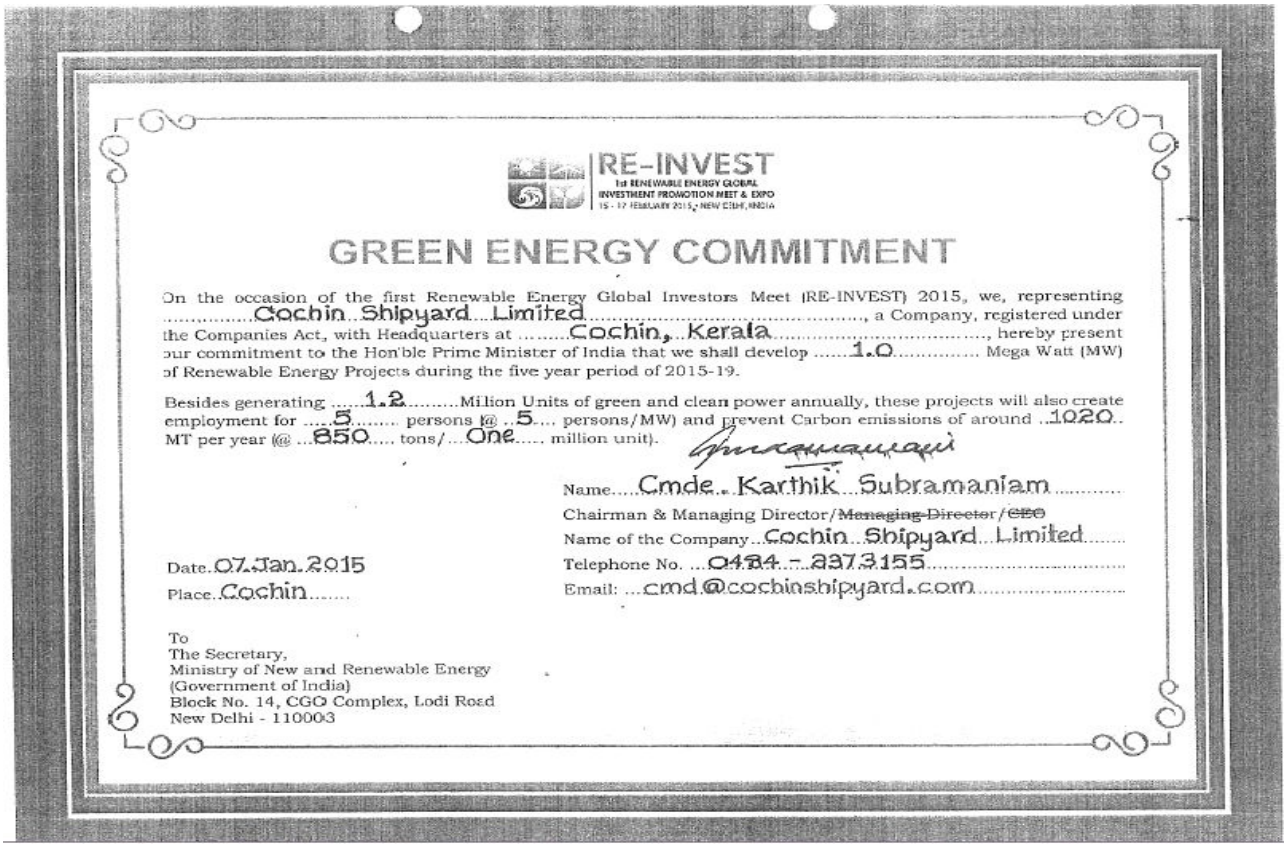
COCHIN SHIPYARD LIMITED

SOLAR POWER PLANTS –

- **EXISTING INSTALLATIONS**
- **FUTURE PROJECTS**

Background

In line with Government's target to increase India's renewable energy capacity to 175 GW by 2022, Cochin Shipyard Ltd. (CSL) had made a Green Energy Commitment to Hon'ble Prime Minister that we shall develop one (1) Mega Watt (MW) of Renewable Energy projects during the five year period 2015-19. CSL mainly caters to the installation of solar power plants for meeting the above commitment.



RE-INVEST
1st RENEWABLE ENERGY GLOBAL INVESTMENT PROMOTION MEET & EXPO

GREEN ENERGY COMMITMENT

On the occasion of the first Renewable Energy Global Investors Meet (RE-INVEST) 2015, we, representing .....Cochin Shipyard Limited....., a Company, registered under the Companies Act, with Headquarters at .....Cochin, Kerala....., hereby present our commitment to the Hon'ble Prime Minister of India that we shall develop .....1.0..... Mega Watt (MW) of Renewable Energy Projects during the five year period of 2015-19.

Besides generating .....1.2.....Milion Units of green and clean power annually, these projects will also create employment for .....5..... persons @ ..5.... persons/MW) and prevent Carbon emissions of around ..1020.. MT per year @ ...850..... tons/...One..... million unit).

Name.....Cmde. Karthik Subramaniam.....
Chairman & Managing Director/~~Managing Director~~/~~CEO~~
Name of the Company...Cochin Shipyard Limited.....
Telephone No. ...0484 - 2373155.....
Email: ...cmd@cochinshipyard.com.....

Date.07.Jan.2015
Place.Cochin.....

To
The Secretary,
Ministry of New and Renewable Energy
(Government of India)
Block No. 14, CGO Complex, Lodi Road
New Delhi - 110003

Fig: - Green Energy Commitment Certificate

CSL Five year Plan for Renewable Energy Projects

Sl no.	Capacity (kWp)	Year of Installation	Remarks
1	200	2015 --16	Commissioned in Dec 2015
2	200	2016 --17	
3	200	2017 -- 18	
4	200	2018 – 19	
5	200	2019	

Details of 200 kWp Capacity Solar installations carried out in CSL:

a) **Main Receiving Station**- 40 kWp Capacity

No. of modules – 160 Nos. (250Wp each), No. of Inverters – 2 Nos. (20KW each)

b) **Employees Hygiene Centre** – 40 kWp Capacity

No. of modules – 160 Nos. (250Wp each), No. of Inverters – 2 Nos. (20KW each)

c) **Fire Station Building**– 20 kWp Capacity

No. of modules – 80 Nos. (250Wp each), No of Inverters – 1 No. (20KW)

d) **U&M – Electronics office** – 35 kWp Capacity

No. of modules – 140 Nos. (250Wp each), No of Inverters – 2 Nos. (20KW each)

e) **Marine Engineering Training Institute** – 25 kWp Capacity

No. of modules – 100 Nos. (250Wp each), No of Inverters – 2 Nos. (15KW each)

f) **Canteen** - 40 kWp Capacity

No. of modules – 160 Nos. (250Wp each), No of Inverters – 2 Nos. (20KW each)

Proposed Solar installations for the period 2016-17 to 2018-19:

Fabrication activities in the yard mainly take place inside the Hull shop having a total area of approx. 37,000 sq M. It is planned that a total of 600 kWp capacity solar installations for the three consecutive financial years viz., 2016-17, 2017-18 and 2018 - 19 are proposed over the rooftop of Hull shop. CSL had already placed purchase order for the supply and installation of 200 Kwp capacity solar power plants on the Hull shop roof for the current financial year.

Fig: - Aerial View of Cochin Shipyard

Proposed Solar installation for April – Dec 2019:

For the period April – Dec 2019, CSL has to carry out the installation of balance 200 kWp capacity solar plants in order to meet the green energy commitment of 1 MW by 2019. It is estimated that solar plants covering a floor area of 2000 sq.M is required to generate 200 kWp.

International Ship Repair Facility (ISRF) project of Cochin Shipyard at Cochin Port premises is scheduled for completion by Aug 2019. Hence, it is proposed that 100 kWp out of the 200 kWp capacity solar power plants targeted for completion by Dec 2019 will be installed on the rooftop of various buildings to be constructed for the ISRF project.

Some of the buildings identified for the installation of solar power plants at the ISRF project area are as follows:-

- Mechanical Superintendent Office building
- Main Receiving station
- Electrical Substation
- Fire station building etc.

VII) <u>The EIA does not address to the entire spectrum of flora and fauna. A detailed assessment and a management plan including macro fauna and flora to be submitted</u>

Fish

Marine study revealed the eutrophic nature of the estuary. Good supply of nutrients that are drained into the Cochin estuary coupled with excellent sunlight during most part of the year supports good primary productivity and subsequent secondary and tertiary productivity. However, the most important finding with regard to biotic community was the low diversity of benthic fauna in the project impacted area. This is very likely due to the frequent dredging taking place in the channel. The eutrophication of the estuary and a reduction in the diversity of biotic community are the probable indication of the ecological degradation.

Cochin University of Science and Technology was engaged for conducting the marine ecological study. Few sampling photographs are presented in **Plate 01** So far primary macro fauna (fish) survey is concerned; they could only get couple of fishes such as *Etroplus suratensis, Etroplus maculatus, sole fish and Leognathus bindus* by trial catch. However, the fish fauna of the study area has reported occurrence of *Catla* (during monsoon season), *Lutjanus johnii, Clarius species, Mugil cephalus, Liza macrolepis*, shrimps and crabs.

