Oil and Natural Gas Corporation Limited
Eastern Offshore Asset
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Telefax: (0884)-2374104

No. ONGC/ECA/IOC-DVN-98-2 27th October, 2021

To
District Forest Officer,
Kakinada Division,
Kakinada

Sub: Proposal for laying of 20" pipeline of about 31 km length from the offshore platform through mouth of the Southern River to ONGC Onshore Gas Terminal at Malleswaram village, Tallarevu Mandal, E.G. District, Andhra Pradesh – Compliance Report Forest Clearance Stage 1 – 3.26 ha

Ref: 1. GoI, RO MOEFCC, Vijayawada F. No. 8-AP8124/2021-VII/SE dt.17.09.2021 communicated in GM No. 982/Section.II/2021/[1420618] dt. 20.09.2021
2. DFO, Kakinada Division, Kakinada Rc. No. 2432/2019-DE, dt. 29.09.2021

A Copy of communication vide 8-AP8124/2021-VII/SE dated 17th September 2021, conveying the Central Government's approval (Stage I) for diversion of 3.26 ha of forest land in Matlatippa Reserve forest of Kakinada Division for laying of 20" gas pipeline from offshore platform through mouth of the Southern River to ONGC Onshore Gas Terminal at Malleswaram village, Tallarevu Mandal, E.G. District in favour of ONGC (ref 2), had been received vide above reference 1.

The refered communication was for compliance of the conditions prescribed in the "in principal approval" along with the payment of Net Present Value and other statutory payments.

Please find enclosed the Compliance report for kind perusal and initiation of necessary actions for accord of Stage II Clearance.

Regards,

Yours faithfully

(ANIL CHAUDHRY)
GGM (C) – PM: KG DWN 98/2
EOA, ONGC

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Compliance Report for the approval of diversion of 3.26 ha forest land issued vide F. No. 4-AP0114/2023-FIU/68 dt. 17.05.2023

S. No.	Condition	Action to be taken
i.	Publish the entire forest clearances granted in verbatim along with the conditions and safeguards imposed by the Central Government in two widely circulated daily newspapers, one in vernacular language and another in English language so as to make people aware of the permission granted to the project proponent for use of forest land for non-forestry purposes.	copies of published advertisements enclosed.
ii.	The copies of the Forest Clearance should also be submitted to the heads of local bodies, Panchayats and Municipal bodies by the Project proponents in addition to the relevant offices of the government who in turn have to display the same for 30 days.	Copies sent through speed post. (copy of receipts attached)
(i)	Legal status of the diverted forest land shall remain unchanged	Noted. Legal Status of the Land will not be changed.
(ii)	The demarcation of the proposed forest area except in the water body shall be carried out at an appropriate interval at the cost of User Agency	Pillars erected. (Photographs attached)
(iii)	No trees felling shall be carried out in the diverted forest area	Noted. No trees felling shall be carried out.
(iv)	The State Forest Department shall carry out compensatory afforestation over an extent of 7.84 ha identified in Compt. No 448, Maram BF, Kakinada Range, at the cost of the User Agency	Amount of Rs. 71,73,830/- paid through RTGS method (copy of Challan attached for total amount of Rs. 1,05,71,380 towards NPV + CA)
(v)	Identified degraded forest area for CA purpose and CA scheme shall not be changed without prior approval Central Government.	Noted. CA purpose and CA scheme shall not be changed.
(vi)	The State Government shall charge the Net Present Value of the diverted forest land measuring 3.26 ha from the User Agency as per the orders of the Hon'ble Supreme Court dated 28.03.2008 and 09.05.2008 in I.A Nos. 826 in 566 with related IA's in Writ Petition (Civil) No. 202/1995.	Amount of Rs. 33,00,180/- paid through RTGS method (copy of Challan attached for total amount of Rs. 1,05,71,380 towards NPV + CA)

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S No.	Condition	Action to be taken
(vii)	Additional amount of the Net Present Value (NPV) of the diverted forest land, if any, becoming due after revision of the same by the Hon'ble Supreme Court of India in future, shall be charged by the State Government from User Agency. User Agency shall furnish an undertaking to this effect	Additional amount of Net Present Value (NPV) of the diverted forest land, if any, becoming due after revision of the same by the Hon'ble Supreme Court of India in future, shall be paid. Undertaking enclosed.
(viii)	All the funds received from the User Agency under the project shall be transferred/ deposited to CAMPA fund only through e-portal (https://parivesh.nic.in/)	All funds have been deposited to CAMPA fund only through e-portal (https://parivesh.nic.in/) Undertaking enclosed
(ix)	The Muck generated in the work during it ops. will be disposed off at designated dumping sites and in no case the muck/ debris will be disposed off in the forest areas	The muck generated, if any, shall be disposed off at designated dumping sites and no muck will be disposed off in forest areas. Undertaking enclosed
(x)	The User Agency shall display signage/ Caution boards at appropriate places for safety and awareness	Signage will be displayed along the pipeline route at appropriate places for safety and awareness after completion of laying of pipeline. Undertaking enclosed.
(xi)	The User Agency shall monitor the pipeline at regular intervals to ensure safety and to avoid any accident. The User agency shall submit such monitoring reports to the DFO concerned	Monitoring of the pipeline shall be carried out and reports will be submitted to DFO concerned Undertaking enclosed.
(xii)	Wildlife mitigation plan especially for Fishing Cats and others and financial outlay of such mitigation plan shall not be overlooked and such mitigation plan shall be submitted along with the compliance report.	Revised Wildlife Mitigation plan is enclosed.
(xiii)	The State Government/ User Agency shall comply with all conditions stipulated in the CRZ clearance	Conditions of CRZ clearance shall be complied with. Undertaking enclosed
(xiv)	The forest land proposed for diversion shall under no circumstances be transferred or sublet to any other agency, department or person	The proposed forest land for diversion shall not be transferred or sublet to any other agency, department or person

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S. No.	Condition	Action to be taken
	without prior approval of the Central Government.	without prior approval of the Central Government. Undertaking enclosed.
(xv)	The layout plan of the proposal shall not be changed without the prior approval of the Central Government.	Noted and confirmed. Layout plan of the proposal shall not be changed without the prior approval of the Central Government. Undertaking enclosed.
(xvi)	Minimal disturbance should be ensured by creating labour camps outside the forest area as far as possible and it will be the responsibility of the UA to ensure that the labourers & staff engaged in execution of work do not destruct nearby flora & fauna.	Noted and confirmed. It shall be ensured that there is minimal disturbance by creating labour camps outside the forest area as far as possible and that the labourers & staff engaged in execution of work do not destruct nearby flora & fauna. Undertaking enclosed.
(xvii)	The total forest area to be utilized for the project shall not exceed 3.25 ha and the forest area diverted shall not be used for any purpose other than those shown in the diversion proposal.	Noted and confirmed. The total forest area utilized shall not exceed 3.25 ha and the forest area diverted shall not be used for any purpose other than those shown in the diversion proposal. Undertaking enclosed.
(xviii)	User agency and state Government shall ensure compliance to provisions of the all Acts, Rules, Regulations and Guidelines, for the time being in force, as applicable to the project.	Noted and confirmed. Undertaking enclosed.
(xix)	Any other conditions that the Central Government or Regional Office, IRO, Vijayawada may impose from time to time in the interest of afforestation, conservation and management of flora and fauna in the area, shall be complied by the user agency.	Noted and confirmed. Shall comply with any other conditions that the Central Government or Regional Office, IRO, Vijayawada may impose from time to time. Undertaking enclosed.

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S. No.	Condition	Action to be taken
(xi)	Compliance report on the above conditions shall be processed and submitted through e-portal (https://parivesh.nic.in)	Noted and confirmed. Undertaking enclosed
(xii)	In the event of failure to comply with any of the above conditions the user agency is liable for penal action as provisions of rules/ guidelines made under EOA, 1986.	Noted and confirmed. Undertaking enclosed.

ANIL CHAUDHRY,GGM
Project Manager,EC-DWN-MH/
EOA, ONGC, KAKINADA

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Compliance Report for the approval of diversion of 3.26 ha forest land issued vide F. No. 4-AP/124/2021-HQ/68 Dt. 17.09.2021

S No	Condition	Action to be taken
i.	Publish the entire forest clearances granted in verbatim along with the conditions and safeguards imposed by the Central Government in two widely circulated daily newspapers, one in vernacular language and another in English language so as to make people aware of the permission granted to the project proponent for use of forest land for non-forestry purposes.	copies of published advertisements enclosed.
ii.	The copies of the Forest Clearance should also be submitted to the heads of local bodies, Panchayats and Municipal Bodies by the Project proponents in addition to the relevant offices of the government who in turn have to display the same for 30 days.	Copies sent through speed post. [copy of receipts attached]
(i)	Legal status of the diverted forest land shall remain unchanged	Noted. Legal Status of the Land will not be changed.
(ii)	The demarcation of the proposed forest area except in the water body shall be carried out at an appropriate interval at the cost of User Agency	Pillars erected. [Photographs attached]
(iii)	No trees felling shall be carried out in the diverted forest area	Noted. No trees felling shall be carried out.
(iv)	The State Forest department shall carry out compensatory afforestation over an extent of 3.84 ha identified in Compt. No 448, Murari SF, Kakinada Range, at the cost of the User Agency	Amount of Rs. 71,71,800/- paid through RTGS method (copy of Challan attached for total amount of Rs. 1,05,71,980 towards NPV + CA)
(v)	Identified degraded forest area for CA purpose and CA scheme shall not be changed without prior approval Central Government	Noted. CA purpose and CA scheme shall not be changed.
(vi)	The State Government shall charge the Net Present Value of the diverted forest land measuring 3.26 ha from the User Agency as per the orders of the Hon'ble Supreme Court dated 28.03.2008 and 09.05.2008 in IA Nos. 826 in 566 with related IAs in Writ Petition (Civil) No. 202/1995.	Amount of Rs. 34,00,180/- paid through RTGS method [copy of Challan attached for total amount of Rs. 1,05,71,980 towards NPV + CA]

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S. No	Condition	Action to be taken
(vi)	Additional amount of the Net Present Value (NPV) of the diverted forest land, if any, becoming due after revision of the same by the Hon'ble Supreme Court of India in future, shall be charged by the State Government from User Agency. User Agency shall furnish an undertaking to this effect.	Additional amount of Net Present Value (NPV) of the diverted forest land, if any, becoming due after revision of the same by the Hon'ble Supreme Court of India in future, shall be paid. Undertaking enclosed.
(vii)	All the funds received from the User Agency under the project shall be transferred/ deposited to CAMPA fund only through e-portal (https://parivesh.nic.in)	All funds have been deposited to CAMPA fund only through e-portal (https://parivesh.nic.in) Undertaking enclosed.
(ix)	The Muck generated in the earth cutting if any, will be disposed off at designated dumping sites and in no case the muck/ debris will be disposed off in the forest areas	The muck generated, if any, shall be disposed off at designated dumping sites and no muck will be disposed off in forest areas. Undertaking enclosed.
(x)	The User Agency shall display signage/ Caution boards at appropriate places for safety and awareness	Signage will be displayed along the pipeline route at appropriate places for safety and awareness after completion of laying of pipeline. Undertaking enclosed.
(xi)	The User Agency shall monitor the pipeline at regular intervals to ensure safety and to avoid any accident. The User agency shall submit such monitoring reports to the DFO concerned	Monitoring of the pipeline shall be carried out and reports will be submitted to DFO concerned. Undertaking enclosed.
(xii)	Wildlife mitigation plan especially for Fishing Cats and otters and financial outlay of such mitigation plan shall not be exorbitant and such mitigation plan shall be submitted along with the compliance report	Revised Wildlife Mitigation plan is enclosed.
(xiii)	The State Government/ User Agency shall comply with all conditions stipulated in the CRZ clearance	Conditions of CRZ clearance shall be complied with. Undertaking enclosed.
(xiv)	The forest land proposed for diversion shall under no circumstances be transferred or sublet to any other agency, department or person	The proposed forest land for diversion shall not be transferred or sublet to any other agency, department or person

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S. No.	Condition	Action to be taken
	without prior approval of the Central Government	without prior approval of the Central Government. Undertaking enclosed
(xv)	The layout plan of the proposal shall not be changed without the prior approval of the Central Government	Noted and confirmed. Layout plan of the proposal shall not be changed without the prior approval of the Central Government. Undertaking enclosed.
(xvi)	Maximal disturbance should be ensured by creating labour camps outside the forest area as far as possible and it will be the responsibility of the UA to ensure that the labourers & staff engaged in execution of work do not destruct nearby flora & fauna	Noted and confirmed. It shall be ensured that there is minimal disturbance by creating labour camps outside the forest area as far as possible and that the labourers & staff engaged in execution of work do not destruct nearby flora & fauna. Undertaking enclosed.
(xvii)	The total forest area to be utilized for the project shall not exceed 3.26 ha and the forest area diverted shall not be used for any purpose other than those shown in the diversion proposal	Noted and confirmed. The total forest area utilized shall not exceed 3.26 ha and the forest area diverted shall not be used for any purpose other than those shown in the diversion proposal Undertaking enclosed.
(xviii)	User agency and state Government shall ensure compliance to provisions of the all Acts, Rules, Regulations and Guidelines, for the time being in force, as applicable to the project.	Noted and confirmed. Undertaking enclosed.
(xix)	Any other conditions that the Central Government or Regional Officer, IRO, Vijayawada may impose from time to time in the interest of afforestation, conservation and management of flora and fauna in the area, shall be complied by the user agency	Noted and confirmed Shall comply with any other conditions that the Central Government or Regional Officer, IRO, Vijayawada may impose from time to time. Undertaking enclosed.

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S. No.	Condition	Action to be taken
(xx)	Compliance report on the above conditions shall be processed and submitted through e-portal (https://parivesh.nic.in)	Noted and confirmed. Undertaking enclosed.
(xxi)	In the event of failure to comply with any of the above conditions the user agency is liable for penal action as provisions of rules/ guidelines made under EPA, 1986	Noted and confirmed. Undertaking enclosed.

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Undertaking to Condition no. (i) to comply with the following condition:

"Legal Status of the diverted forest land should remain unchanged"

We, the Oil and Natural Gas Corporation Limited, undertake to comply with the condition of not changing the legal Status of the diverted forest land as stipulated in condition (i) of vide F.No. 4-498124/2021-FC/SS; Dt.17-09-2021

[For Oil and Natural Gas Corporation Limited]

ANIL CHAUDHRY AGM
Project Manager (U-DWN-1&2)
EOA, ONGC, KAKINADA

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Undertaking to Condition no. (8) to comply with the following conditions:

"No tree felling shall be carried out in the diverted forest area"

We, the Oil and Natural Gas Corporation Limited, undertake to comply with the condition of no tree felling shall be carried out in the diverted forest area as stipulated in condition (8) of vide F No. 4-A/98114/2021-WII(W); Dt.17-08-2021

[For Oil and Natural Gas Corporation Limited]

ANIL CHAUDHRY, GGM
Project Manager-cum-HoD
EOA, ONGC, KAKINADA

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Undertaking to Condition no. (v) to comply with the following condition:

"Identified degraded forest area for CA purpose and CA scheme shall not be changed without prior approval Central Government"

We, the Oil and Natural Gas Corporation Limited, undertake to comply with the condition of identified degraded forest area for CA purpose and CA scheme shall not be changed without prior approval Central Government as stipulated in condition (v) of vide F.No. 8-49/2024/2021-WL/66 Dt.17-09-2021.

[For Oil and Natural Gas Corporation Limited]

ANIL CHAUDHRY,GGM
Project Manager(In-charge)
EOA, ONGC, KAKINADA

Oil and Natural Gas Corporation Limited
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Undertaking to Condition no. (vi) to comply with the following condition:

"Additional amount of the Net Present Value (NPV) of the diverted forest land, if any, becoming due after revision of the same by the Hon'ble Supreme Court of India in future, shall be charged by the State Government from the User Agency. User agency shall furnish an Undertaking to this effect."

We, the Oil and Natural Gas Corporation Limited, undertake to comply with the condition of Paying of Additional amount of the Net Present Value (NPV) of the diverted forest land, if any, becoming due after revision of the same by the Hon'ble Supreme Court of India in future, which shall be charged by the State Government as stipulated in condition (7) of vide F.No. 8-68/2002/2003-NB(E); Dt.3/08/2003

[For Oil and Natural Gas Corporation Limited]

ANIL CHAUDHRY,GM
Project Manager-EOA-ONGC
EOA, ONGC, KAKINADA

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Undertaking to Condition no. [xii] to comply with the following condition:

"All the funds received from the User Agency under the project shall be transferred/ deposited to CAMPA fund only through e-portal (https://portal.reh.nic.in)"

We, the Oil and Natural Gas Corporation Limited, undertake to comply with the condition that All the funds received from the User Agency under the project shall be transferred/ deposited to CAMPA fund only through e-portal (https://portal.reh.nic.in) as stipulated in condition (ii) of vide F.No. 4-AP8324/2023-NV/66 dt. 27-03-2023.

[For Oil and Natural Gas Corporation Limited]

ANIL CHAUDHRY,GGM
Project Manager-KG-DWN-98/2
EOA, ONGC, KAKINADA

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Undertaking in Consideration we [is] to comply with the following conditions:

"The Muck generated in the earth cutting if any, will be disposed off at designated dumping sites and in no case the muck/ debris will be disposed off in the forest areas"

We, the Oil and Natural Gas Corporation Limited, undertake to comply with the condition that the Muck generated in the earth cutting if any, will be disposed off at designated dumping sites and in no case the muck/ debris will be disposed off in the forest areas as stipulated in condition (ii) of vide F.No. 8-178134/2021-WL/EB; Dt. 17-09-2021.

(For Oil and Natural Gas Corporation Limited)

ANIL CHAUDHARY,GM
Project Manager,EC/2019/EB1
EOA, ONGC, KAKINADA

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Undertaking to Condition no. (x) to comply with the following condition:

"The User Agency shall display signage/ Caution boards at appropriate places for safety and awareness"

We, the Oil and Natural Gas Corporation Limited, undertake to comply with the condition that the User Agency shall display signage/ Caution boards at appropriate places for safety and awareness as stipulated in condition [10] of vide F.No. 4-PNG/23/2021-Vol/68, 01.07.09.2021.

(For Oil and Natural Gas Corporation Limited)

ANIL CHAUDHURY, GGM
Project Manager, EG-DWA-BUA
EOA, ONGC, KAKINADA

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Undertaking to Condition no. (xi) to comply with the following condition:

"The User Agency shall monitor the pipeline at regular intervals to ensure safety and to avoid any accident. The User agency shall submit such monitoring reports to the DFO concerned."

We, the Oil and Natural Gas Corporation Limited, undertake to comply with the condition that we shall monitor the pipeline at regular intervals to ensure safety and to avoid any accident and shall submit such monitoring reports to the DFO concerned as stipulated in condition (xi) of vide T No. 4-APB124/2021 WL(M); Dt.27.09.2021.

28/10/21

(For Oil and Natural Gas Corporation Limited)

ANIL CHAUDHRY, IGEM
Project Manager/CS-EMS-MOT
EOA, ONGC, KAKINADA

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Undertaking to Condition no. (ii)(f) to comply with the following condition:

"The State Government/ User Agency shall comply with all conditions stipulated in the CRZ clearance"

We, the Oil and Natural Gas Corporation Limited, undertake to comply with the condition that ONGC shall comply with all conditions stipulated in the CRZ clearance as stipulated in condition (ii)(f) of vide F.No. 4-AP/EAC/2021 V (I)/66 DT:17.05.2021.

(For Oil and Natural Gas Corporation Limited)

ANIL CHAUDHRY,AGM
Project Manager/CC-DMA-OEA
EOA, ONGC, KAKINADA

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Undertaking to **Condition no. (xiv)** to comply with the following condition

"The forest land proposed for diversion shall under no circumstances be transferred or outsider to any other agency, department or person without prior approval of the Central Government."

We, the Oil and Natural Gas Corporation Limited, undertake to comply with the condition by not transferring or outsourcing the proposed forest land to any other agency, department or person without prior approval of the central government as stipulated in condition (xiv) of vide F.No. 8-49/2013-FC(pt) Dt.17-09-2013.

[For Oil and Natural Gas Corporation Limited]

ANIL CHAUDHARY, IRSM
Project Manager, KG-OSN-2001
EOA, ONGC, KAKINADA

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Undertaking to Condition no. (xx) to comply with the following condition:

"The layout plan of the proposal shall not be changed without the prior approval of the Central Government."

We, the Oil and Natural Gas Corporation Limited, undertake to comply with the condition by not changing the layout plan of the proposal without the prior approval of the central government as stipulated in condition (15) of vide F.No. IA-MIS(1)/2021-KW/66; Dt.17-03-2022.

(For Oil and Natural Gas Corporation Limited)

ANIL CHAUDHRY,AGM
Project Manager (CC IA/AP-182)
EOA, ONGC, KAKINADA

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Undertaking to Condition no. (xvi) to comply with the following condition:

"Minimal disturbance should be ensured by creating labour camps outside the forest area as far as possible and it will be the responsibility of the EA to ensure that the labourers & staff engaged in execution of work do not destruct nearby flora & fauna."

We, the Oil and Natural Gas Corporation Limited, undertake to comply with the condition that Minimal disturbance should be ensured by creating labour camps outside the forest area as far as possible and it will be the responsibility of the ONGC to ensure that the labourers & staff engaged in execution of work do not destruct nearby flora & fauna as stipulated in condition (ii) of vide F.No. 8-39/2018/FP/MoEF(I)/58178 17-05-2021.

(For Oil and Natural Gas Corporation Limited)

ANIL CHAUDHRY.GM
Project Manager/EC-I/WP/MEF
EOA, ONGC, KAKINADA

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Undertaking to Condition no. (xxii) to comply with the following condition:

"The total forest area to be utilized for the project shall not exceed 3.26 ha and the forest area diverted shall not be used for any purpose other than those shown in the diversion proposal"

We, the Oil and Natural Gas Corporation Limited, undertake to comply with the condition by ensuring that the total forest area utilization is limited to 3.26 ha and the forest area diverted shall not be used for any other purpose other than those shown in diversion proposal as stipulated in condition (27) of vide F.No. 8-48/2019/FC-II(ISS) Dt.17-03-2021.

[For Oil and Natural Gas Corporation Limited]

ANIL CHAUDHARY, DGM
Project Manager, EO-ONN-BD1
EOA, ONGC, KAKINADA

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Undertaking to Condition no. (xviii) to comply with the following condition:

"User agency and State Government shall ensure compliance to provisions of the all Acts, Rules, Regulations and Guidelines, for the time being in force, as applicable to the project."

We, the Oil and Natural Gas Corporation limited, undertake to comply with the condition that ONGC shall ensure compliance to provisions of the all Acts, Rules, Regulations and Guidelines, for the time being in force, as applicable to the project as stipulated in condition (18) of vide F.No. 4-A/8134/2021-IA/(E): Dt.17-08-2021.

(For Oil and Natural Gas Corporation Limited)

ANIL CHAUDHRY,GGM
Project Manager AS-ENVI-EPC
EOA, ONGC, KAKINADA

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Undertaking to Condition no. (xix) to comply with the following condition:

"Any other conditions that the Central Government or Regional Officer, IRO, Vijayawada may impose from time to time in the interest of afforestation, conservation and management of flora and fauna in the area, shall be complied by the user agency"

We, the Oil and Natural Gas Corporation Limited, undertake to comply with Any other conditions that the Central Government or Regional Officer, IRO, Vijayawada may impose from time to time in the interest of afforestation, conservation and management of flora and fauna in the area, shall be complied by the user agency as stipulated in condition (xix) of vide F.No. 8-98/2020-WL/HQ Dt.17-06-2021.

[For Oil and Natural Gas Corporation Limited]

ANIL CHAUDHRY.AGM
Project Manager, IC-DWARKA
EOA, ONGC, KAKINADA

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Undertaking to Condition no. (xx) to comply with the following condition:

Compliance report on the above conditions shall be processed and submitted through e-portal (https://parivesh.nic.in)

We, the Oil and Natural Gas Corporation Limited, undertake to process and submit compliance report on all the conditions through e-portal (https://parivesh.nic.in/) as stipulated in condition (xx) of vide F. No. 4-AP/EC/Oil&Gas/xxxx/2021 Dt. 13-09-2021.

(For Oil and Natural Gas Corporation Limited)

ANIL CHAUDHRY, DGM
Project Manager, Eastern Offshore Asset
EOA, ONGC, KAKINADA

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Telefax: (0884)-2374104

Undertaking to Condition no. [xii] to comply with the following condition:

"In the event of failure to comply with any of the above conditions the user agency is liable for penal action as per provisions of rules/ guidelines made under FCA, 1980"

We, the Oil and Natural Gas Corporation Limited, undertake to comply with all the conditions stipulated in F.No. 9-MoEF&CC/2021-FC/002, Dt.17-09-2021 and we understand that failure to comply with any of the above conditions we are liable penal action as provisions of rules/ guidelines made under FCA, 1980 as stipulated in condition (21) of vide F.No. 9-MoEF&CC/2021-FC/66, Dt.17-09-2021.