Table: 1 List of Fish species composition from primary catch data

Sl. No.	Species Name	Local Name	Family	Habitat	Status	Environment	Migration
1	*Etroplus maculatus*	Pullattay/ Pallathy	Cichilidae	FB	LC	Benthopelagic	Amphidromous
2	*Etroplus suratensis*	Erumeen/ Karimeen	Cichilidae	B	LC	Benthopelagic	Amphidromous
3	*Cynoglossus semifasciatus*	Sole fish	Cynoglossidae	F	LC	Demersal	Potamodromous
4	*Leognathus bindus*	Silverbellies	Leioganthidae	MB	NC	Demersal	-

Etroplus suratensis

Etroplus maculatus

Leognathus bindus

Cynoglossus semifasciatus

We have used CMFRI landing data for the report preparation. Though CMFRI data mainly pertains to the marine fishes, Cochin estuary being an ecotone between freshwater and marine environment, has a transient fauna from both these ecosystems (freshwater and marine) which are tolerant to fluctuations in environmental conditions. Also the trial catch does not represent a complete picture as it is limited to one or two cast net operations. We have also used the research data from Asha et al (2014) on decline of fishery resources of the Vembanad wetland system (Cochin estuary is a part of this larger system).

Fishery

The total marine fish landings along the Kerala coast was 7.43 lakh Tonnes during 2011, which was 22.2% more than that (6.04 Tonnes) of 2010. The overall increase recorded was mainly due to the increased production of oil sardine (+62760 Tonnes), threadfin breams (+33185 Tonnes) and ribbon fishes (+17514 Tonnes).

Pelagic fin fishes constituted 73%, demersal fin fishes 16%, crustaceans 6% and molluscs 5% of the total landings. The contributions of mechanized, motorized and non-mechanized sectors were 62%, 37% and 1% respectively. The total unit efforts (19.5 lakh) operated increased by 18.5% in 2011 compared to that of 2010. While the total effort in fishing hours (104.3lakhs) expended increased by 19.7% in 2011, the average catch per hour realized has increased only by 2%. Yield of 40 out of 59 important groups monitored has registered increase, whereas 19 groups declined in their landings during 2011. The groups which recorded significant increase were skates (+140.1%), cat fishes (+321.4%), pigface breams (+181.1%), leather jackets (+302.9%), white sardines (+236.9%), silver pomfrets (+200%), Chinese pomfrets (+189.3%), longtail tuna (+113.8%), non-penaeid prawns (+187.5%) and lobsters (+109.8%). Important resources which registered significant decline were white baits (-17039 Tonnes), other sardines (-1563 Tonnes), squids (-2036 Tonnes) and stomatopods (-2613 Tonnes).The major groups which contributed to the fishery during 2011were oil sardine (43.3%), Indian mackerel (9.7%), threadfin breams (9.0%),carangids (5.8%), penaeid prawns (4.7%), cephalopods (4.6%), ribbonfishes(3.7%), stolephorus sp. (3.5%), tunas (2.3%), soles (1.9%), lizard fishes (1.5%),seer fishes (0.9%) , non-penaeid prawns (0.8 %) and other sardines (0.6%).

The major gears that supported the fishery were seine nets (57), trawl nets(30.3%), gillnets (7.6%) and hooks and lines (3.3%).Fourth quarter with a contribution of 27.6% was the most productive period, followed by the third quarter (26.1%), second quarter (23.7%) and first quarter (22.6%). The highest (87979.8 Tonnes) landing was recorded during the post monsoon/post ban period of August and the least (45887.6 t) was in March. District-wise production showed that Ernakulam with 19.6% landings ranked first followed by Calicut (18.8%), Malappuram (14.8%), Kollam (12.2%), Trichur (9.7%), Kannur (7.6%), Alleppey (7.4%), Trivandrum (7.2%) and Kasaragod (2.8%).The cat fish fishery, which was almost collapsed, seems to be on the revival path with 321.4% increase over 2010. White sardine, Escuolosathoracata, fishery with 236.9% increase (1184.9 Tonnes to 3992.5 Tonnes) during 2011 also seems to be on the revival path. Belonids need closer attention/study as a high value emerging resource. The pelagic resources constituted 73% (5,42,480 Tonnes) of the total Kerala

landings, which was 25.6% more compared to 2010. The major contributors were oil sardines (59.4%), Indian mackerel (13.3%), carangids (8.0%), ribbon fishes (5.0%), white baits (4.8%), tunas (3.2%), seer fishes (1.2%) and other sardines (0.8%).

Table: 2 Biological indicators of major pelagic resources of Kerala

Sl. No.	Scientific Name	Length in cm
1.	Alepes djedaba	10.1
2.	Selar crumenophthalmus	14
3.	Megalaspis cordyla	14
4.	Trichiurus lepturus	22.5
5.	Scomberomorus commerson	17
6.	Acanthocybium solandri	64
7.	Euthynnus affinis	38
8.	Auxis thazard	22
9.	Auxis rochei	19
10.	Rachycentron canadum	24
11.	Rastrelliger kanagurta	8.5
12.	Sardinella longiceps	4
13.	Encrasicholina devisi	7
14.	Stolephorus commersonii	7.5

CMFRI Annual Report 2011-12

Crustacean Resources:

The total crustacean landings during the year (44,861 tonnes), increased by 1.9% compared to 2010. Crustaceans formed 6% of the total Kerala landing since 2011. The major contributors were penaeid prawns (78.5%), non-penaied prawns (14%), crabs (4.9%), stomatopods (2.5%) and lobsters (0.2%). About 84% of the crustaceans were landed by trawlers followed by seines (14%), gillnets 0.5% and others (1.7%) Penaeid prawn catches during the year (35,200 Tonnes) declined by 1.3% as compared to 2010. Non-penaeid prawn catches (6,260 Tonnes) increased by 187.5% and lobster catches (99 Tonnes) increased by 109.8% over 2010. Crabcatches (2197 t) declined by 9.1% and stomatopod landings (1105 tonnes) declined by 70.3% over 2010.

Prawn:

Total prawn landings in 2011 (41,460 tonnes) increased by 9.6% over 2010 which formed 92.4% of the crustacean landings. Penaeid prawns formed 84.9% of the prawn landings and non-penaeid prawns formed 15.1%. About 89.8% of penaeid prawns were caught from the inshore grounds and the rest 10.2% from the deep sea grounds. Among the inshore penaeid prawns, Metapenaeusdobsoni dominated with 58.6% and 38.1% in the landings of north and central Kerala, whereas Fenneropenaeusindicus was the dominant species (98.3%) in Trivandrum. The other important species were Parapenaopsis stylifera, Metapenaeusmonoceros, M. affinis, Trachypenaeus curvirostris, Solenocera choprai, Penaeus monodon, Melicertus canaliculatus and P. semisulcatus. The deepsea penaeid catch was dominated by Aristeus alcocki (50.6%) followed by Metapenaeopsis andamanensis (49.0%) and S. hextii (0.3%). Penaeopsis jerryi, P. investigatories and Hymenopenaeus aequaliswere also landedong the deep sea non-penaeidprawns, Plesionikaspinipes contributed 36.5% followed by Heterocarpus gibbossus (29%) and H. woodmasoni (29.5%). Plesionika martia, Acanthephyra sanguinea and A. armata were also landed in small quantities. Length (mm) based biological indicators of major prawn resources of Kerala.

Table: 3 Biological indicators of major prawn resources of Kerala

Sl. No.	Scientific Name	Length in mm
1.	M. dobsoni	125.6
2.	P. stylifera	123
3.	M. monoceros	181.3
4.	M. affinis	161.2
5.	P. sanguinolentus	61 – 145
6.	P. pelagicus	71 - 140
7.	C. feriatus	61 - 105

CMFRI Annual Report 2011-12

Crabs:

The crab landings during the year (2197 Tonnes) declined by 9.1% compared to that of 2010 which formed 4.9% of the crustacean landings. 89.8% were landed by trawlers, 2.7%

by gillnetters and rest (7.5%) by non-mechanised gears. Portunus sanguinolentus (61-145 mm CW) was the most important species in the crab landings throughout Kerala. It formed 52.4% in Malabar and 45% in the crab landings of central and south Kerala. P. pelagicus (71-140 mm CW) formed 37.6% at Malabar and 32.6% in the central Kerala. Charybdis feriatus (46-115 mm CW) formed 15.9% at central Kerala and 5.2% in Malabar. Other important species were C. lucifera (6%) and Podophthalmus vigil (4.6%), Scylla serrate in small quantities also landed at Vizhijium in bottom-set gillnet.

Table: 4 Biological indicators of major crab resources of Kerala

Sl. No.	Scientific Name	Length in mm
1	P. sanguinolentus	61 – 145
2	P. pelagicus	71 - 140
3	C. feriatus	61 - 105

CMFRI Annual Report 2011-12

Lobsters:

Lobster landings during the year (99 Tonnes) increased by 109.8% compared to that of 2010. They formed 0.2% of the crustacean landings. About 65% were landed by trawlers and 35.5% by non- mechanized trap fishing and bottom-set gillnets. Slipper lobster, Thenus unimaculatus (81-265 mm CL) and spiny lobster, Panulirus homarus (90-248 mm CL) were the most important species landed during the year. P. versicolor were also landed in small quantities.

Molluscan resources:

The total molluscan landings (34,869 Tonnes) declined by 1.6% compared to 2010. It formed 4.7% of the Kerala landings. About 73% was caught by trawlers followed by hooks and lines (21.3%), seine nets (2.4%) and gillnets and non-mechanised gears (3.7%). The major contributors were cuttlefishes (48%), squids (39.3%), octopus (11.2%) and gastropods (1.1%).Total cephalopod catch (34,467 t) declined by 1.1% in 2011. Group wise contributions were: cuttle fishes (48.5%), squids (39.7%) and octopus (11.7%).