(For Oil and Natural Gas Corporation Limited)

ANIL CHAUDHRY.GCM
Project Manager,GC-DMN 981
EOA, ONGC, KAKINADA

Indian Express dated 01/10/2021

Enadu Dated 01/10/2021

Date : 01/10/2021 Edition Name : ANDHRA PRADESH Page No. : 02

Address to Secretary

To,

The President
Guttina Devi Panchayat
I.Polavaram Mandal
East Godavari
A.P 533464

L. Durga Devi
5/10/21

Account Opening

To,

The President
G.Vemavaram Panchayat
I.Polavaram Mandal
East Godavari
A.P 533464

7/10/21

Acknowledgement

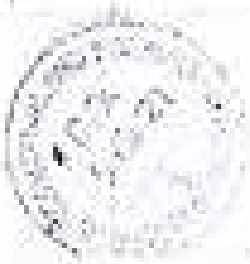
To,

The M R O,(Tahasildar)
M R O Office
Tallarevu (Mandal)
East Godavari
A.P 533463

Acknowledgement

To,

The M R O.(Tahasildar)
M R O Office
I. Polavaram(Mandal)
East Godavari
A.P 533220

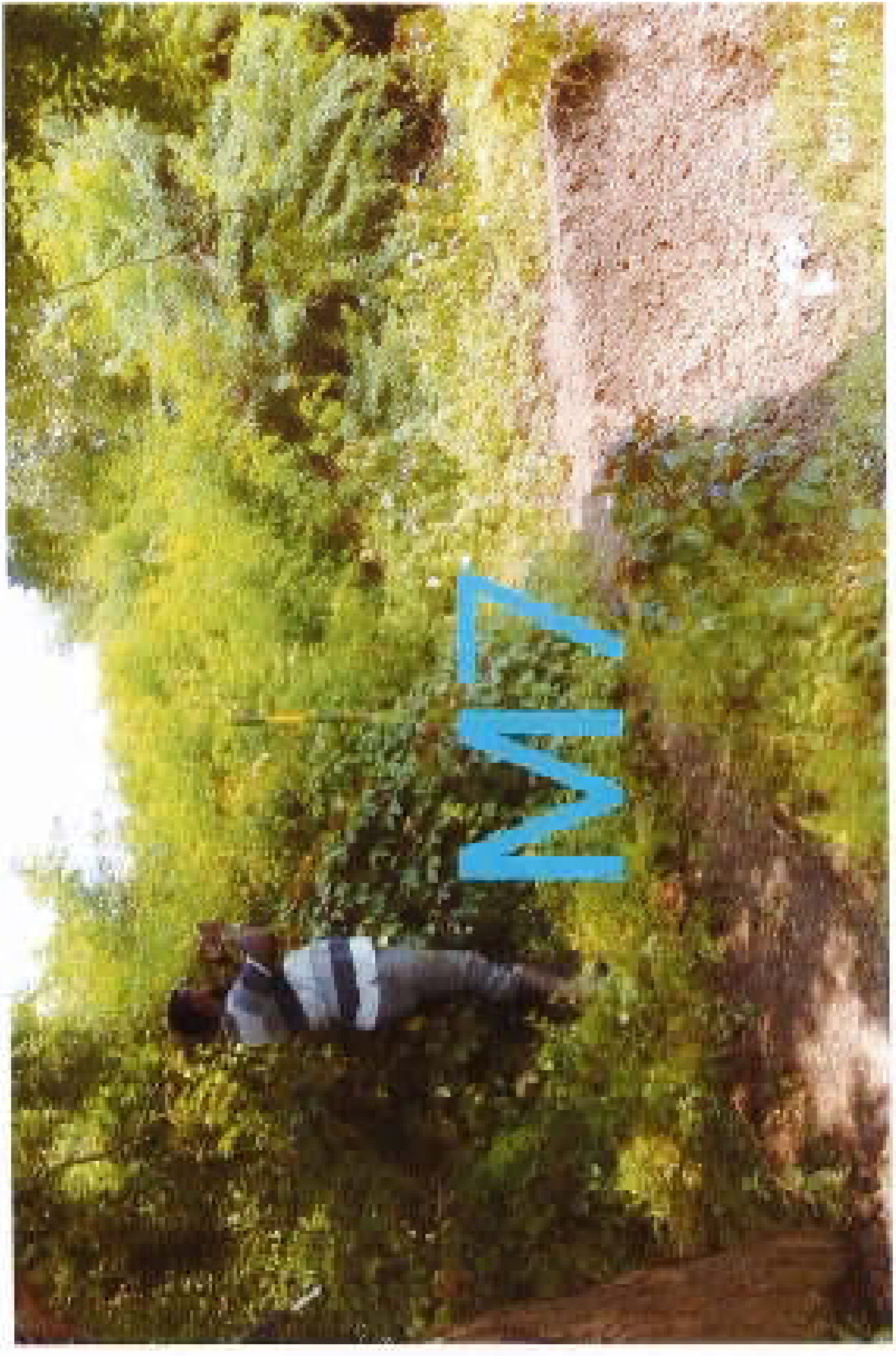


Acknowledgement

To,

The R.D.O, R.D.O office
NTR Marg,Near Red Bridge
Amalapuram,
East Godavari
A.P 533201


M2
M9

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AGENCY COPY

NEFT / RTGS CHALLAN for CAMPA Funds

Date : 04-10-2021

Agency Name.	**ONGC**
Application No.	**7242672959**
MoEF/SG File No.	**4-APB124/2021-VIJ**
Location.	**ANDHRA PRADESH**
Address.	**Corporate HSE, 8th Floor Core IV, SCOPE Minar, Delhi 10092East**
Amount(in Rs)	**10571980/-**

Amount in Words :One Crore Five Lakh Seventy-One Thousand Nine Hundred and Eighty Rupees Only

NEFT/RTGS to be made as per following details;

Beneficiary Name:	**ANDHRA PRADESH CAMPA**
IFSC Code:	**UBIN0903710**
Pay to Account No.	**150597242672959** **Valid only for this challan amount.**
Bank Name & Address:	**Union Bank Of India Lodhi Complex Branch, Block 11,CGO Complex, Phase I, Lodhi Road, New Delhi -110003**

- **This Challan is strictly to be used for making payment to CAMPA by NEFT/RTGS only**

BANK COPY

NEFT / RTGS CHALLAN for CAMPA Funds

Date : 04-10-2021

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After making successful payment, User Agencies may send a line of confirmation through Email: helpdeskcampa@corpbank.co.in

Note:After making the required payment through challan, if the payment status has not been updated even after 7 working days, then kindly mail a copy of your challan with transaction date to Email: cb0371@unionbankofindia.com

Counter foil

SBI STATE BANK OF INDIA

Branch ..... SME .....

Date ..... 8-10-2021 .....

Received ₹ ..... 1,05,71,980/- .....

From ..... ONGC .....

For remittance of NEFT/RTGS by way of (i) Transfer (only NEFT), (ii) Cash (only NEFT), (iii) Cheque (NEFT/RTGS) using cheque No. ..... 223995 .....

favouring ..... DTCS .....

.....

A/c No. ..... 1SDGJ724267295J .....

IFSC Code ..... UBIN0903810 .....

Beneficiary Bank & Branch ..... Union Bank of India, Lodhi Complex Branch .....

Amount ₹ ..... 1,05,71,980/- .....

Bank's Charges ₹ .....

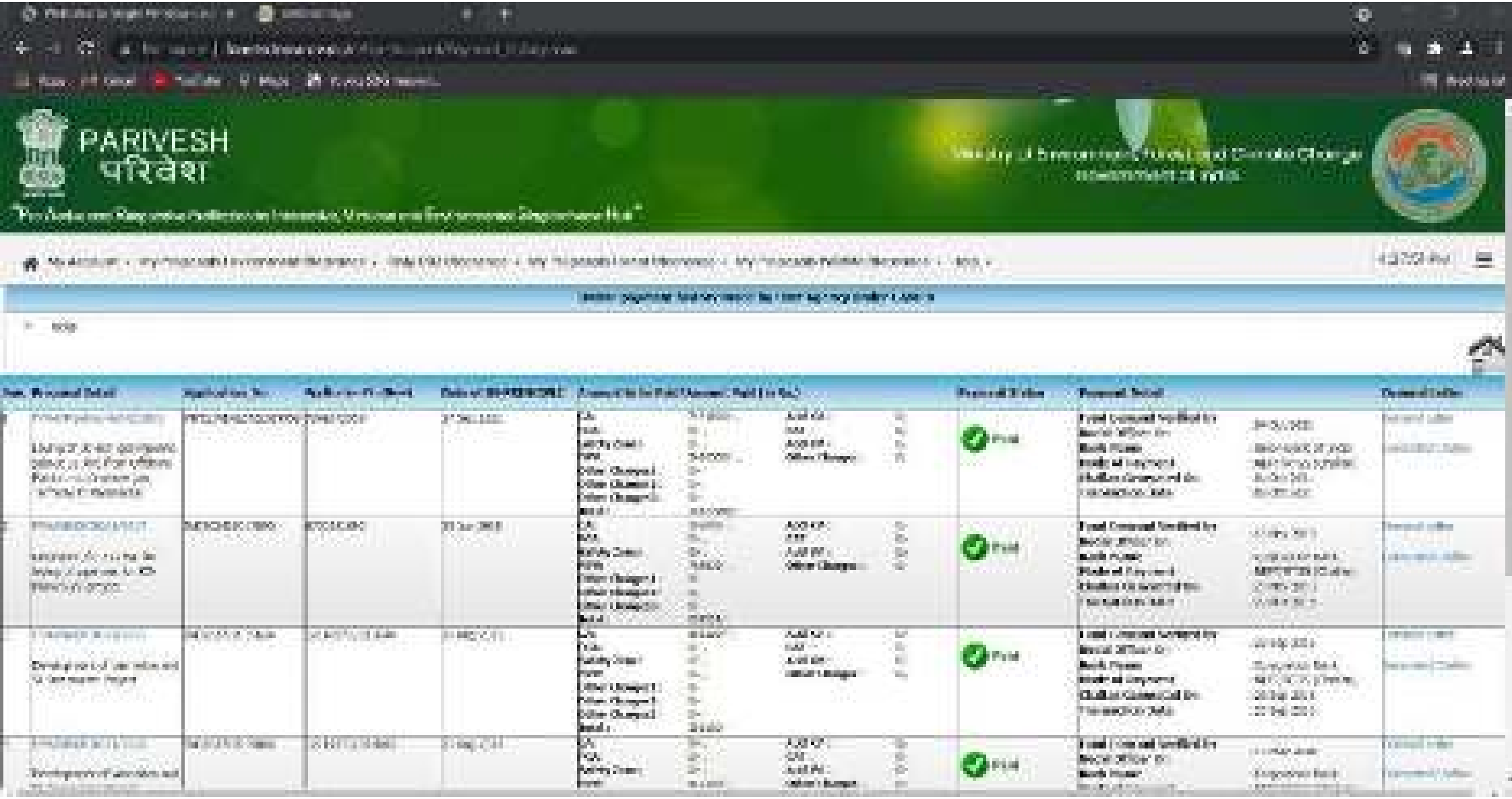
Total ₹ ..... 105,71,980/- .....

Rupees ..... One crore five lakh seventy one thousand nine hundred and eighty. Only)

Office Use

No. ..... (SB) NRS 2021 0008457334

Branch Manager


PARIVESH
परिवेश

ECOLOGY AND BIODIVERSITY STUDY REPORT
&
WILDLIFE CONSERVATION PLAN

For

The Proposed Laying 20" Pipeline of about 31 km length from Offshore Platform, through Mouth of the Goutami River to ONGC Onshore Plant at Mallavaram Village, Thallarevu Mandal, East Godavari District, Andhra Pradesh.

Submitted by

Oil & Natural Gas Corporation Limited (ONGC)
Kakinada, Andhra Pradesh.

October 2021

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1.0 INTRODUCTION

Oil & Natural Gas Corporation Limited (ONGC) is a Maharatna company Public Sector Undertaking (PSU) of the Government of India, under the administrative control of the Ministry of Petroleum and Natural Gas. It is India's largest oil and gas exploration and production company. It produces around 70% of India's crude oil (equivalent to around 30% of the country's total demand) and around 62% of its natural gas. With a market capitalization of over INR 2 trillion, it is the India's first largest publicly-traded companies. It is the largest crude oil and natural gas company in India, contributing around 70 per cent to Indian domestic production. Crude oil is the raw material used by downstream companies like IOC, BPCL and HPCL to produce petroleum products like Petrol, Diesel, Kerosene, Naphtha and Cooking Gas-LPG.

ONGC is the Top Energy Company in India, ranked 11th globally as per Platts Top 250 Global Energy Rankings, 2017. It is the only public sector Indian company to feature in Fortune's 'Most Admired Energy Companies' list. ONGC ranks 38th in 'Oil and Gas operations' and 183rd overall in Forbes Global 2000. Acclaimed for its Corporate Governance practices, transparency international has ranked ONGC 26th among the biggest publicly traded global giants. It is most valued and largest E&P Company in the world, and one of the highest profit-making and dividend-paying enterprise.

ONGC Videsh is a wholly owned subsidiary of Oil and Natural Gas Corporation Limited (ONGC), the National Oil Company of India, and is India's largest international oil and gas Company. ONGC Videsh has participation in 41 projects in 20 countries namely Azerbaijan, Bangladesh, Brazil, Colombia, Iraq, Israel, Iran, Kazakhstan, Libya, Mozambique, Myanmar, Namibia, Russia, South Sudan, Sudan, Syria, United Arab Emirates, Venezuela, Vietnam and New Zealand. ONGC Videsh maintains a balanced portfolio of 15 producing, 4 discovered/under development, 18 exploratory and 4 pipeline projects. The Company currently operates/ jointly operates 21 projects. ONGC Videsh had total oil & gas reserves (2P) of about 711 Million Metric Ton of Oil Equivalent (MMTOE) as on April 1st, 2018.

Now, ONGC proposes to lay 20" pipeline (about 31 km length) to transport gas from Offshore Platform, through Mouth of the Godavari River to ONGC onshore plant at Kaikavaram Village, Thallarevu Mandal, East Godavari District, Andhra Pradesh.

1.1 Background and Importance of the Project

The Indian hydrocarbon industry is currently passing through a challenging phase with the share of natural gas, the third largest contributor to the national energy basket, projected to increase at a rate faster than any other energy source. In order to meet the ever-increasing national energy requirements and to reduce the burden of hydrocarbon imports on the national exchequer, Oil & Natural Gas Corporation Limited (ONGC) is currently involved with the exploration in several deep sea fields off the east coast of India.

1.2 Objective of the Study

- Primary Survey of Ecology and Biodiversity of the core area extending up to 500m on either side of the proposed pipeline route and the buffer zone extending up to 10km in order to gather baseline data relating to flora and fauna with special reference to RET and Schedule I species.
- To assess the impacts of project activities on fauna, flora and wildlife in the study area during different phases of the project.
- To prepare management and conservation plan in consultation with the State Forest and Wildlife Department for habitat improvement, resource augmentation and reduction of potential threats using modern technologies.

2.0 SALIENT FEATURES OF THE PROJECT

2.1 Name and Address of the Proponent

M/s. Oil & Natural Gas Corporation Limited (ONGC),
Easter offshore Asset,
2nd Floor, Subhadra Arcade,
Bhanugudi Junction, Kakinada,
Andhra Pradesh-533 003.
Telefax: (0884)-2374184

2.2 Project Location & Nature of the Project

The proposed 18" pipeline route of total 31 km in length from offshore Central Process Platform (CPP) location to onshore Gas Terminal (OGT) at Malleswaram comprises of following segments:

1. CPP to River Mouth: offshore laying (about 9 km) at depth of 1-2 m by post lay trenching method.
2. River Mouth to Landfall Point (LFP): laying along the Gowthami river (about 11 km) at depth 7 m (below the scour depth) by dredging method.
3. LFP to OGT, Malleswaram: onshore laying (about 11 km) buried at depth 2 m below surface by trenching method.

It has major River crossings by Horizontal Directional Drilling (HDD) at two different locations, crossing of Mangroves area and road (at OGT) by HDD with 15 m depth. The environmental setting of the proposed pipeline project is given in **Table-1.**

TABLE-1
ENVIRONMENTAL SETTING OF THE PROPOSED PIPELINE PROJECT

Sr. No.	Particulars	Description
1	Pipeline length	About 28 km
2	Location	From offshore platform, through mouth of the Godavari river to ONGC onshore plant at Kothapalli village, East Godavari district, Andhra Pradesh.
3	Toposheet No.	65 I/3, I/4, I/7, I/8
4	Current status of land	Proposed pipeline is passing through various land uses such as river bed, salt pans, river crossing, private land, forest land and aquaculture ponds
5	Elevation above MSL	0-5 meters AMSL
6	Nearest Town	Yanam – 7.5 km, West
7	Nearest City	Kakinada – 37.0 km, NNW
8	Nearest highway	NH-216 – 6.5 km, West
9	Nearest railway station	Kakinada – 37.0 km, NNW
10	Nearest airport	Rajahmundry – 65.5 km, NW
11	Places of Archaeological importance	Nil
12	Protected areas as per Wildlife Protection Act,1972 (Tiger reserve, Elephant reserve, Wildlife sanctuaries, National Park, Conservation reserve and community reserve)	• Coringa Wildlife Sanctuary - 7.33 km, NNE from nearest pipeline point
13	Reserve Forests within 10-km radius	From nearest Pipeline point: • Coringa Extension reserve forest &Coringa Wildlife Sanctuary - 2.33 Km, East • Konavaram reserve forest - 2.5 km, East Kadalkuva reserve forest - 9.20 km, East • Pasarlapudi reserve forest - 6.5 km, East Bellupalli reserve forest and mangroves - 2.38 km, East • Kothapalem reserve forest - 9.6 km, West • Kandrapalli reserve forest - 2.0 km, West
14	Hydrographs	• Passing through Bay of Bengal to Godavari River • Passing through Godavari river and aquaculture ponds within 500 m either sides of pipeline route • Confluent Godavari River (Tidal, EWPT) passing through.
15	Seismic Zone	Specifically, this area is categorized under zone-III as per IS: 1893 (Part 1):2002, which is a stable zone.
16	CRZ	CRZ-1: Passing through Mangroves, Low water line, Mudy, Salt pans falling within 500 m either sides of pipeline route
17	Other industries within 10 km radius	• Reliance Industries Onshore Gas Terminal Gadimoga 1.4 km NW • ONGC Onshore HPHT Assets • Yanam Sugar • Shanti Cements

Note: All distances mentioned above are aerial distances
Source: Toposheets, Google Image and field visits

3.0 ECOLOGY & BIODIVERSITY STUDY

The core area is defined as the stretch of 1000 m wide (500m on each side of the proposed pipeline) 31 Km longproposed laying20" pipeline from the offshore platform, through the mouth of the Gautami River to ONGC onshore plant at Malikipuram Village, Thallarevu Mandal, East Godavari District, Andhra Pradesh.

The total length is about 31 km but the onshore length is only 10km and hence the terrestrial area including the marshy areas and aquaculture ponds. The length of the pipeline that passing throughNasanibppa reserve forest, Rajolaiyo section boundary of reserved forest is 1.17 km river portion and the forest area involved is about 2.45ha (10 m buffer either side of 1.17 km pipeline. For the purpose of EIA, a buffer zone of 10 km radius around the pipeline is considered as the study area. The study area is rich in ecosystem diversity. It ranges from marine to estuarine and fresh water ecosystems passing through large marshy areas, mangrove forests, mud flats, aquaculture ponds, sand dunes, salt pans, croplands, plantations and built-up areas. As such there is a fair amount of biodiversity, mainly because of the rich deltaic soils, availability of water and coastal climate. The forests in the study area represented by the Mangroves of Godavari Estuary. The East Godavari River Estuarine Ecosystem (EGREE) is famous for the Coringa Wildlife Sanctuary (CWLS). **The nearest distance between the boundary of the CWLS and the pipeline is 2.32 km.** In view of the location of the CWLSwithin a distance of 10km from the pipeline, pipeline falls in eco sensitivezone. esESZ of CWLS has not been declared and hence 10 km is the default ESZ. In view of the National importance of the pipeline and the justifiable need to for the gas pipeline, the ONGC after a careful investigation of three alternatives chosen the one under consideration based on the merits.

3.1 Methodology

Extensive survey of literature on Flora, Fauna, Ecology and biodiversity of the Godavari River Estuarine Ecosystem (EGREE) in general and Coring Wildlife Sanctuary in particular was carried out during April and May 2019. There is abundant of valuable and reliable scientific information in the form of records, reports and scientific documents. Based on the knowledge and information gained through desk-top studies, primary survey of flora and fauna of the project site including the buffer zone was undertaken during May 2019 by Prof.K.S.Reddy, Retired Professor of Ecology and Environmental Sciences and QCI-NABET Accredited Functional Area Expert in Ecology, Biodiversity and Soil conservation(Category A). The report was prepared based on what was seen during the filed survey and what was on record and in consultation with forest & wildlife officials.

3.2 Field Surveys & Ecological Assessment

Vegetation and Flora of the Core Area (500m on either side of the Pipeline)

The pipeline takes off from the offshore Central Processing Platform (CPP)in Bay of Bengal, passes through the Gautami Godavari River, aquaculture ponds, marshy areas, mud flats and a few patches of degraded forests where the mangroves are mostly replaced by *Prosopis juliflora*. Since the project impacts either in the sea or in the Gautami Godavari River are temporary and limited to construction (laying of pipeline) and as no tree or vegetation is going to be lost, the area is not considered for detailed survey of Biodiversity. The onshore vegetation comprises of saline mud flats, marshy areas, Mangrove forests and cultivated plants and commercial plantations, especially Coconut. Among the Mangroves, both *Avicennia alba* and *Avicennia officinalis* are most abundant dominant. *Prosopis juliflora* has invaded these areas where gaps were created either on account of the fall of *Avicennia* trees or felling of the same. Beyond the influence of estuarine and marine water, all common cultivated fruit trees, avenue trees and commercial plantations Coconut were very common and widespread. It may be stated that the nearly threatened (IUCN) mangrove species (*Cerriops decandra*) which is found in the Coringa Wildlife Sanctuary (CWLS)has not been reported it was absent in the core area. A common list of Mangroves and Mangrove Associates found in the core areas (1000m wide band along the pipe line) as well as in the buffer zone of 10 km is given in the Table 2 since most species except *Cerriops decandra* are common to core area and the buffer zone. But the impact of the pipeline shall be limited to a maximum of 100 width. A map of the study area indicating the route of the proposed pipeline, CWLS, Reserve forests and water bodies in the 5 km, 10 km and 15 Km buffer zone is given in **Figure-1**.

Vegetation and Flora of the Buffer Zone

As already stated earlier, the buffer zone is rich in habitat / Ecosystem diversity. In the Coringa Wildlife Sanctuary (CWLS) there is one nearly threatened (IUCN) mangrove species (*Cerriops decandra*) and there are three rare species (*Sonneratia alba*, *Scyphiphora hydrophyllacea* and *Xylocarpus moluccensis*) which are not reported in core areas. This is probably the only place (CWLS) in India where three species of *Avicennia*, i.e. *Avicennia officinalis*, *Avicennia marina*, and *Avicennia alba* are found together in mixed forests.

A brief description of the vegetation and flora of the different blocks shall follow. Needless to say, that the Coringa Wildlife Sanctuary (CWLS) is rich in Biodiversity and the area received fairly good amount of scientific attention. A list of reserved forests along with type of vegetationpresentin the buffer zone along with there extent is given in **Table-2**.

TABLE-2
LIST OF RESERVE FORESTS PRESENT IN THE BUFFER ZONE AND THEIR EXTENT IN HA

Reserved Forests	Type of vegetation	Area in ha within the CWLS	Area in ha outside the CWLS
Coringa Extension RF	Mangrove swamp	19441.70	-
Coringa RF	Mangrove swamp	3136.54	-
Bhairavapalem RF	Mangrove swamp	302.05	-
Kondagunta RF	Casuarina plantation	-	3484
Kotipalem RF	Mostly agricultural lands	-	60
Narasapur RF	-	-	1098
Bhairavapalem RF	Mangrove swamp	-	425
Narasapur RF	Mangrove swamp	-	546
Kakinada RF	Mangrove swamp	-	2081
Mallavaram	-	-	445
	Sub Total	**22,879.29**	**8,155**
	Total		**31,034.29**

Source: Atlas of Mangrove Wetlands of India, Part 2 (Andhra Pradesh), T. Ramakrishnan and others, M. S. Swaminathan Research Foundation, Chennai, India, March 2004

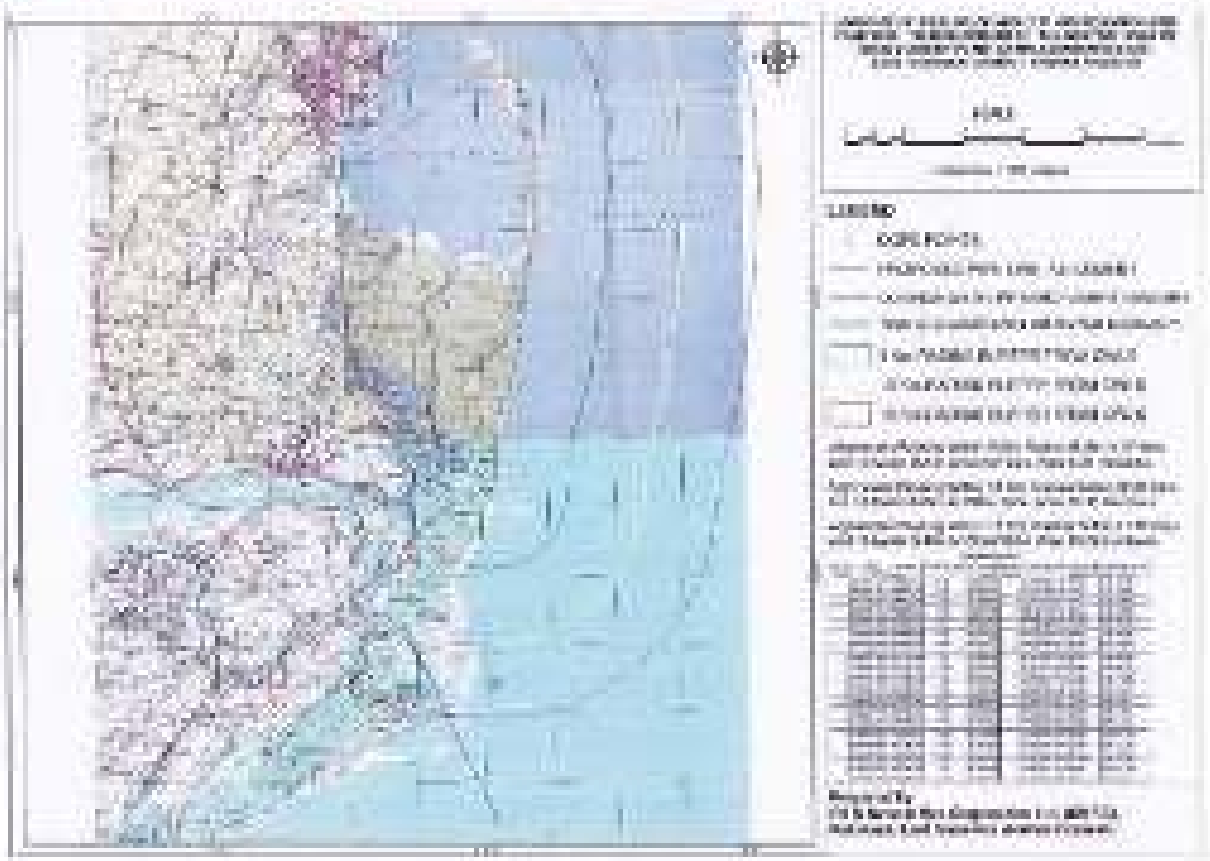


FIGURE-1

STUDY AREA MAP OF THE PROPOSED PIPELINE ROUTE, CWLS, RESERVE FORESTS AND WATER BODIES IN THE 5 KM, 10 KM AND 15 KM BUFFER ZONE

A common list of Mangroves and Mangrove Associates found in the core areas (1000 m wide band along the pipe line) as well as in the buffer zone of 10 km is given in the **Table-3**. However, only part of CWLS falls in the 10km buffer zone and the shortest distance between the pipeline and the CWLS is 2.35km.