Bivalves:

The bivalve landings in estuaries/lakes of Kerala were estimated as 49,680 Tonnes. Villorita cyprinoides contributed 77%, mainly from Vembanad Lakeand Paphia malabarica

formed 23%, mainly from Ashtamudi Lake. The brown mussel (Perna indica) production was 713.2 Tonnes at Trivandrum.

Gastropods:

Gastropod exploitation, mainly at Kollam was 395 Tonnest, declined by 12.04% as compared to 2010. Babylonia sp. contributed 61% followed by Xancus pyrum 12% and Bursa sp. 11%. Among the cephalopods, cuttle fish (+0.4%) and octopus (+63.5%) catches increased whereas that of squids declined by 13% in 2011.

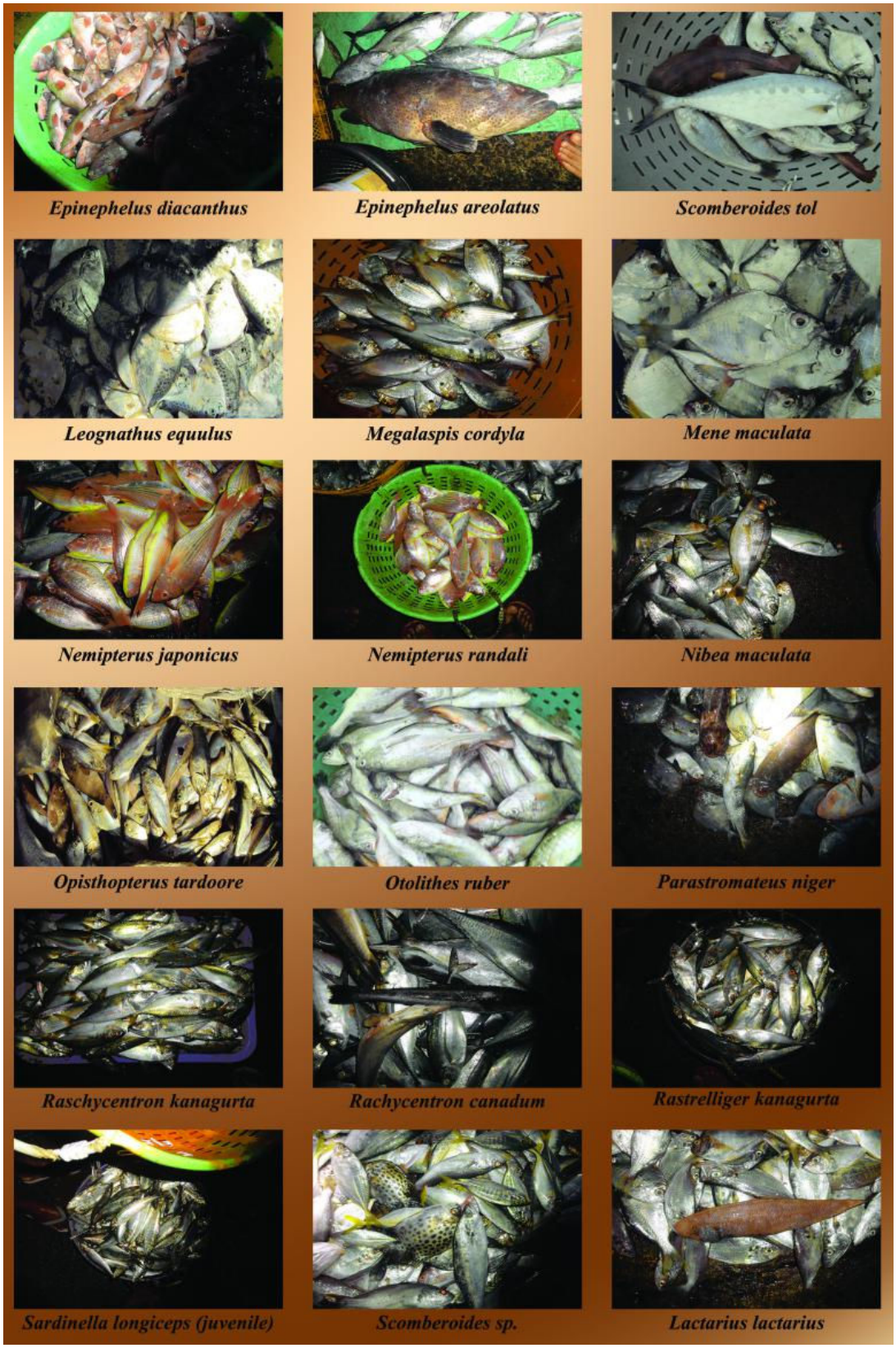
Cephalopods:

Cuttle fish landings (16,721 Tonnes) were dominated by Sepiapharaonis (90.1%). Other species landed were Sepia ellptica (5.5%) and Sepiella inermis (4.4%). Sepia aculeate landings were minimal. Squid catch (13,697 Tonnes) was supported mainly by Loligo duvauceli (78.2%), L. singhalensis (16.2%), L. edulis(5.1%), L. chinensis (0.3%) and Sepioteuthis lessoniana (0.2%). Sthenoteuthis oualaniensis and Thysanoteuthis rhombus were also landed instray numbers. Octopus fishery (4049 Tonnes) was supported by six species. However, Octopus membranaceus (52%), O. dollfusi, (25%) and Cystopus indicus (18%) were the dominant species. O. aegina, O. cyanea and other Octopus sp. were also landed occasionally. The major squid species L. duvauceli was exploited at 30% below the optimum length, the cuttle fish S. pharaonis at 3% below optimum length and O. membranaceus at above optimum length. The spawning stocks of all major species were above 60% of the standing stock. The proportion of juveniles in the trawl fishery was small; 1.6% in S.pharaonis, 0.7% L. duvauceli and 7.2% in O. membranaceus.

Table: 5 Fishery Landing data along the Ernakulam district (CMFRI Bulletin, 2013)

Type of Fishes	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
Elasmobranchs	202	216	207	206	214	220	218	217	207	203	196
Eels	3	4	3	3	4	4	4	4	4	4	4
Cat Fish	30	24	31	31	34	35	35	34	34	34	37
Chirocentrius	12	15	13	14	14	13	14	13	13	12	12
Oil Sardines	12306	13073	12640	12516	10864	11603	11386	11339	11167	11001	11008
Lesser sardines	2063	611	2122	2095	1391	1559	1509	1505	1462	1428	1353
Hilsa Ilisha	0	0	0	0	0	0	0	0	0	0	0
Other Hilsa	0	0	0	0	0	0	0	0	0	0	0
Anchovilla	4427	3698	4547	4475	3824	4341	4222	4201	4122	4049	4058
Trisocles	286	554	294	292	402	406	404	3999	392	391	389
Other Clupeids	1046	883	1072	1052	1276	1369	1334	1324	1284	1258	1230
Harpodon Nehereus	0	0	0	0	0	0	0	0	0	0	0
Saurida & Saurus	802	934	825	811	761	845	818	811	785	767	752
Hemirhampus & Belone	73	112	75	75	81	82	83	82	81	80	80
Flying Fish	0	0	0	0	0	0	0	0	0	0	0
Perches	5647	7498	5797	5689	5682	6232	6057	6021	5816	5695	5597
Red Mullets	68	6	66	70	73	70	72	72	72	72	72
Polynemids	1	9	1	1	5	4	5	4	4	4	4
Sciaenids	1135	780	1159	1153	1268	1256	1244	1235	1180	1127	1115
Ribbon Fish	4313	3777	4419	4382	3683	3835	3794	3785	3637	3568	3563
Caranx	3170	3140	3249	3210	3408	3547	3503	3481	3458	3429	3395
Chorinemus	19	9	18	19	18	18	18	18	18	18	18
Thachynotus	0	0	0	0	0	0	0	0	0	0	0

Type of Fishes	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
Other Carangids	1749	1395	1796	1763	1515	1683	1629	1620	1561	1515	1487
Coryphaena	0	0	0	0	0	0	0	0	0	0	0
Elacate	0	0	0	0	0	0	0	0	0	0	0
Leiognathus	82	140	84	84	87	90	89	88	87	86	85
Gazza	0	0	0	0	0	0	0	0	0	0	0
Lactrious	242	133	249	247	223	229	228	226	223	217	215
Pomfrets	204	377	208	206	223	228	226	225	230	228	226
Mackerel	2194	2818	2250	2223	2284	2403	2365	2349	2346	2325	2299
Seer Fish	261	391	267	265	276	292	287	287	282	285	282
Tunnis	1314	1843	1350	1338	1423	1495	1473	1463	1461	1439	1421
Sphyraena	197	405	203	199	264	281	275	272	267	263	259
Mugil	15	48	15	16	584	600	595	592	158	156	156
Bregmaceros	0	0	0	0	0	0	0	0	0	0	0
Soles	447	831	460	454	785	827	8210	807	797	782	775
Penaid Prawn	9181	9251	9205	9210	8280	8677	8568	8513	8349	8214	8098
Non Penaid Prawn	136	142	143	138	73	72	72	73	72	71	70
Lobsters	0	178	0	0	80	90	87	86	83	81	79
Crabs	113	260	115	115	151	153	153	150	154	151	151
Stomatopodes	59	2916	60	58	1668	1666	1671	1643	1654	1650	1644
Cephalopods	3924	6665	4036	3984	3550	3834	3743	3720	3631	3565	3511
Miscellaneous	192	500	197	193	337	349	342	341	338	334	331
Total (MT)	**55,913**	**63,636**	**57,176**	**56,587**	**54,805**	**58,408**	**64,733**	**60,600**	**55,429**	**54,502**	**53,972**



Intertidal Biodiversity along the Project Influence Area (PIA)

Intertidal Biodiversity along the Project Influence Area (PIA)

Macrophytes

As per the study conducted by Cochin University of Science and Technology Only floating macrophytes (Water Hyacinth – Eichhornia crassipes) was observed in the study area. Images of the same are placed under **Plate 02**.

Family:	Pontederiaceae
Genus:	Eichhornia
Species	crassipes
Local Name	Kulavazha,

Since the study area is away from the coast occurrence of rooted plants were totally absent. Macrophytes are floating from elsewhere that does not deserve any particular attention. Since the study area is sufficiently turbid the conditions can also not support growth of rooted vegetation. Water hyacinths are seen all over estuary especially after the monsoon season, when they get dislodged from the nearby freshwater canals and lakes and move into the estuary along with tides. They will finally end up in Arabian sea and perish as the salinity of the seawater does not support their growth.

Plate 02. Macrophytes seen in the study area

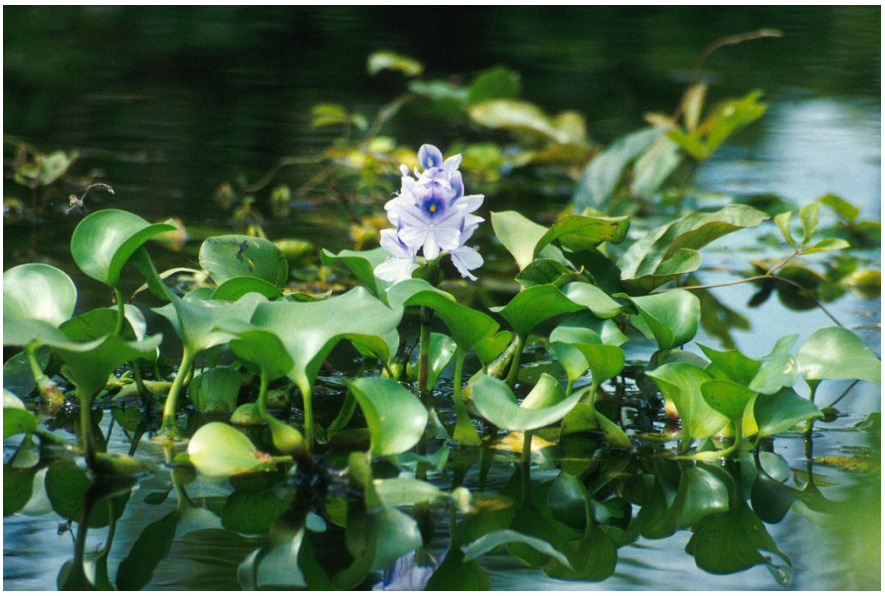


Plate 01 - Images of Field Sampling

Management Plan:

As the macrophytes are floating from elsewhere that does not deserve any particular attention. As such there are no rooted vegetation in the study area (in the estuary) and the question of conservation does not really arise here.

Regarding the fish fauna (macrofauna) they are active swimmers and likely to avoid the area during construction. However, the changes that could arise as a result of dumping of construction materials and other could have some effect on their distribution. However, they will recolonise the area once the conditions are stabilized.

The construction could affect shell fishes, however there were no shellfishes in the grab samples, hence does not deserve mention.

The most important conservation measure should be responsible transportation and storage materials involved in the construction and avoid dumping of any unwanted material into estuary. Usually this is the case and it does more damage than the actual construction process or the structures erected as a result of construction. Management and disposal of dredged material has already been discussed under EMP.

IX) Details of hazardous wastes generated from the proposed unit and its management plan as per the provisions of the Hazardous Waste Management rules.

The hazardous waste generated during the operations of the proposed International Ship Repair Facility (ISRF) will be handled as per the existing practices of Cochin Shipyard Limited (CSL) complying with the 'Hazardous and Other Wastes (Management and Trans-boundary Movement) Rules, 2016'. CSL will bring the complete mobilization (including temporary storage) of hazardous wastes generated from the proposed ISRF project under the responsibility of concerned Officers / Departments.

Various hazardous wastes, which will be generated from the ISRF project area along with its estimated quantities and temporary storage is as indicated in the following table:

Table-1 Hazardous waste details

Sl. No.	Hazardous Waste	Proposed Quantity (approx)	Temporary Storage	Disposal
1	Used Oil	125 KL/year	Steel Container	CTSDF
2	Waste containing Oil	2 T/year	Roofed storage	CTSDF (KEIL)*
3	Used Copper Slag	360 T / year	Roofed storage	CTSDF (KEIL)
4	Paint Sludge	0.5 T/year	Roofed storage	CTSDF (KEIL)
5	Battery Waste	75 nos./year	Roofed storage	CTSDF
6	E waste (scarp items of computer, scanner, printer etc.)	0.25 T/year	Roofed storage	CTSDF (KEIL)
7	Industrial Waste (On board scrap items, tyres, cartons, packing material, wood etc.)	300 T/year	Roofed storage	CTSDF (KEIL)
8	Sludge	50T/year	Concrete pit with roof	CTSDF
9	Asbestos Containing Material (ACM)**	0.1 T/year	Air tight containers	CTSDF (KEIL)

* KEIL – M/s Kerala Enviro Infrastructure Ltd., Kochi

** ACM will be handled in emergency cases only.

Wastes generated will be segregated in the yard itself and will be stored at designated locations complying with the norms. CSL main facility is equipped with temporary storage facilities for proper handling of hazardous wastes generated within the yard.

Temporary storage facilities within CSL main facility is as follows:-

Fig-1 Used Oil storage tank

Fig-2 Waste containing oil storage

Fig-3 E-waste storage

Fig-4 Battery storage

Fig-5 Paint sludge storage

Fig-6 Sludge storage

Fig-7 Used Copper slag storage

Designated area for temporary storage of hazardous waste is incorporated in the master plan of ISRF project. Separate rooms / enclosures will be set up within the ISRF project area in compliance with statutory norms.

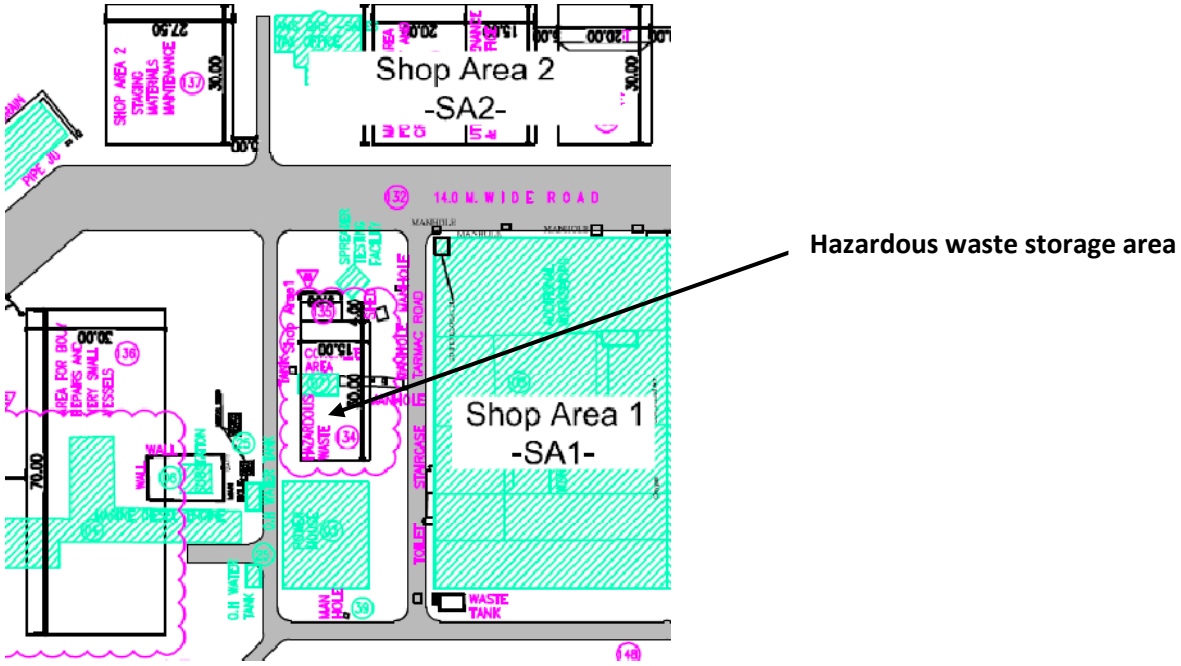


Fig-8 Designated Hazardous waste storage area

Generally, handling of ACM is not envisaged in the proposed ISRF project area. Majority of the ships presently operating is devoid of any asbestos content. However, in case of repair of any old vessels, excessive care will be taken while handling ACM. This will be carried out only by specially trained team equipped with suitable protective clothing and respirators. Collecting containers for ACM waste will be air tight and capable of being effectively closed. Care will be taken to ensure that exterior of the container is not contaminated with asbestos dust. ACM eventually will be disposed off at designated landfill sites (CTSDF).

Wastes will be dispatched for final disposal with proper documentation, whose copies shall be submitted to Kerala State Pollution Control Board.

CSL is having tie-up with CTSDF viz. M/s Kerala Enviro Infrastructure Ltd. (KEIL), Cochin for the disposal of Hazardous waste mentioned at Sl no. 2, 3, 4, 6, 7 & 9 of Table-1 viz. Waste containing Oil, Used Copper Slag, Paint Sludge, E waste, Industrial Waste & ACM.