The vegetation and flora of different areas is slightly different depending on topography, salinity and land use as revealed by the following details:

Occasionally inundated areas support species like Excoecaria agallocha and Lumnitzera racemosa and generally they are of short stature. Suaeda monoica, Suaeda nudiflora and Aeluropus lagopoidesare common in this area.

Casuarina Plantations: The Casuarina plantations raised by the Forest Department along the coast are seen in the Hope Island, along the shore near Masanitippa and in Kandikuppa R.F. near Sacramento Hill etc.,

Invasion by *Prosopis juliflora*: Invasion of *Prosopis juliflora*, an exotic species with wide ecological amplitude was quite common in the high tidal mud flats where inundation is rare. Invasion could also be seen even near the river mouth and degraded forests.

Coringa Reserve Forest (RF): The Mangrove vegetation in this R.F. is dense. The total area as per the forest department is about 4,343 ha, out of which 2,951 ha is with dense mangroves. *Avicennia marina* and *Excoecaria agallocha* are the dominant species. *Aegiceras corniculata* and *Myrsistichya wightiana* are found in thick patches along the creeks of Coringa River near Kamalapuram and Nallacheleru creeks. Associated species like *Pongamia pinnata*, *Melaeus littoralis* and *Clerodendrum inerme* are present. *Suaeda maritima* and *Suaeda monoica* are common in the degraded and partially degraded areas. In the elevated areas where the soil is highly saline *Salicornia brachiata* is seen. Shrubs namely *Acanthus ilicifolius* and *Dalbergia spinosa* and climbers like *Ipomoea pes-caprae*, *Sarcostemma auriculatum*, *Caesalpinia crista*, and *Derris trifoliata* are also recorded. *Luminitzera racemosa*, *Excoecaria agallocha* and *Avicennia marina* are found in the up-land areas. The soil of this R.F. is clayey.

The mangrove zonation near Coringa river mouth and Nallajalem canal are distinct. *Avicennia alba* is seen as pure stands near Kakinada Bay side [Coringa River and Nallajalem canal mouths]. The next zone towards landward side is with pure stands of *Sonneratia apetala*. After this the vegetation is mixed with pure stands of *Excoecaria agallocha*, *Lumnitzera racemosa*, *Aegiceras corniculatum* and *Avicennia marina*. The other mangrove species *Rhizophora apiculata*, *Xylocarpus moluccensis*, *Bruguiera cylindrica*, *Bruguiera gymnorrhiza* and *Ceriops decandrawere* almost absent.

Coringa Extension R.F: The Coringa extension R.F. as per the records of Forest department is 19,467 ha. As Kakinada bay falls under this R.F. more than 90% of the area is under water bodies. The vegetation along the Nallajalem creek and Gadaru creek are thick. *Excoecaria agallocha* is the dominant species and *Avicennia marina* is sub dominant. The average height of the vegetation is about 4.5m. In the eastern side of Gadaru River, species namely *Bruguiera gymnorrhiza*, *Bruguiera cylindrica*, *Rhizophora apiculata*, *Rhizophora mucronata* and *Xylocarpus moluccensis* are recorded. These species are either rare or absent in the Nallajalem canal area. Near the Gadaru river mouth *Sonneratia alba* is recorded. *Acanthus ilicifolius*, *Myrsistichya wightiana*, *Pemphis/Lythraceae* are recorded. In the degraded areas *Suaeda maritima*, *Suaeda monoica* and *Salicornia brachiata* are recorded. *Sesuvium portulacastrum* is abundant in this R.F along with *Bruguiera cylindrica* near Gadaru side. The soil of this R.F. is clayey in the Gadaru riverside and sandy clay near the Bay side.

Bhairavapalem R.F: It is named after the village Bhairavapalem that is situated near the Godavari River mouth and occupies an area of 973 ha. In Bhairavapalem R.F. almost all the species are recorded except *Sonneratia hydrophyllacea*. In this R.F. *Excoecaria agallocha*, *Avicennia marina*, *Avicennia officinalis* and *Aegiceras corniculatum* are abundant. *Rhizophora apiculata*, *Rhizophora mucronata*, *Xylocarpus moluccensis*, *Sonneratia apetala*, *Bruguiera gymnorrhiza* and *Bruguiera cylindrica* are seen along the creeks. *Suaeda* spp. is noticed in the degraded areas. The other species namely *Derris trifoliata*, *Sarcostemma viminale*, *Clerodendrum inerme* and *Dalbergia spinosa* are also recorded. The soil of this R. F. is clayey along the Gadaru River and is sandy clay towards the seaside.

Rathikalava R.F: The total area under this R.F. is 2,043 ha of which 805 ha is with dense mangroves. As per the GIS data, the water spread area (Godavari River) accounts for 724 ha. Degraded and partially degraded mangroves account for 214 ha. *Rhizophora apiculata, Rhizophora mucronata, Xylocarpus moluccensis, Bruguiera gymnorrhiza, Avicennia marina, Avicennia officinalis* and *Excoecaria agallocha* occur in this R.F. Trees of *Rhizophora, Bruguiera* are seen along the creeks reaching a height of about 4 to 5 m. Large trees of *Avicennia officinalis* are found in the R.F. *Ipomoea biloba*, a mangrove associate is recorded in this R.F along with *Thespesia populnea, Hibiscus tiliaceus* and *Clerodendrum inerme*. Species of *Suaeda* and *Salicornia* occur in the degraded areas. Stunted *Excoecaria agallocha, Cynodonteae racemosa* are also found in the degraded areas. *Prosopis* invasion along the Satern canal is noticed which are cut and sold by the villagers for tobacco curing during December and January every year. In spite of this practice, this species is fast making inroads into mangrove areas posing a severe threat to mangroves. The soil is clayey.

Hasanthippa R.F: It is named after the village Hasanthippa. This R.F. extends to an area of 3,089.5 Ha. Out of this, 814 ha is covered with dense mangroves. The species composition and the vegetation pattern in this R.F. are similar to Rathikalava R.F. *Rhizophora apiculata* and *Rhizophora mucronata* of about 5m height are seen along the creeks. *Avicennia marina* and *Excoecaria agallocha* are the dominant species in this R.F. *Sonneratia apetala, Bruguiera gymnorrhiza, Ceriops decandra, Lumnitzera racemosa* and *Bruguiera cylindrica* are also recorded in these R.F. Large areas of mangroves are occurring outside the R.F. towards the Bay of Bengal, which is under severe erosion due to oceanic currents and tides. Prosopis thickets are also noticed in this area. The soil of this R.F. is clayey.

Matlatippa R.F: It is fairly dense mangrove vegetation is found on the eastern side. The western side is elevated and also there are no creeks to facilitate tidal flow. According to Forest department the mangroves are spread in 445 ha of which 210 ha is with vegetation. The remaining areas are with degraded mangroves and water bodies. Grazing by cattle and goat are observed in this R.F. Species like *Sonneratia apetala, Rhizophora apiculata, Bruguiera gymnorrhiza, Avicennia marina, Avicennia officinalis, Avicennia alba, Lumnitzera racemosa, Ceriops decandra* and *Xylocarpus moluccensis* are recorded in this R.F. Climbers like *Derris trifoliata, Sarcolobus carinatus*, grasses like *Porteresia coarctata, Myrioclachne wightiana* and shrubs like *Salvadora persica* and *Acanthus ilicifolius* are recorded. The soil of this RF. is clayey.

Balusutippa RF: It is named after the village Balusutippa. The extent of mangroves under this R.F. is about 475 Ha of which 427 ha is under mangrove vegetation. Large trees of *Avicennia officinalis, Avicennia marina, Rhizophora apiculata, Rhizophora mucronata, Bruguiera gymnorrhiza, Xylocarpus moluccensis* and *Ceriops decandra* are recorded in this R.F. Large area of mangroves are seen outside this RF. along the Gowthami Godavari River. Soil of this R.F. is clayey.

Kothapalem RF. This is also named after the village Kothapalem. Though the mangrove extent in this R.F. is only 58.8 Ha. The species diversity is rich and the vegetation is fairly dense. A rare and endemic species namely *Scyphiphora hydrophyllacea* (Rubiaceae) is recorded near the Sacramento lighthouse. They are about 2 m in height. Along the entire East coast this species occurs only in this

R.F. Other plants namely *Excoecaria agallocha*, *Lumnitzera racemosa*, *Rhizophora mucronata*, *Avicennia officinalis* and *Avicennia alba* are recorded. Trees of these species are about 4-5 m in height. Climbers namely, *Derris trifoliata* and *Sarcostemma viminale* are recorded. Shrubs like *Dalbergia spinosa*, *Clerodendrum inerme* and the halophytic herbs such as *Suaeda* and *Salicornia* are also recorded. The nearby aqua ponds and habitation are constant sources of threat to the mangrove ecosystem in this area. The soil is clayey.

Kandikuppa RF. This R.F is about 3,802 Ha of which healthy mangroves occur in 425 Ha. Large areas of Casuarina plantations along the shore, is also a part of this R.F. Vegetation in this R. F. is relatively healthy and also rich in diversity. Species namely *Rhizophora apiculata*, *Bruguiera gymnorrhiza*, *Ceriops decandra* and *Xylocarpus moluccensis* are found in the RF. *Excoecaria agallocha*, *Avicennia marina*, *Avicennia officinalis* and *Lumnitzera racemosa* are also recorded in this R.F. The vegetation in this RF is disturbed due to the human pressure from the nearby villages namely Mollettmoppa, Kothapalem, Pandi and Pora. The soil is clayey in the land ward side and it is sandy clay near the seaward side.

The mangroves of Godavari are dence when compared to Krishna mangroves. The species composition is also high. *Excoecaria agallocha* and *Avicennia marina* contribute to about 90% of area of mangroves of the Godavari estuarine complex.

A comprehensive list of Mangroves and Mangrove associates found in the study area is given in **Table-3**. The Sanctuary in the estuary of River Godavari has rich mangrove vegetation. There are 38 species of plants belonging to twenty four families as shown in Table-3. The plant species that are commonly found are.

Avicennia officinalis, *Avicennia marina*, *Avicennia alba*, *Excoecaria agallocha*, *Rhizophora mucronata*, *Ceriops decandra*, *Bruguiera gymnorrhiza*, *Lumnitzera racemosa*, *Sarcostemma viminale*, *Rhizophora conjugata*, *Aegiceras corniculatum*, *Thespesia populneoides* and *Hibiscus tiliaceus*. Apart from the tree species, some of the shrubs found in the sanctuary are *Dalbergia spinosa*, *Derris trifoliata*, herbs like *Sesuvium portulacastrum*, *Suaeda maritima*, *Suaeda monoica* and *Salicornia brachiata* and grasses like *Aeluropus lagopoides*, *Porteresia coarctata* and *Myriostachya wightiana* are found in the sanctuary.