About M/s Kerala Enviro Infrastructure Ltd. (KEIL)

Kerala Enviro Infrastructure Ltd (KEIL) is a public limited Company functioning at the industrial hub of Ambalamedu, situated about 25 Km on the Eastern side of Kochi City. This facility was established on the directive of the Supreme Court Monitoring Committee on hazardous waste for treatment and disposal of hazardous waste generated from industries in the State of Kerala. The company is functioning at the 50 acres of land purchased in the name of Govt. of Kerala

and leased to KEIL for 50 years. The company disposes solid hazardous waste through engineered landfills from various industries in the state of Kerala, India.

The facilities include a well equipped laboratory, Common storage and Physical treatment area having 1800 M^2 with impervious lined floor for temporary storage of the hazardous waste, dedicated vehicles for transportation of hazardous waste complying with environmental regulations, multiple effect evaporation plant and secured landfill constructed as per CPCB guidelines with double composite liner.

KEIL has capacity to dispose 10,00,000 MT for a period of 20 years. The Common TSDF of KEIL is the only facility in Kerala to collect, transport, treat and dispose hazardous waste as per Hazardous and Other wastes (Management and Trans-boundary Movement) Rules, 2016. The company currently caters to 180 industries. Some of the specific industrial processes to whom KEIL is offering its service are:

- Treatment and Disposal of process waste from metallurgical Industries like Zinc, Titanium Pigment and Aluminum.
- Process waste from Petroleum and Petrochemical industry and hazardous waste from Fertilizer industry
- Waste from Chloro alkali industry
- Process waste from Catalyst manufacturing units
- Hazardous waste from Food industry
- Waste from Coir and Paper industry
- ETP waste from Effluent Treatment Plant
- Hazardous waste from Pesticide Industry
- Waste generated from Plywood manufacturing unit
- Waste from Garment manufacturing unit
- Solid hazardous waste from Ship building industry

The wastes which are suitable for direct disposal in the landfill are disposed directly in the landfill and wastes which require pretreatment / stabilization are subjected to necessary treatment before disposal in the landfill.

Fig-9 KEIL Office

Fig-10 Landfill site

Fig-11 KEIL Landfill site

Fig-12 KEIL facility

CSL's Tie up with KEIL

CSL is having a contract in force with KEIL from 20 April 2015 valid for 5 years thereafter, for the disposal of waste generated from the yard.

KERALA

500 Rs.

INDIA NON JUDICIAL

५०० रु. Rs 500

सत्यमेव जयते

भारत

पाँच सौ रुपये FIVE HUNDRED RUPEES

AGREEMENT TO BE EXECUTED BETWEEN MEMBER INDUSTRIES AND KEIL

AGREEMENT is entered at Kochi on this the 20th day of the month of April 2015 between **M/s KERALA ENVIRO INFRASTRUCTURE LIMITED** having its registered office at FACT-CD Campus, Aambalamedu - 682 303, Kochi, Kerala, India, a company registered under the Companies Act, 1956 and currently represented by its CEO, Dr. N.K. Pillai hereinafter referred to as "KEIL", which expression shall where context so requires or admits of, be deemed to include its successors or assignees) of on one part

and

M/s COCHIN SHIPYARD LIMITED, a Government of India Enterprises and Private Limited company registered under the companies act 1956, having its registered office / factory at 39/6080, administrative building ,Cochin Shipyard premises, Perumanoor, Cochin- 682015 and currently represented by its Occupier - Environmental Shri S. Varadarajan aged about 54 years, residing at B5, Shri Hari Apartments, Infort, Thripunithura (hereinafter referred to as MEMBER which expression shall where the context so requires or admits of, be deemed to include its successors or assignee) of the other part,

AND WHEREAS, the foremost and the sole objective of KEIL is to prevent Environmental Pollution Hazards and to observe the existing laws on Environmental and Pollution Control.

एस वरदराजन / S VARADARAJAN
दखलकार-पर्यावरण(संरक्षण) अधिनियम 1986
Occupier-Environment(Protection) Act 1986
कोचीन शिपयार्ड लिमिटेड
Cochin Shipyard Ltd.
कोच्ची / Kochi-682 015

Page 1 of 10

Dr. N.K. PILLAI
Chief Executive Officer
Kerala Enviro Infrastructure Ltd
Ambalamedu - 682 303

DISTRICT STAMP DEPOT
09 APR 2015

Cochin Shipyard Ltd

Fig-13 First page of agreement between CSL & KEIL

Further, the requirement of disposing hazardous waste that will be generated from the ISRF project was taken up with KEIL and the concurrence issued by them is as below:

COCHIN SHIPYARD LTD.
(A GOVERNMENT OF INDIA ENTERPRISE)
KOCHI - 682 015, INDIA

कोचीन शिपयार्ड लिमिटेड
(भारत सरकार का उद्यम)
कोच्ची - 682 015, भारत

PROJ/ISRF/701/13

30 Aug 2016

M/s Kerala Enviro Infrastructure Ltd (KEIL).
TSDF Project, Inside FACT-CD Campus
Ambalamedu
Kochi – 682 303
Ph: 0484 – 2722041, 2722141
Email: drnkpillai@gmail.com

Kind Attn: - Dr. N K Pillai, Chief Executive Officer

Sir,

Sub: - Disposal Facility for Construction & Demolition waste and Hazardous waste in connection with the International Ship Repair Facility (ISRF) Project of Cochin Shipyard Ltd.

1. Cochin Shipyard Limited (CSL), a category-1 miniratna company fully owned by Government of India, under Ministry of Shipping is the largest and the most modern ship building and ship repair yard in India. Recently, CSL had taken over the existing marine workshop facility of Cochin Port Trust (CoPT) located at Willingdon Island, Kochi for a lease period of 30 years. CSL intends to set up an International Ship Repair Facility (ISRF) equipped with state of the art facilities like shiplift, transfer system & associated facilities for a project cost of Rs. 970 crores.

2. The process of obtaining Environmental Clearance from Ministry of Environment, Forests & Climate Change (MoEFCC) is in the advanced stage. In this connection, CSL had to submit disposal plan for Construction & Demolition (C&D) waste and Hazardous waste.

3. Details of C&D waste estimated during the demolition of existing structures and during construction stage is as follows:-

Sl. No.	Description	Approx. Qty
1	Cement Concrete	3,550 Cu. M
2	Brick/Block Masonry	3,100 Cu. M
3	Pile Muck	90,000 Cu. M
4	Asbestos roofing	9,800 Sq. M

पंजीकृत कार्यालय : प्रशासनिक भवन, पी.ओ. बैग सं 1653, पेरुमानूर पी. ओ., कोच्ची- 682 015
Registered Office : Administrative Building, P.O. Bag No. 1653, Perumanoor P.O., Kochi - 682 015
फाक्स / Fax : +91 (484) 2370897/2383902. फोन / Phone : +91(484)2380181/2501200
ग्राम / Grams : SHIPYARD, ERNAKULAM. ई-मेल / E-mail:info@cochinshipyard.com
CIN: U63032KL1972GOI002414

4. Details of waste in connection with ISRF project, proposed to be disposed at KEIL facility is as follows:-

Sl No.	Description	Approx. Qty
1	Used Copper slag	360 T / year
2	Waste containing Oil	2 T / year
3	Paint sludge (hard)	0.5 T / year
4	Non-hazardous industrial waste (metal scrap, cartons, wood & other solid wastes)	300 T / year
5	E waste	0.25 T / year
6	Asbestos	0.1 T / year

5. Since KEIL is the only facility in Kerala to collect, transport, treat and dispose hazardous and other industrial wastes, it is proposed that the above quantities of C&D and hazardous wastes from the ISRF project may also be disposed off through KEIL. As CSL and KEIL had already entered into an agreement for waste disposal on 20 April 2015 with validity for 5 years thereafter, Terms & conditions for the above mentioned disposal will be worked out in due course of time.

6. In this regard, it is requested to inform your willingness to dispose the above mentioned quantities of Hazardous and C&D waste at your landfill site.

7. Early concurrence by your good office shall be greatly appreciated and thanking you in advance for favourable consideration of our request.

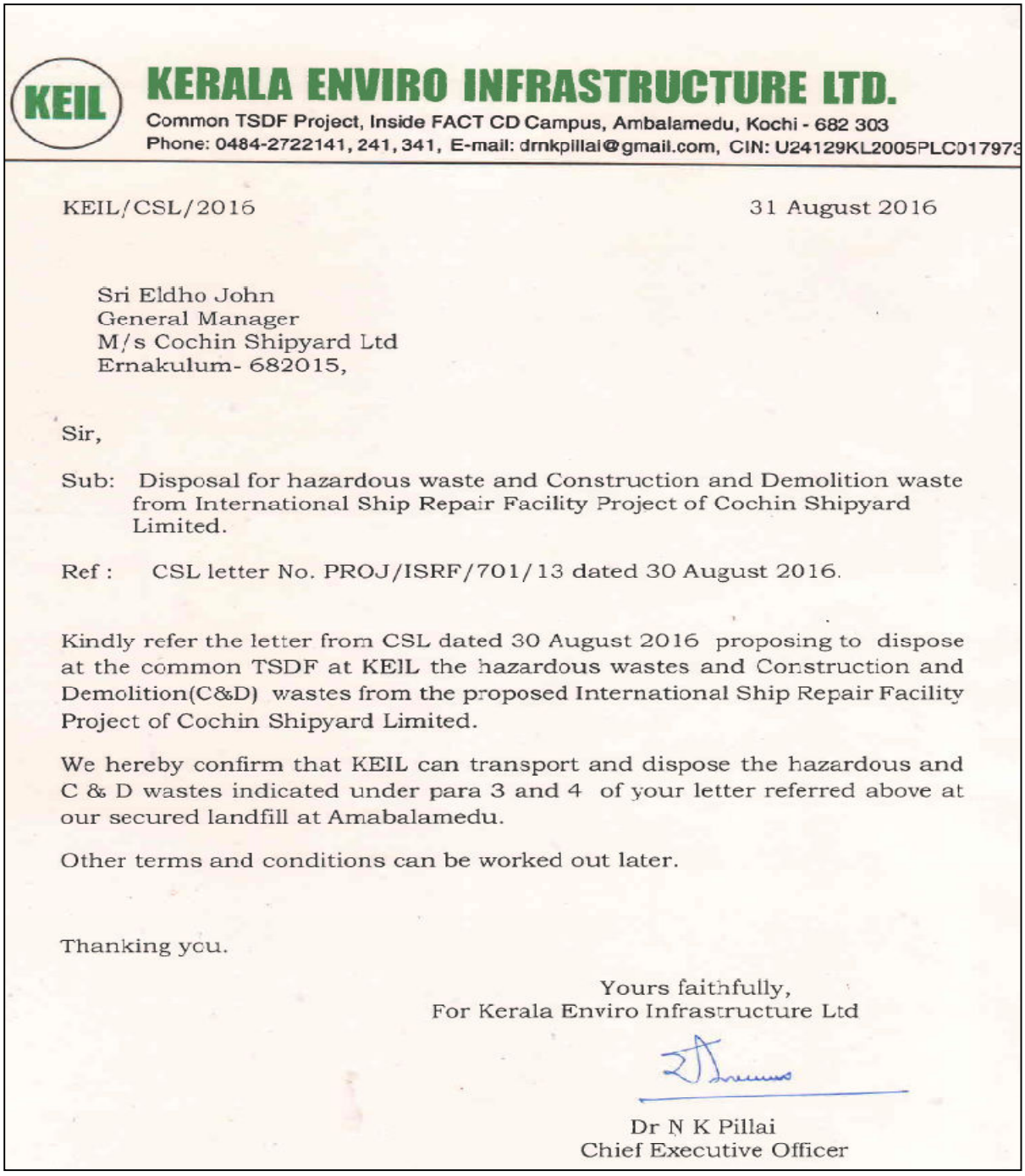
Thanking you

Yours faithfully

For Cochin Shipyard Ltd.

ELDHO JOHN
General Manager
कोचीन शिपयार्ड लिमिटेड
Cochin Shipyard Ltd.
कोच्ची / Kochi - 682 015

Fig-14 CSL letter addressed to KEIL



KERALA ENVIRO INFRASTRUCTURE LTD.

Common TSDF Project, Inside FACT CD Campus, Ambalamedu, Kochi - 682 303
Phone: 0484-2722141, 241, 341, E-mail: drnkpillai@gmail.com, CIN: U24129KL2005PLC017973

KEIL/CSL/2016 31 August 2016

Sri Eldho John
General Manager
M/s Cochin Shipyard Ltd
Ernakulum- 682015,

Sir,

Sub: Disposal for hazardous waste and Construction and Demolition waste from International Ship Repair Facility Project of Cochin Shipyard Limited.

Ref : CSL letter No. PROJ/ISRF/701/13 dated 30 August 2016.

Kindly refer the letter from CSL dated 30 August 2016 proposing to dispose at the common TSDF at KEIL the hazardous wastes and Construction and Demolition(C&D) wastes from the proposed International Ship Repair Facility Project of Cochin Shipyard Limited.

We hereby confirm that KEIL can transport and dispose the hazardous and C & D wastes indicated under para 3 and 4 of your letter referred above at our secured landfill at Amabalamedu.

Other terms and conditions can be worked out later.

Thanking you.

Yours faithfully,
For Kerala Enviro Infrastructure Ltd

Dr N K Pillai
Chief Executive Officer

Fig-15 Concurrence letter for waste disposal from KEIL

Disposal of Waste Oil, Sludge, Battery waste etc are carried out by e-auction through M/s MSTC (Metal Scrap Trading Corporation Ltd. - a PSU under Ministry of Steel) among agencies authorized by State Pollution Control Board.

****

IX) Details of hazardous wastes generated from the proposed unit and its management plan as per the provisions of the Hazardous Waste Management rules.

The hazardous waste generated during the operations of the proposed International Ship Repair Facility (ISRF) will be handled as per the existing practices of Cochin Shipyard Limited (CSL) complying with the 'Hazardous and Other Wastes (Management and Trans-boundary Movement) Rules, 2016'. CSL will bring the complete mobilization (including temporary storage) of hazardous wastes generated from the proposed ISRF project under the responsibility of concerned Officers / Departments.

Various hazardous wastes, which will be generated from the ISRF project area along with its estimated quantities and temporary storage is as indicated in the following table:

Table-1 Hazardous waste details

Sl. No.	Hazardous Waste	Proposed Quantity (approx)	Temporary Storage	Disposal
1	Used Oil	125 KL/year	Steel Container	CTSDF
2	Waste containing Oil	2 T/year	Roofed storage	CTSDF (KEIL)*
3	Used Copper Slag	360 T / year	Roofed storage	CTSDF (KEIL)
4	Paint Sludge	0.5 T/year	Roofed storage	CTSDF (KEIL)
5	Battery Waste	75 nos./year	Roofed storage	CTSDF
6	E waste (scarp items of computer, scanner, printer etc.)	0.25 T/year	Roofed storage	CTSDF (KEIL)
7	Industrial Waste (On board scrap items, tyres, cartons, packing material, wood etc.)	300 T/year	Roofed storage	CTSDF (KEIL)
8	Sludge	50T/year	Concrete pit with roof	CTSDF
9	Asbestos Containing Material (ACM)**	0.1 T/year	Air tight containers	CTSDF (KEIL)

* KEIL – M/s Kerala Enviro Infrastructure Ltd., Kochi

** ACM will be handled in emergency cases only.

Wastes generated will be segregated in the yard itself and will be stored at designated locations complying with the norms. CSL main facility is equipped with temporary storage facilities for proper handling of hazardous wastes generated within the yard.

Temporary storage facilities within CSL main facility is as follows:-

Fig-1 Used Oil storage tank

Fig-2 Waste containing oil storage

Fig-3 E-waste storage

Fig-4 Battery storage

Fig-5 Paint sludge storage

Fig-6 Sludge storage

Fig-7 Used Copper slag storage

Designated area for temporary storage of hazardous waste is incorporated in the master plan of ISRF project. Separate rooms / enclosures will be set up within the ISRF project area in compliance with statutory norms.

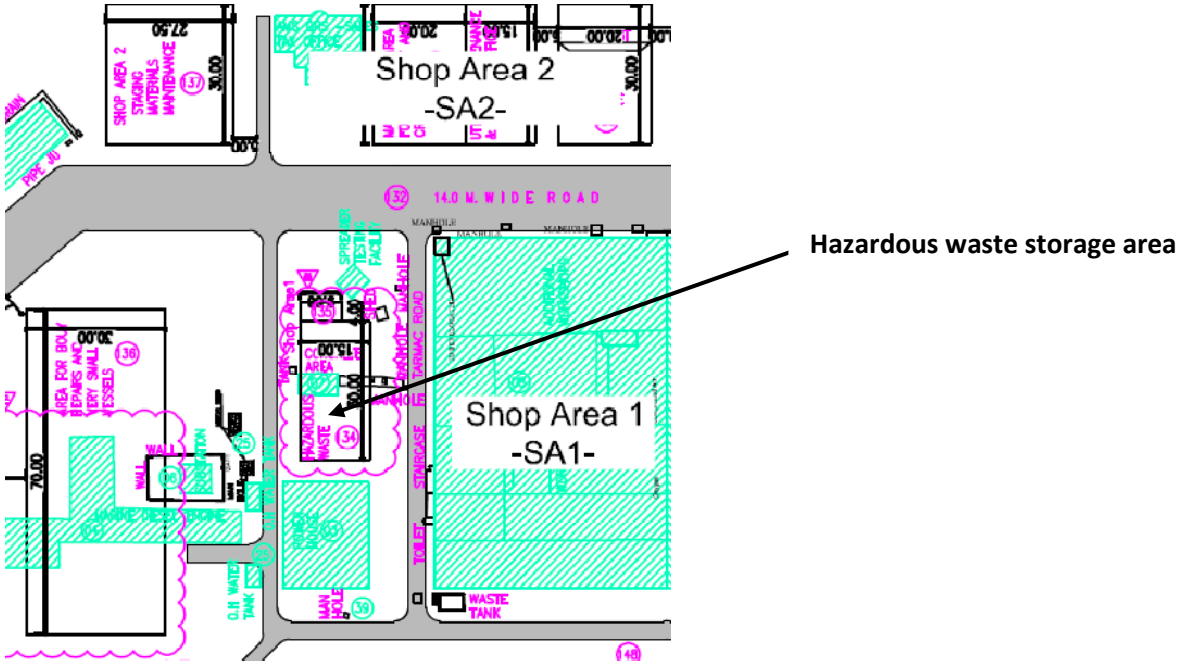


Fig-8 Designated Hazardous waste storage area

Generally, handling of ACM is not envisaged in the proposed ISRF project area. Majority of the ships presently operating is devoid of any asbestos content. However, in case of repair of any old vessels, excessive care will be taken while handling ACM. This will be carried out only by specially trained team equipped with suitable protective clothing and respirators. Collecting containers for ACM waste will be air tight and capable of being effectively closed. Care will be taken to ensure that exterior of the container is not contaminated with asbestos dust. ACM eventually will be disposed off at designated landfill sites (CTSDF).