TABLE-3
LIST OF MANGROVES AND MANGROVE ASSOCIATES FOUND IN THE STUDY AREA

Scientific name	Family	Vernacular name	Habit	IUCN
Mangroves				
Avicennia officinalis	Avicenniaceae	Nalla	Shrub	LC
Avicennia marina	Avicenniaceae	Nalla	Shrub	LC
Avicennia alba	Avicenniaceae	Nallamada	Tree	LC
Avicennia officinalis	Avicenniaceae	Nallamada	Tree	LC
Bruguiera cylindrica	Rhizophoraceae	Ankudu	Tree	LC
Bruguiera gymnorhiza	Rhizophoraceae	Sorrelgu	Tree	LC
Ceriops decandra *	Rhizophoraceae	Togaru	Tree	NT
Excoecaria agallocha	Euphorbiaceae	Tiruku	Tree	LC
Lumnitzera racemosa	Combretaceae	Thanduga	Tree	LC
Rhizophora apiculata	Rhizophoraceae	Ponna	Tree	LC
Rhizophora mucronata	Rhizophoraceae	Ponna	Tree	LC
Sonneratia caseolaris	Sonneratiaceae	Pedda Kokinga	Tree	LC
Sonneratia alba	Sonneratiaceae	Pedda Kokinga	Tree	LC
Sonneratia apetala	Sonneratiaceae	Kokinga tree	Tree	LC
Xylocarpus moluccensis	Meliaceae	Senaga Tree	Tree	LC
Mangrove Associates				
Acrostichum aureum	Pteridaceae	Nalla gaddi	Grass	LC
Caesalpinia crista	Caesalpiniaceae	Sunthi Vine	Climber	LC
Clerodendrum inerme	Verbenaceae	Pekeru	Small tree	LC
Derris trifoliata	Fabaceae	Dalinga	Shrub	LC
Derris trifoliata	Fabaceae	Nallathiruga	Vine	LC
Fimbristylis ferruginea	Cyperaceae	Tyrgu	Sedge	LC
Hibiscus tiliaceus	Malvaceae	Adaluskara	Small tree	LC
Ipomoea pes-caprae	Convolvulaceae	Morning glory	Vine	LC
Ipomoea sp.a	Convolvulaceae	Tiruthiga	Vine	LC
Myriostachya wightiana	Poaceae	Dhalla gaddi	Grass	LC
Acrostichum aureum	Acrostichum	Yerragaddi	Grass	LC
Salicornia brachiata	Chenopodiaceae	Kajeru	Herb	LC
Sarcostemma acidum	Asclepiadaceae	Balebadchiruga	Vine	LC
Sesuvium portulacastrum	Aizoaceae	Vangamtakura	Herb	LC
Suaeda maritima	Chenopodiaceae	Kakiru	Herb	LC
Suaeda monoica	Chenopodiaceae	Kakiru	Herb	LC
Tamarix indica	Tamaricaceae	Pilakuru	Tree	LC
Thespesia populnea	Malvaceae	Gangaravi	Tree	LC
Typha elephantina	Typhaceae	Ocean turf Grass	Herb	LC
Typha latifolia	Typhaceae	Ocean turf Grass	Herb	LC

* denotes that the species is restricted to Coringa Wildlife Sanctuary (CWLS) only

A list of plants found in areas beyond the influence of sea are given in **Table-4**. A noteworthy feature is the presence of all the three species of Ammania (*Ammania baccifera, Ammania reticulata and Ammania multiflora*) in the buffer zone. It may be noted that two exotic trees, namely Terminalia mantaly and Casuarina Equisetifolia are now widely grown as avenue trees. List of plant species found in the sandy areas and on the bunds of the fish ponds is given in **Table-5**. It may

be noted that most of them are mat forming or profusely branching prostrate or erect herbs and sedges.

TABLE-4
LIST OF TREES, SHRUBS AND PERENNIAL CLIMBERS FOUND IN THE BUFFER ZONE WHICH IS BEYOND THE INFLUENCE OF SEA AND ESTUARINE SYSTEM

Scientific name	Common / Local name	Family
Abrus precatorius	Gurivinda	Fabaceae
Acacia nilotica	Nallathumma	Mimosaceae
Aegle marmelos	Velaga	Rutaceae
Albizia lebbeck	Sirisa	Mimosaceae
Alstonia scholaris	Saptaparnamu	Apocynaceae
Anacardium occidentale	Cashew nut	Anacardiaceae
Annona muricata	Lakshmanaphalamu	Annonaceae
Annona reticulata	Ramaphalamu	Annonaceae
Annona squamosa	Seetaphalamu	Annonaceae
Antrocephalus indica	Kadamba	Rubiaceae
Artocarpus heterophyllus	Jack fruit	Moraceae
Azadirachta indica	Vepa	Meliaceae
Bauhinia purpurea	Kanchanam	Caesalpiniaceae
Bauhinia racemosa	Aralimanu	Caesalpiniaceae
Borassus flabellifer	Taadi	Arecaceae
Caesalpinia pulcherrima	Pooli mogali	Caesalpiniaceae
Casuarina equisetifolia	Gaalicha	Casuarinaceae
Callistemon lanceus	Bottle brush tree	Myrtaceae
Calotropis gigantea	Tella jilledu	Asclepiadaceae
Calotropis procera	Jilledu	Asclepiadaceae
Carica papaya	Boppa	Caricaceae
Cassia fistula	Rela	Caesalpiniaceae
Cassia siamea	Kasinta Tangedu	Caesalpiniaceae
Casuarina equisetifolia	Sarvi	Casuarinaceae
Citrus limonia	Stamen wood	Rutaceae
Clerodendrum inerme	Indian Privet	Verbenaceae
Cocos nucifera	Kobbari	Arecaceae
Corchorus aestuans	Cotton bush	Tiliaceae
Crataeva religiosa	Sosco	Fabaceae
Delonix elata	Sunkesula	Caesalpiniaceae
Delonix regia	Tella gulmohar	Caesalpiniaceae
Dendrocalamus strictus	Bamboo	Poaceae
Elaeis guineensis	Oil Palm	Arecaceae
Eucalyptus citriodora	Eucalyptus	Myrtaceae
Eucalyptus hybrid	Eucalyptus	Myrtaceae
Ficus benghalensis	Banyan tree	Moraceae
Ficus benjamina	Weeping fig	Moraceae
Ficus hispida	Hairy fig	Moraceae
Ficus racemosa	Cluster fig	Moraceae
Ficus religiosa	Raavi	Moraceae
Ipomoea carnea	Rubber vine	Convolvulaceae
Ipomoea pescaprae	Morning glory	Convolvulaceae
Jacaranda mimosifolia	Jacaranda	Bignoniaceae
Jatropha curcas	Adavivelamudamu	Euphorbiaceae
Jatropha gossypifolia	Adavivelamudamu	Euphorbiaceae
Lantana camara	Lantana	Verbenaceae

Scientific name	Common / Local name	Family
Lantadena reticulata	Kakara	Asclepiadaceae.
Lawsonia inermis	Gorintaku	Vitaceae
Mangifera indica	Mango / Mavidi	Anacardiaceae
Manilkara zapota	Sapota	Sapotaceae
Moringa oleifera	Chettuku munaga	Moringaceae
Musa paradisiaca	Arati	Musaceae
Murraya koenigii	Jamaica Cherry	Rutaceae
Musa paradisiaca	Arati	Musaceae
Nerium oleander	Ganneru	Apocynaceae
Pandanus fascicularis	Mogali	Pandanaceae
Peltophorum pterocarpum	Copper pod	Caesalpiniaceae
Pergularia daemia	Dudhalatheega	Asclepiadaceae
Phoenix dactylifera	Eetha	Arecaceae
Phyllanthus reticulatus	Pandiri	Euphorbiaceae
Pithecellobium dulce	Seema chinta	Mimosaceae
Polyalthia pendula	Ashoka	Annonaceae
Portulaca oleracea	Gangaavu	Portulacaceae
Psidium guava	Jaama	Myrtaceae
Pterocarpus indicus	English thamara	Papilionaceae
Santalum album	Gandhapu chekka	Santalaceae
Sapindus emarginatus	Plants of the forest	Sapindaceae
Syzygium cumini	Neredu	Myrtaceae
Tamarindus indica	Chinta	Caesalpiniaceae
Tectona grandis	Teak	Verbenaceae
Terminalia arjuna	Tellamaddi	Combretaceae
Terminalia catappa	Badam	Combretaceae
Terminalia mantaly	Nalagaddam chettu	Combretaceae
Thespesia populnea	Gangi chettu	Malvaceae
Vanda parviflora	Vanda	Orchidaceae

TABLE-5
LIST OF PLANT SPECIES FOUND IN THE SANDY AREAS AND ON THE BUNDS OF THE FISH PONDS

Scientific name	Common / local name	Family
Ethulia conyzoides	Marigold plant	Asteraceae
Alternanthera sessilis	Ganagaakoora	Amaranthaceae
Amaranthus tricolor	Flowering Amaranth	Amaranthaceae
Canavalia rosea	Beach Bean	Fabaceae
Canavalia maritima	Beach Bean	Fabaceae
Cenchrus digitatus	Chevi grass	Poaceae
Crotalaria burhia	Burhia Rattle pod	Fabaceae
Crotalaria falcata var falcata	Wild Gut Jeera	Fabaceae
Crotalaria retusa	Rattle weed	Fabaceae
Crotalaria verrucosa	Tiny rattle pod	Fabaceae
Crotalaria verrucosa	Blue Rattle Pod	Fabaceae
Cyperus arenarius	Nut sedge	Cyperaceae
Cyperus pedunculatus	Beach Star	Cyperaceae
Cyperus stoloniferus	Creeping sedge	Cyperaceae
Desmodium parvifolium	Narrow leaf desmodium	Fabaceae
Ipomoea pes-caprae	Railpoo	Convolvulaceae
Ipomoea pes-tigridis var.	Tigerfoot	Convolvulaceae

Scientific name	Common / local name	Family
Hyrtios reges	Army Sponge	Hyrtiosidae
Bubonia ficoides	Ficoid Coral	Euphyllidae
Pentapetes quinquelocularis	Green Bell Pimpry	Cyperaceae
Pentapetes suberifolia	Mauritius grass	Cyperaceae
Cleome gynandra	Cabbage tarragon	Cleomaceae
Cleome viscosa	Dove	Malvaceae
Heliotropium curassavicum	Heliotrope	Boraginaceae
Phaseolus trinervius	Jackbean	Fabaceae
Indigofera aspalathoides	Shrub	Fabaceae
Indigofera cordifolia	Heartleaf indigo	Fabaceae
Indigofera linifolia	Oval-leaved Indigo	Fabaceae
Ipomoea aquatica	Swamp Morning glory	Convolvulaceae
Ipomoea pes-caprae	Morning glory	Convolvulaceae
Ipomoea vagans	Morning glory	Convolvulaceae
Launaea commersonii	Beach hawkbit	Asteraceae
Melilotus officinalis	Carpet weed	Molluginaceae
Mollugo cerviana	Carpet weed	Molluginaceae
Sesbania sesban	Jayanti	Leguminosae
Canscora diffusa	Bandala Akt	Melastomataceae
Paspalum vaginatum	Seashore paspalum	Poaceae
Perotis indica	Indian Comet grass	Poaceae
Phaseolus trilobus	Pilli pesara	Fabaceae
Phyllanthus rotundifolius	Kalavaru	Euphorbiaceae
Polycarpaea corymbosa	Old Man's Cap	Caryophyllaceae
Portulaca oleracea	Garden chemanti	Portulacaceae
Achyranthes aspera	Prickly Chaff flower	Amaranthaceae
Salvadora persica	Arabian Mustard	Salvadoraceae
Spermacoce articularis	Jointed Button weed	Rubiaceae
Spermacoce stricta	Shrubby False button weed	Rubiaceae
Sporobolus virginicus	Salt marsh grass	Poaceae
Tephrosia purpurea	Wedge leaf tephrosia	Fabaceae
Trianthema portulacastrum	Horse purslane	Aizoaceae
Tephrosia villosa	Hairy Tephrosia	Fabaceae
Thuarea involuta	Sand grass	Poaceae
Trianthema triquetra	Three-angled Horse purslane	Aizoaceae
Vigna luteola	Hairy Pod Cowpea	Fabaceae
Xyris indica	Yellow-eyed grass	Xyridaceae
Zornia gibbosa	Coast Nee Zornia	Fabaceae
Zoysia matrella	Manila grass	Poaceae

3.3 Fauna of the Study Area

Coringa Wildlife Sanctuary (CWLS) is a part of the East Godavari River Estuarine Ecosystem (EGERES). Coringa Wildlife Sanctuary and Godavari estuary is an IBA, according to IBA Criteria it is given the final code No.IN215.

3.3.1 Site Description

Coringa Wildlife Sanctuary is located 20 km south of the port city Kakinada, on the Kakinada-Yanam state highway, nestling on the deltaic branches of Gautami and Godavari rivers at Kakinada Bay. It has extensive marshes and mangroves. During monsoon, the mudflats get submerged under 5 m of water. These large mudflats, which are subjected to cyclic influx and efflux of tidal water, play a vital

role in attracting a large number of waders to this region. About 50% of the area is the backwaters which include a sand bar of about 20 km, running north-south (Rao et al., 1996). Two rivers, namely the Coringa and Gaderu, and their deltaic branches intersect the entire region, along with other water channels draining into them or directly into the sea. This forms about 33,570 ha of marsh vegetation. The Sanctuary is part of the estuary of River Godavari, and supports a rich growth of mangrove vegetation with halophytes such as *Excoecaria agallocha*, *Rhizophora mucronata*, *Avicennia officinalis*, *Lumnitzera racemosa*, *Ceriops decandra*, *Sonneratia apetala* and *Aegiceras corniculatus*. According to Raja Sekhar et al. (2002), 24 species are representative of the vegetation structure of Godavari Estuary.

3.3.2 Key Biodiversity

AVIFAUNA: Rao et al. (1996) have identified 236 species of birds from this Sanctuary. However, they have reported species that are not likely to be present, such as Yellow-throated Bulbul *Pycnonotus xanthopygos*, Wood Snipe *Gallinago nemoricola* and Scribble-lipped Vanellus *gregarius*. Nevertheless, Coringa is an extremely interesting area for waders and mangrove birds, and should be designated as an IBA (Asokanshudu pers. comm. 2003). More than 20,000 waders use this area in a year. The area needs detailed investigation on its bird life. Oriental White-backed Vulture *Gyps bengalensis* and Long-billed Vulture *G. indicus* had been reported in past in that region but presently these are not found in the CWLS. Among the near threatened species, Painted Stork (*Mycteria leucocephala*), Oriental White Ibis (*Threskiornis melanocephala*), and Ferruginous Pochard (*Aythya nyroca*) are found in Coringa. Rao et al. (1996) have reported 17 species of ducks, and 37 species of waders of Family Charadridae. Even though some species need to be confirmed, the site still holds a very high diversity of water birds.