Wastes will be dispatched for final disposal with proper documentation, whose copies shall be submitted to Kerala State Pollution Control Board.

CSL is having tie-up with CTSDF viz. M/s Kerala Enviro Infrastructure Ltd. (KEIL), Cochin for the disposal of Hazardous waste mentioned at Sl no. 2, 3, 4, 6, 7 & 9 of Table-1 viz. Waste containing Oil, Used Copper Slag, Paint Sludge, E waste, Industrial Waste & ACM.

About M/s Kerala Enviro Infrastructure Ltd. (KEIL)

Kerala Enviro Infrastructure Ltd (KEIL) is a public limited Company functioning at the industrial hub of Ambalamedu, situated about 25 Km on the Eastern side of Kochi City. This facility was established on the directive of the Supreme Court Monitoring Committee on hazardous waste for treatment and disposal of hazardous waste generated from industries in the State of Kerala. The company is functioning at the 50 acres of land purchased in the name of Govt. of Kerala

and leased to KEIL for 50 years. The company disposes solid hazardous waste through engineered landfills from various industries in the state of Kerala, India.

The facilities include a well equipped laboratory, Common storage and Physical treatment area having 1800 M^2 with impervious lined floor for temporary storage of the hazardous waste, dedicated vehicles for transportation of hazardous waste complying with environmental regulations, multiple effect evaporation plant and secured landfill constructed as per CPCB guidelines with double composite liner.

KEIL has capacity to dispose 10,00,000 MT for a period of 20 years. The Common TSDF of KEIL is the only facility in Kerala to collect, transport, treat and dispose hazardous waste as per Hazardous and Other wastes (Management and Trans-boundary Movement) Rules, 2016. The company currently caters to 180 industries. Some of the specific industrial processes to whom KEIL is offering its service are:

- Treatment and Disposal of process waste from metallurgical Industries like Zinc, Titanium Pigment and Aluminum.
- Process waste from Petroleum and Petrochemical industry and hazardous waste from Fertilizer industry
- Waste from Chloro alkali industry
- Process waste from Catalyst manufacturing units
- Hazardous waste from Food industry
- Waste from Coir and Paper industry
- ETP waste from Effluent Treatment Plant
- Hazardous waste from Pesticide Industry
- Waste generated from Plywood manufacturing unit
- Waste from Garment manufacturing unit
- Solid hazardous waste from Ship building industry

The wastes which are suitable for direct disposal in the landfill are disposed directly in the landfill and wastes which require pretreatment / stabilization are subjected to necessary treatment before disposal in the landfill.

Fig-9 KEIL Office

Fig-10 Landfill site

Fig-11 KEIL Landfill site

Fig-12 KEIL facility

CSL's Tie up with KEIL

CSL is having a contract in force with KEIL from 20 April 2015 valid for 5 years thereafter, for the disposal of waste generated from the yard.

KERALA

500 Rs.

INDIA NON JUDICIAL

५०० रु. Rs 500

सत्यमेव जयते

भारत

पाँच सौ रुपये FIVE HUNDRED RUPEES

AGREEMENT TO BE EXECUTED BETWEEN MEMBER INDUSTRIES AND KEIL

AGREEMENT is entered at Kochi on this the 20th day of the month of April 2015 between **M/s KERALA ENVIRO INFRASTRUCTURE LIMITED** having its registered office at FACT-CD Campus, Aambalamedu - 682 303, Kochi, Kerala, India, a company registered under the Companies Act, 1956 and currently represented by its CEO, Dr. N.K. Pillai hereinafter referred to as "KEIL", which expression shall where context so requires or admits of, be deemed to include its successors or assignees) of on one part

and

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दखलकार-पर्यावरण(संरक्षण) अधिनियम 1986
Occupier-Environment(Protection) Act 1986
कोचीन शिपयार्ड लिमिटेड
Cochin Shipyard Ltd.
कोच्ची / Kochi-682 015

Page 1 of 10

Dr. N.K. PILLAI
Chief Executive Officer
Kerala Enviro Infrastructure Ltd
Ambalamedu - 682 303

DISTRICT STAMP DEPOT
09 APR 2015

Cochin Shipyard Ltd

Fig-13 First page of agreement between CSL & KEIL

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(A GOVERNMENT OF INDIA ENTERPRISE)
KOCHI - 682 015, INDIA

कोचीन शिपयार्ड लिमिटेड
(भारत सरकार का उद्यम)
कोच्ची - 682 015, भारत

PROJ/ISRF/701/13

30 Aug 2016

M/s Kerala Enviro Infrastructure Ltd (KEIL).
TSDF Project, Inside FACT-CD Campus
Ambalamedu
Kochi – 682 303
Ph: 0484 – 2722041, 2722141
Email: drnkpillai@gmail.com

Kind Attn: - Dr. N K Pillai, Chief Executive Officer

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पंजीकृत कार्यालय : प्रशासनिक भवन, पी.ओ. बैग सं 1653, पेरुमानूर पी. ओ., कोच्ची- 682 015
Registered Office : Administrative Building, P.O. Bag No. 1653, Perumanoor P.O., Kochi - 682 015
फाक्स / Fax : +91 (484) 2370897/2383902. फोन / Phone : +91(484)2380181/2501200
ग्राम / Grams : SHIPYARD, ERNAKULAM. ई-मेल / E-mail:info@cochinshipyard.com
CIN: U63032KL1972GOI002414

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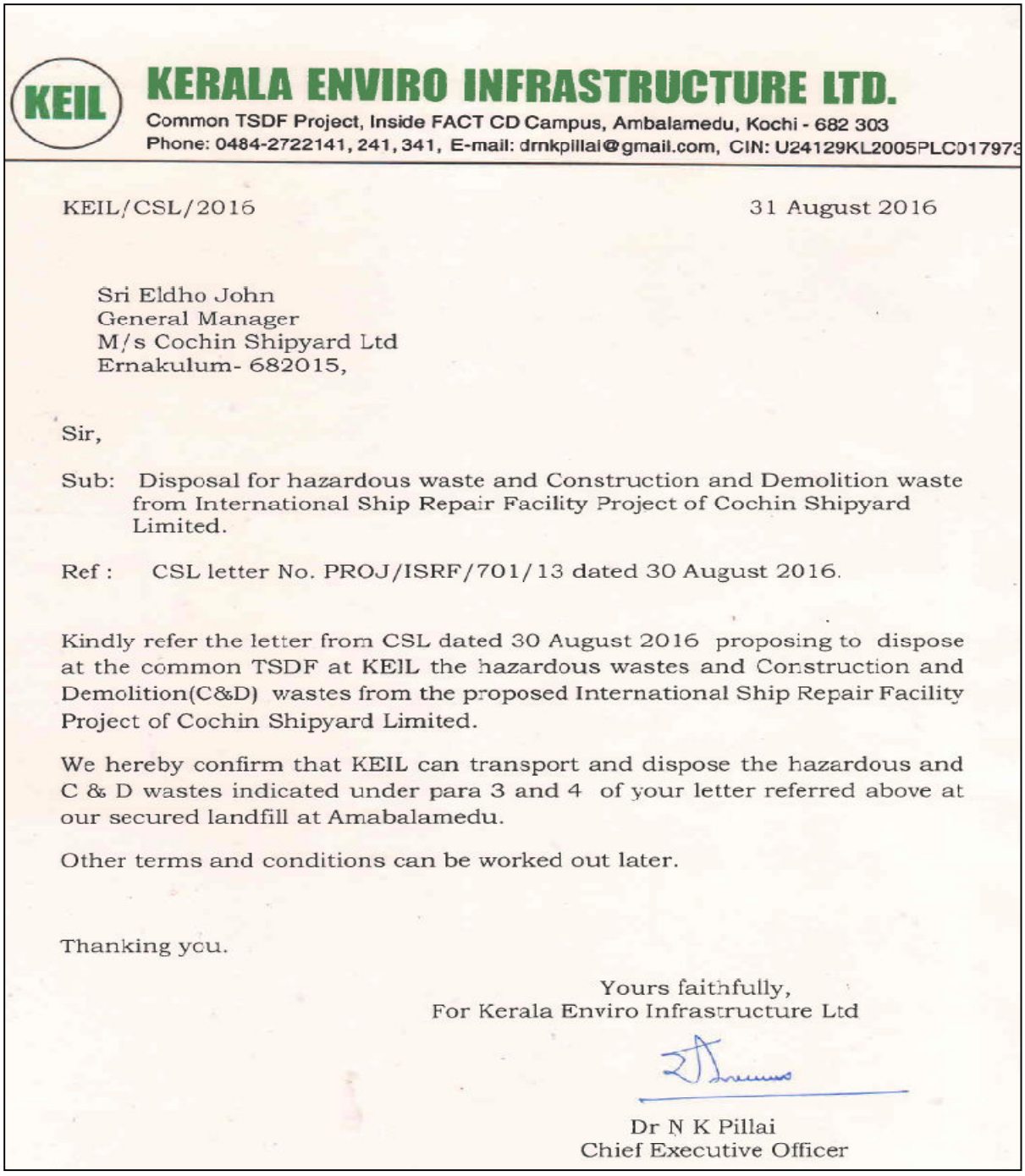
Thanking you

Yours faithfully

For Cochin Shipyard Ltd.

ELDHO JOHN
General Manager
कोचीन शिपयार्ड लिमिटेड
Cochin Shipyard Ltd.
कोच्ची / Kochi - 682 015

Fig-14 CSL letter addressed to KEIL



KERALA ENVIRO INFRASTRUCTURE LTD.