Other Key Fauna: A fair population of Fishing Cat (*Prionailurus viverrinus* or *Felis viverrina*), Golden Jackal (*Canis aureus*), Olive Ridley Sea Turtle (*Lepidochelys olivacea*). This IBA has a large breeding population of otters. In fact, the entire estuarine mangrove forest of Godavari river is a stronghold of otters, mainly Smooth Indian Otter *Lutra perspicillata* (Nagulu et al. 1994, 1999). The sighting of otters in this IBA is very common, and the group size ranges from 2 to 12, indicating healthy breeding populations (S. A. Hussain in litt. 2003).

Thus, the sanctuary possesses a wide variety of birds, because of the food available in the backwaters of the mangrove forest. During low tide, some of the areas are exposed (elevated mud flats) having small fishes, shrimps and molluscs. These attract avifauna for feeding. The painted stork, Oriental white ibis, ferruginous pochard found in the sanctuary are near threatened species, and spot-billed pelican is a vulnerable species. Significant populations of waders and mangrove birds are also present. Altogether, 236 species of birds have been reported by Rao et al (1996) during the winter season. About 120 species of birds have been reported from the surrounding areas and they are also common to the CWLS. Among them some of the commonly found birds in the sanctuary are: little egret, cattle egret, pied kingfisher, small blue kingfisher, black-capped kingfisher, pond heron, reef heron, grey heron, night heron, little stint, sandpiper, redshank, red-wattled lapwing, crow pheasant, flamingos, sea gulls, purple heron, brahmini kite, openbill stork, and little cormorant.

A comprehensive list of all birds reported / recorded in CWLS during the whole year is given in **Table-6.**

Mammals of the Coringa Wildlife Sanctuary (CWLS)

Apart from the avian fauna, the sanctuary has a fair population of fishing cat, golden jackal and a healthy breeding population of smooth-coated otter. CWLS is famous for two mammalian species, namely the Smooth Indian Otter *Lutra perspicillata* and the fishing cat (*Prionailurus viverrinus*). Both are in Schedule I of the Wildlife (Protection) Act and they are in the VU (vulnerable) category of the IUCN Red List. Other than these two, rest of the mammals are fairly common and widespread. Prominent among them is the Golden Jackal (*Canis aureus*). Rodents and Bats are quite common.

TABLE-6
LIST OF BIRDS REPORTED / RECORDED FROM THE CORINGA WILDLIFE SANCTUARY

Scientific name	Common name	Family	IUCN/ WPA
Accipiter badius	Shikra	Accipitridae	LC / I
Accipiter nisus (melanoschis)	Japanese Sparrow	Accipitridae	LC / I
Acridotheres ginginianus	Bank Myna	Sturnidae	LC /IV
Acridotheres tristis	Common Myna	Sturnidae	LC /IV
Acrocephalus dumetorum	Blyth's Reed Warbler	Muscicapidae	LC /IV
Acrocephalus stentoreus	Indian Great Reed Warbler	Muscicapidae	LC /IV
Aegithina tiphia	Common Iora	Campephagidae	LC /IV
Alauda gulgula	Indian Small Skylark	Alaudidae	LC /IV
Alcedo atthis	Small Blue Kingfisher	Alcedinidae	LC /IV
Amaurornis phoenicurus	Brown Crake	Rallidae	LC /IV
Anhinga melanogaster	Indian Darter or Oriental Darter	Ardeidae	LC /IV
Anas acuta	Pintail	Anatidae	LC / IV
Anas clypeata	Shoveller	Anatidae	LC / IV
Anas crecca	Common Teal	Anatidae	LC / IV
Anas penelope	Wigeon	Anatidae	LC / IV
Anas poecilorhyncha	Spot-bill Duck	Anatidae	LC / IV
Anas querquedula	Garganey	Anatidae	LC / IV
Anas strepera	Gadwall	Anatidae	LC / IV
Himantopus himantopus	Oriental Stork	Ciconiidae	LC / IV
Anser indicus	Bar-headed Goose	Anatidae	LC / IV
Anthus rufulus	Paddy-field Pipit	Motacillidae	LC /IV
Anthus trivialis	Tree Pipit	Motacillidae	LC /IV
Apus affinis	House Swift	Apodidae	LC /IV
Aquila rapax vindhiana	Tawny Eagle	Accipitridae	LC / IV
Ardea alba	Large Egret	Ardeidae	LC / IV
Ardea cinerea	Grey Heron	Ardeidae	LC / IV
Ardea purpurea	Purple Heron	Ardeidae	LC / IV
Ardeola bacchus	Chinese Pond Heron	Ardeidae	LC / IV
Ardeola grayii	Pond Heron	Ardeidae	LC / IV
Artamus fuscus	Ashy Swallow-Shrike	Artamidae	LC /IV
Athene brama	Spotted Owlet	Strigidae	LC /IV
Avocets recurvirostra	Black-crested Bazs	Accipitridae	LC / IV

Scientific name	Common name	Family	IUCN/ WPA
Anthus [illegible]	Common Pipit	Motacillidae	LC / IV
Aythya fuligula	Tufted duck	Anatidae	LC / IV
Aythya nyroca	Ferruginous Duck	Anatidae	NT / IV
Ardeotis nigriceps	Indian Great Bustard	Otidiformes	LC /IV
Athene brama	Spotted Owlet	Strigidae	LC /IV
Bubulcus ibis	Cattle Egret	Ardeidae	LC / IV
Calandrella cinerea	Short-Toed Lark	Alaudidae	LC /IV
Calidris alba	Sanderling	Charadriidae	LC /IV
Calidris alpina	Dunlin	Charadriidae	LC /IV
Calidris canutus	Knot	Charadriidae	LC /IV
Calidris minuta	Little Stint	Charadriidae	LC /IV
Calidris temminckii	Temminck's Stint	Charadriidae	LC /IV
Calidris tenuirostris	Eastern Knot	Charadriidae	LC /IV
Calidris testacea	Curlew-Sandpiper	Charadriidae	LC /IV
Caprimulgus indicus	Indian Jungle Nightjar	Caprimulgidae	LC /IV
Centropus sinensis	Crow-Pheasant	Cuculidae	LC /IV
Charadrius dubius	Lesser Pied Kingfisher	Alcedinidae	LC /IV
Charadrius dubius	Little Ringed Plover	Charadriidae	LC /IV
Charadrius hiaticula	Ringed Plover	Charadriidae	LC /IV
Charadrius leschenaultii	Large Sand Plover	Charadriidae	LC /IV
Charadrius mongolus	Lesser Sand Plover	Charadriidae	LC /IV
Charadrius placidus	Long Billed Ringed Plover	Charadriidae	LC /IV
Chlidonias hybrida	Whiskered Tern	Laridae	LC /IV
Ciconia episcopus	White-necked Stork	Ciconiidae	LC / IV
Circus aeruginosus	Marsh Harrier	Accipitridae	LC / IV
Circus macrourus	Pale Harrier	Accipitridae	LC / IV
Circus melanoleucos	Pied Harrier	Accipitridae	LC / IV
Cisticola juncidis	Streaked Fantail Warbler	Muscicapidae	LC /IV
Clamator jacobinus	Pied Crested Cuckoo	Cuculidae	LC /IV
Cuculus micropterus	Indian Plaintive Cuckoo	Cuculidae	LC /IV
Columba livia	Blue Rock Pigeon	Columbidae	LC /IV
Copsychus saularis	Magpie-Robin	Muscicapidae	LC /IV
Coracina melaschistos	Large Cuckoo Shrike	Campephagidae	LC /IV
Corvus macrorhynchos	Jungle Crow	Corvidae	LC /IV
Corvus splendens	House Crow	Corvidae	LC / IV
Coturnix coromandelica	Rain Quail	Phasianidae	LC / IV
Coturnix coturnix	Grey Quail	Phasianidae	LC / IV
Cuculus canorus	Indian Cuckoo	Cuculidae	LC /IV
Cypsiurus parvus	Palm Swift	Apodidae	LC /IV
Dendrocitta vagabunda	Southeastern Treepie	Corvidae	LC /IV
Dendrocygna bicolor	Large Whistling Teal	Anatidae	LC / IV
Dendrocygna javanica	Lesser Whistling Teal	Anatidae	LC / IV
Dicrurus adsimilis	Thick-billed Flowerpecker	Dicruridae	LC /IV
Dicrurus caerulescens	Tickell's Flowerpecker	Dicruridae	LC /IV
Dicrurus macrocercus	Black Drongo	Dicruridae	LC /IV
Dicrurus paradiseus	White-bellied Drongo	Dicruridae	LC /IV
Dinopium benghalense	Lesser Golden-backed Woodpecker	Picidae	LC /IV
Dromas ardeola	Crab Plover	Dromadidae	LC /IV
Egretta garzetta	Little Egret	Ardeidae	LC / IV
Egretta gularis	Indian Reef Heron	Ardeidae	LC / IV
Egretta intermedia	Smaller Egret	Ardeidae	LC / IV
Elanus caeruleus	Black-winged Kite	Accipitridae	LC / I
Esacus recurvirostris	Antp-crowned Plover-Lark	Alaudidae	LC /IV

Scientific name	Common name	Family	IUCN/ WPA
Eudynamys scolopaceus	Koel	Cuculidae	LC /IV
Falco tinnunculus	European Kestrel	Falconidae	LC / IV
Francolinus pondicerianus	Grey Francolin	Phasianidae	LC / IV
Fulica atra	Coot	Rallidae	LC /IV
Gallicrex cinerea	Watercock	Rallidae	LC /IV
Gallinago stenura	Pintail Snipe	Charadriidae	LC /IV
Gallinago nemoricola	Wood Snipe	Charadriidae	LC /IV
Gallinago solitaria	Solitary Snipe	Charadriidae	LC /IV
Gallinago stenura	Pintail Snipe	Charadriidae	LC /IV
Gallinago gallinago	Common Snipe	Charadriidae	LC /IV
Gallinula chloropus	Indian Moorhen	Rallidae	LC /IV
Galloperdix lunulata	Painted Spurfowl	Phasianidae	LC / IV
Galloperdix spadicea	Red Spurfowl	Phasianidae	LC / IV
Gelochelidon nilotica	Gull-billed Tern	Laridae	LC /IV
Glareola lactea	Small Indian Pratincole	Glareolidae	LC /IV
Glareola maldivarum	Oriental Pratincole	Glareolidae	LC /IV
Glareola pratincola	Collared Pratincole	Glareolidae	LC /IV
Gyps bengalensis	Indian White-backed Vulture	Accipitridae	CR /I
Gyps indicus	Indian Long-billed Vulture	Accipitridae	CR /I
Halcyon pileata	Black-capped Kingfisher	Alcedinidae	LC /IV
Halcyon smyrnensis	White-breasted Kingfisher	Alcedinidae	LC /IV
Haliaeetus leucogaster	White-bellied Sea Eagle	Accipitridae	LC / IV
Himantopus himantopus	Black-winged Stilt	Recurvirostridae	LC /IV
Hoplopterus indicus	Bonted Warbler	Muscicapidae	LC /IV
Hoplopterus ventralis	Sandy Carp Warbler	Hirundinidae	LC /IV
Hoplopterus cinereus	Indian Striated Swallow	Hirundinidae	LC /IV
Hoplopterus mystax	Swallow	Hirundinidae	LC /IV
Hoplopterus gregaria	White-tailed Swallow	Hirundinidae	LC /IV
Hydrobasileus chinensis	Pheasant-tailed Jacana	Jacanidae	LC /IV
Hydroprogne caspia	Caspian Tern	Laridae	LC /IV
Ichthyaetus melanocephalus	Black Bayo	Acupitridae	LC / IV
Ixobrychus cinnamomeus	Chestnut Bittern	Ardeidae	LC / IV
Ixobrychus flavicollis	Black Bittern	Ardeidae	LC / IV
Ixobrychus sinensis	Yellow Bittern	Ardeidae	LC / IV
Ixobrychus minutus	Little Bittern	Ardeidae	LC / IV
Lanius excubitor	Indian Grey Shrike	Laniidae	LC /IV
Lanius schach	Rufous-backed Shrike	Laniidae	LC /IV
Lanius vittatus	Indian Bay-backed Shrike	Laniidae	LC /IV
Larus argentatus	Herring Gull	Laridae	LC /IV
Larus brunnicephalus	Brown-headed Gull	Laridae	LC /IV
Larus fuscus	Lesser Black-backed Gull	Laridae	LC /IV
Larus ridibundus	Great Black-headed Gull	Laridae	LC /IV
Limosa lapponica	Bar-tailed Godwit	Charadriidae	LC /IV
Limosa limosa	Black-tailed Godwit	Charadriidae	LC /IV
Lonchura malabarica	White-throated Munia	Ploceidae	LC /IV
Lonchura malacca	Black-headed Munia	Ploceidae	LC /IV
Lonchura punctulata	Spotted Munia	Ploceidae	LC /IV
Lonchura striata	White-backed Munia	Ploceidae	LC /IV
Megalaima haemacephala	Coppersmith Barbet	Capitonidae	LC /IV
Megalaima viridis	Small Green Barbet	Capitonidae	LC /IV
Megalaima zeylanica	Large Green Barbet	Capitonidae	LC /IV
Merops orientalis	Small Green Bee-eater	Meropidae	LC /IV
Merops philippinus	Blue-tailed Bee-eater	Meropidae	LC /IV
Metopidius indicus	Bronze-winged Jacana	Jacanidae	LC /IV