Common TSDF Project, Inside FACT CD Campus, Ambalamedu, Kochi - 682 303
Phone: 0484-2722141, 241, 341, E-mail: drnkpillai@gmail.com, CIN: U24129KL2005PLC017973

KEIL/CSL/2016 31 August 2016

Sri Eldho John
General Manager
M/s Cochin Shipyard Ltd
Ernakulum- 682015,

Sir,

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Ref : CSL letter No. PROJ/ISRF/701/13 dated 30 August 2016.

Kindly refer the letter from CSL dated 30 August 2016 proposing to dispose at the common TSDF at KEIL the hazardous wastes and Construction and Demolition(C&D) wastes from the proposed International Ship Repair Facility Project of Cochin Shipyard Limited.

We hereby confirm that KEIL can transport and dispose the hazardous and C & D wastes indicated under para 3 and 4 of your letter referred above at our secured landfill at Amabalamedu.

Other terms and conditions can be worked out later.

Thanking you.

Yours faithfully,
For Kerala Enviro Infrastructure Ltd

Dr N K Pillai
Chief Executive Officer

Fig-15 Concurrence letter for waste disposal from KEIL

Disposal of Waste Oil, Sludge, Battery waste etc are carried out by e-auction through M/s MSTC (Metal Scrap Trading Corporation Ltd. - a PSU under Ministry of Steel) among agencies authorized by State Pollution Control Board.

****

X) Quantity of wastewater generation and its management and disposal plan to be submitted.

As per the Detailed Project Report, the total water requirement is as indicated below:-

Water requirement (ship lift/work stations/quays)	
Work shop/work area	**Quantity**
Pipe shop/boiler repair	75 (m^3 per day)
Diesel engine repair	75 (m^3 per day)
Ship lift/work stations/quays	300 (m^3) for washing 6 vessels
Sub contractor's area	50 (m^3 per day)
Sub Total	500 KLD

Total Water Requirement

SL. No	Activity	Water Requirement
1.	Water requirement (shiplift/work stations/quays etc.)	500 m^3
2.	Supply to port staff and users	28 (m^3/day) (22.4 m^3 after treatment)
	Total 528 m^3	

From the above table, it is evident that maximum water requirement (300 KLD) is for the Shiplift, workstations & quays during operation. This figure was arrived on the basis of requirement, which happens during the simultaneous washing of vessels at all the six workstations. Such a requirement may come only in a graving dock, where all the dry docked vessels have to be undocked concurrently. This will seldom happen in a repair facility equipped with Shiplift & transfer system wherein undocking of a vessel & subsequent docking of other vessel will take about 6-8 hours. Therefore, it is prudent to consider the water requirement for Shiplift/work stations/quays as 100 KLD. Moreover, it may be noted that 100 KLD is not a daily requirement since washing will be carried out only twice while dry docking of vessels. ISRF project is designed to carry out dry docking of 72 nos. vessels / year. Hence the cumulative washing of vessels in a year will be limited to approximately 150 nos.

Similarly, 75 m^3 water requirement projected for Pipe shop/boiler repair Shop and Diesel engine repair shop is not required on a daily basis. At a maximum, it will be required twice a week and that too not concurrently. However, for the purpose of working out capacity of ETP, it is considered as 100 KLD for these two shops. Hence the process water requirement is reworked as follows:-

Water requirement (ship lift/work stations/quays)	
Work shop/work area	**Quantity**
Pipe shop/boiler repair	100 m^3
Diesel engine repair	
Ship lift/work stations/quays	100 m^3 for washing 2 vessels
Sub contractor's area	50 m^3 per day
Total	**250 m^3 per day**

WATER MANAGEMENT AND DISPOSAL PLAN

The effluent from process, shops / areas, workstation, oil and grease will be treated in ETP having capacity of 300 KLD. The wastewater collected from process shops/areas, workstations will be collected separately through closed conduits and treated through ETP. The storm water collected from workstations will be diverted to ETP, in case workstations are in operation. In rainy seasons, the treated water will be let out to see along with storm water.

The wastewater generated from the toilets, bathrooms and other areas in the operation building will be treated in the Sewage Treatment Plant (STP). Two STPs of capacity 25 KLD and 15 KLD are proposed. The storm water collected from the facility will be let out to backwaters after treating it in the effluent treatment plant.

Reutilization of treated water (322 KLD) for horticulture will flood the green belt area during monsoon. Hence water requirement for horticulture during summer season has been calculated on normal accepted quantity and given in following table.

Water Requirement for Greenbelt Development during dry season

Activity	Water Requirement	Area for Greenbelt development	Daily Requirement
Greenbelt Development during dry season	4 liter/m^2 /day	13435 m^2	53740 m^3 **(54 KLD)**

- During operation that total water generation per day will be 322.40 KLD
- Water reuse (for greenbelt development during dry season) will be 54 KLD
- Excess water from operation **268.40 KLD**

Excess quantity of water after horticulture will be disposed to the channel by ensuring that the parameters are within the acceptable limits specified by CPCB.

As per CPCB guidelines - physical and chemical properties of water should be met ensured before discharging it into natural water sources. To meet this requirement, an initial investigation has been carried out and test report of water sample taken from the existing dry dock has been reviewed. It was found that few parameters are exceeding CPCB norms before treatment. Through proper treatment, parameters of discharge water will be ensured prior to discharge into the back waters.

For safe disposal, water quality standards for coastal water marine outfalls has been referred to. In a coastal segment marine water is subjected to several types of uses. Depending of the types of uses and activities, water quality criteria have been specified to determine its suitability for a particular purpose. Among the various types of uses there is one use that demands highest level of water quality/purity and that is termed a — designated best use in that stretch of the coastal segment. Based on this, primary water quality criteria have been specified for following five designated best uses:-

Class	Designated best use
SW-1	Salt pans, Shell fishing, Mariculture and Ecologically Sensitive Zone
SW-II	Bathing, Contact Water Sports and Commercial fishing.
SW-III	Industrial cooling, Recreation(non-contact) and Aesthetics
SW-IV	Harbour
SW-V	Navigation and Controlled Waste Disposal

Pollution Control Acts, Rules and Notifications by CPCB, March 2010

The Standards along with rationale/remarks for various parameters for different designated best uses, given in Table:

Comparison of Primary Water quality criteria for Class SW-IV waters (for harbour waters) & Baseline Monitoring Results

Sl. No.	Parameter	Standards	Rationale/Remarks	Baseline Test Results
1.	pH range	6.0---9.0	To minimize corrosive and scaling effect.	7.5 - 7.82
2.	Dissolved Oxygen	3.0 mg/l or 40 per cent saturation value whichever is higher.	Considering bio-degradation of oil and inhibition to oxygen production through photosynthesis.	4.8-6.4
3.	Colour and Odour	No visible colour or offensive odour	None from reactive chemicals which may corrode paints/ metallic surfaces.	Unobjectionable
4.	Floating materials, Oil, grease and scum (including Petroleum products)	10 mg/l	Floating matter should be free from excessive living organisms which may clog or coat operative parts of marine vessels/equipment.	BDL to 17.3 mg/l
5.	Fecal Coliform	500/100 ml (MPN)	Not exceeding 1000/100 ml in 20 per cent of samples in the year and in 3 consecutive samples in monsoon months.	1100/100 ml (MPN)
6.	Biochemical Oxygen Demand (3 days at 27oC)	5 mg/l	To maintain water relatively free from pollution caused by sewage and other decomposable wastes.	1.2-1.6 mg/l

Pollution Control Acts, Rules and Notifications by CPCB, March 2010

Comparison of Standards for Discharge of Environmental Pollutants Part-A: Effluents in Marine Coastal Area and Results of water prior to Treatment:

Sl. No.	Parameter	Unit	Standard	Result	Remarks
1.	Biological Oxygen Demand	mg/l	30/100	775	Exceeding CPCB standard
2.	Chemical Oxygen Demand	mg/l	250	1600	Exceeding CPCB standard
3.	Iron as Fe	mg/l	3.0	18.88	Exceeding CPCB standard
4.	Copper as CU	mg/l	3.0	10.012	Exceeding CPCB standard
5.	Total Suspended Solids	mg/l	100	282	Exceeding CPCB standard

6.	Free ammonia (as NH3) mg/l, Max	mg/l	5.0	-	Not monitored
7.	Total Kjeldahl Nitrogen (as NH3) mg/l, Max.	mg/l	100	-	Not monitored
8.	Ammonical nitrogen (as N), mg/l Max.	mg/l	50	-	Not monitored
9.	Hexavalent Chromium (as Cr+6), mg/l max.	mg/l	1.0	-	Not monitored
10.	Vanadium (as V)	mg/	0.2	-	Not monitored
11.	Radioactive materials: (if any) (a) Alpha emitter (b) Beta emitter	micro curie/ml	 10-7 10-6	-	Not monitored
12.	Bio-assay test	% survival	90% survival of fish after 96 hours in 100% effluent	-	Not monitored

GENERAL STANDARDS FOR DISCHARGE OF ENVIRONMENTAL POLLUTANTS PART-A: EFFLUENTS in Marine Coastal Areas, The Environment (Protection) Rules, 1986

Conclusion: Referring to the primary water quality criteria for class SW-IV waters, it is evident that water quality of the project area comes under class IV i.e. harbour water. Based on the general standards for discharge of environmental pollutants part-A: Effluents in marine coastal areas as per EPA 1986, Test result of untreated effluent has been compared with the CPCB norms and found that after proper treatment, the desired discharge standard can be achieved.

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