Scientific name	Common name	Family	IUCN/ WPA
Merops orientalis	Green Bee-eater	Meropidae	LC / IV
Motacilla alaudina	Western Yellow Wagtail	Motacillidae	LC /IV
Motacilla cinerea	Grey Wagtail	Motacillidae	LC /IV
Motacilla flava	Yellow Wagtail	Motacillidae	LC /IV
Motacilla maderaspatensis	White Wagtail	Motacillidae	LC /IV
Mycteria leucocephala	Painted Stork	Ciconiidae	NT /IV
Nectarinia asiatica	Purple Sunbird	Nectariniidae	LC /IV
Nectarinia zeylonica	Purple-rumped Sunbird	Nectariniidae	LC /IV
Nycticorax nycticorax	Night Heron	Ardeidae	LC / IV
Oriolus oriolus	Eurasian Golden Oriole	Oriolidae	LC /IV
Orthotomus sutorius	Tailorbird	Muscicapidae	LC /IV
Pandion haliaetus	Osprey	Accipitridae	LC / IV
Passer domesticus	House Sparrow	Ploceidae	LC /IV
Pavo cristatus	Indian Peafowl	Phasianidae	LC / II
Perdicula asiatica	Jungle Bush Quail	Phasianidae	LC / IV
Peregrinus peregrinus	Peregrine Falcon	Falconidae	LC / IV
Pericrocotus cinnamomeus	Small Minivet	Campephagidae	LC /IV
Pernis ptilorhynchus	Crested Honey Buzzard	Accipitridae	LC / IV
Phalacrocorax fuscicollis	Indian Shag	Phalacrocoracidae	LC / IV
Phalacrocorax niger	Little Cormorant	Phalacrocoracidae	LC / IV
Phalacrocorax pygmeus	Ruff and Reeve	Charadriidae	LC /IV
Phoenicurus phoenicurus	Redstart	Muscicapidae	LC /IV
Phylloscopus collybita	Chiffchaff	Muscicapidae	LC /IV
Phylloscopus griseolus	Olivaceous Leaf Warbler	Muscicapidae	LC /IV
Phylloscopus trochiloides	Bright Green Leaf Warbler	Muscicapidae	LC /IV
Picus canus	Indian Pitta	Pittidae	LC /IV
Pitta brachyura	Spoonbill	Threskiornithidae	LC /IV
Plegadis falcinellus	Glossy Ibis	Threskiornithidae	LC /IV
Ploceus philippinus	Baya Weaver	Ploceidae	LC /IV
Pluvialis apricaria	Golden Plover	Charadriidae	LC /IV
Pluvialis dominica fulva	Eastern Golden Plover	Charadriidae	LC /IV
Porphyrio porphyrio	Purple Moorhen	Rallidae	LC /IV
Porzana fusca	Ruddy Crake	Rallidae	LC /IV
Porzana parva	Little Crake	Rallidae	LC /IV
Prinia buchanani	Rufous-fronted Wren-Warbler	Muscicapidae	LC /IV
Prinia socialis	Ashy Wren Warbler	Muscicapidae	LC /IV
Prinia subflava	Plain Wren-Warbler	Muscicapidae	LC /IV
Prinia sylvatica	Jungle Wren-Warbler	Muscicapidae	LC /IV
Psaltoda psaltria	Black Ibis	Threskiornithidae	LC /IV
Psittacula krameri	Rose-ringed Parakeet	Psittacidae	LC /IV
Pycnonotus cafer	Red-vented Bulbul	Pycnonotidae	LC /IV
Pycnonotus melanicterus	Yellow-throated Bulbul	Pycnonotidae	LC /IV

Scientific name	Common name	Family	IUCN / WPA
Pycnonotus jocosus	Red-whiskered Bulbul	Pycnonotidae	LC /IV
Milvus migrans	Black Kite	Falconidae	LC /IV
Accipiter badius	Shikra	Accipitridae	LC /IV
Motacilla alba	White Wagtail	Motacillidae	LC /IV
Motacilla maderaspatensis	Large Pied Wagtail	Motacillidae	LC /IV
Motacilla tschutschensis	Eastern Yellow Wagtail	Motacillidae	LC /IV
Anthus rufulus	Paddyfield Pipit	Motacillidae	LC /IV
Anthus similis	Long-billed Pipit	Motacillidae	LC /IV
Anthus novaeseelandiae	Richard's Pipit	Motacillidae	LC /IV
Merops orientalis	Green Bee-eater	Meropidae	LC /IV
Merops leschenaulti	Chestnut-headed Bee-eater	Meropidae	LC /IV
Coracias benghalensis	Indian Roller	Coraciidae	LC /IV
Upupa epops	Common Hoopoe	Upupidae	LC /IV
Halcyon smyrnensis	White-breasted Kingfisher	Alcedinidae	LC /IV
Ceryle rudis	Pied Kingfisher	Alcedinidae	LC /IV
Alcedo atthis	Common Kingfisher	Alcedinidae	LC /IV
Dicrurus macrocercus	Black Drongo	Dicruridae	LC /IV
Dicrurus leucophaeus	Ashy Drongo	Dicruridae	LC /IV
Dicrurus paradiseus	Greater Racket-tailed Drongo	Dicruridae	LC /IV
Oriolus oriolus	Eurasian Golden Oriole	Oriolidae	LC /IV
Oriolus kundoo	Indian Golden Oriole	Oriolidae	LC /IV
Sturnus pagodarum	Brahminy Myna	Sturnidae	LC /IV
Acridotheres tristis	Common Myna	Sturnidae	LC /IV
Acridotheres fuscus	Jungle Myna	Sturnidae	LC /IV
Corvus splendens	House Crow	Corvidae	LC /IV
Corvus macrorhynchos	Jungle Crow	Corvidae	LC /IV
Dendrocitta vagabunda	Indian Tree Pie	Corvidae	LC /IV
Copsychus saularis	Oriental Magpie Robin	Muscicapidae	LC /IV
Saxicoloides fulicata	Indian Robin	Muscicapidae	LC /IV
Saxicola caprata	Pied Bush Chat	Muscicapidae	LC /IV
Turdoides striata	Jungle Babbler	Timaliidae	LC /IV
Pycnonotus cafer	Red-vented Bulbul	Pycnonotidae	LC /IV
Pycnonotus jocosus	Red-whiskered Bulbul	Pycnonotidae	LC /IV
Milvus migrans	Black Kite	Falconidae	LC /IV
Accipiter badius	Shikra	Accipitridae	LC /IV
Motacilla alba	White Wagtail	Motacillidae	LC /IV
Motacilla maderaspatensis	Large Pied Wagtail	Motacillidae	LC /IV
Motacilla tschutschensis	Eastern Yellow Wagtail	Motacillidae	LC /IV
Anthus rufulus	Paddyfield Pipit	Motacillidae	LC /IV
Anthus similis	Long-billed Pipit	Motacillidae	LC /IV
Anthus novaeseelandiae	Richard's Pipit	Motacillidae	LC /IV
Merops orientalis	Green Bee-eater	Meropidae	LC /IV
Merops leschenaulti	Chestnut-headed Bee-eater	Meropidae	LC /IV
Coracias benghalensis	Indian Roller	Coraciidae	LC /IV
Upupa epops	Common Hoopoe	Upupidae	LC /IV
Halcyon smyrnensis	White-breasted Kingfisher	Alcedinidae	LC /IV
Ceryle rudis	Pied Kingfisher	Alcedinidae	LC /IV
Alcedo atthis	Common Kingfisher	Alcedinidae	LC /IV
Dicrurus macrocercus	Black Drongo	Dicruridae	LC /IV
Dicrurus leucophaeus	Ashy Drongo	Dicruridae	LC /IV
Dicrurus paradiseus	Greater Racket-tailed Drongo	Dicruridae	LC /IV
Oriolus oriolus	Eurasian Golden Oriole	Oriolidae	LC /IV
Oriolus kundoo	Indian Golden Oriole	Oriolidae	LC /IV
Sturnus pagodarum	Brahminy Myna	Sturnidae	LC /IV
Acridotheres tristis	Common Myna	Sturnidae	LC /IV
Acridotheres fuscus	Jungle Myna	Sturnidae	LC /IV
Corvus splendens	House Crow	Corvidae	LC /IV
Corvus macrorhynchos	Jungle Crow	Corvidae	LC /IV
Dendrocitta vagabunda	Indian Tree Pie	Corvidae	LC /IV
Copsychus saularis	Oriental Magpie Robin	Muscicapidae	LC /IV
Saxicoloides fulicata	Indian Robin	Muscicapidae	LC /IV
Saxicola caprata	Pied Bush Chat	Muscicapidae	LC /IV
Turdoides striata	Jungle Babbler	Timaliidae	LC /IV
Pycnonotus cafer	Red-vented Bulbul	Pycnonotidae	LC /IV

Source:

List of Birds reported / recorded from the Coringa Wildlife Sanctuary (Javed Rao, V. V., Arjunarjuna, P., Nagulu, T., Srinivasulu, C. and Satyanarayana, T. (1993) Annotated checklist of Coringa Wildlife Sanctuary, Andhra Pradesh. Zoos' Print 24 (1 & 2): 73-85. Birds which are not found outside the CWLS are indicated by *

- Important Bird Areas (IBAs) in India (2018) PRATIS Centre of Wildlife & Protected Areas http://datazone.sdi.in/Database/IBA_3467.aspx
- List of Endemic birds with IBA site codes. (Important Bird Areas in India - Andhra Pradesh) http://datazone.sdi.in/Database/IBA_3467.aspx

A list of Mammals found in the CWLS area is given in **Table-7**. A list of reptiles reported / recorded from the buffer zone, mainly from the CWLS is given in **Table-8**.

TABLE-7
LIST OF MAMMALS REPORTED / RECORDED FROM THE CORINGA WILDLIFE SANCTUARY

Scientific Name	Common Name	IUCN / WPA
Bandicota bengalensis	Lesser bandicoot Rat	LC / V
Canis aureus	Golden Jackal	LC / III
Funambulus palmarum	Squirrel	LC / V
Hemigalerix schwarzi	Indian Grey Mongoose	LC / IV
Lutra perspicillata	Smooth Indian Otter	VU /I
Macaca mulatta	Monkey	LC / II
Mus booduga	Indian Field Mouse	LC / V
[illegible]	Flying Squ.	VU /I
Rattus rattus	Black Rat	LC / V
[illegible]	Indian bandicoot rat/ Rat	LC / V
Sus scrofa	Wild pig	LC /III
Vulpes bengalensis	Indian Fox	LC / II

List of Reptiles reported / recorded from the Coringa Wildlife Sanctuary and its surroundings is given in **Table-8.**

TABLE-8
LIST OF REPTILES REPORTED / RECORDED FROM THE CORINGA WILDLIFE SANCTUARY

Scientific name	Common name	IUCN / WPA
Ahaetulla nasuta	Tree snake	LC/II
Amphiesma stolatum	Striped keelback	LC/II
Atretium schistosum	Olive keelback / Water Snake	LC /IV
Bungarus caeruleus	Indian krait	LC/II
Bungarus fasciatus	Banded krait	LC/II
Calotes versicolor	Garden Lizard	LC /IV
Daboia russelii	Russell's viper	LC/II
Enhydrina schistosa	Hook nosed sea snake	LC /IV
Enhydris enhydris	Smooth water snake / Rice snake	LC/II
Eutropis carinata	Skink	LC /IV
Gonyosoma oxycephe	Common Sandboa	LC/II
Hemidactylus frenatus	House gecko / Wall Lizard	LC /IV
Lepidochelys olivacea	Olive Ridley sea turtle	VU/I
Lissemys punctata	Peninsul turtle	LC/II
Lycodon aulicus	Wolf snake	LC/II
Naja naja	Cobra	LC/II
Natrix piscator	Checkered keelback	LC /IV
Ptyas mucosa	Rat snake / Dhaman	LC/II
Sibynophis sagittarius	Five-striped Litard	LC /IV
Xylophiophis dussumieri	Snake skink	LC /IV
Varanus bengalensis	Monitor lizard	LC/I

3.4 Fishes / Fisheries and Fishing in the study area

Fishing activity is carried out at large scale due to presence of Gautami-Godavari River by non-motorized, motorized and mechanized crafts in this sector. Mangroves play an important role in coastal fisheries production. They support breeding and feeding of a variety of fishes, prawn and crabs, thereby enhance the potential of adjacent coastal waters.

The prawn seed and juvenile resources of the Godavari mangrove ecosystem profoundly influence the artisanal fishery around CWLS. But indiscriminate prawn seed collection in recent years has depleted fishery resources, leading to a ban on prawn seed collection and fishing curbs during the breeding season.

National Bureau of Fish Genetic Resources (NBFGR), Lucknow compiled a list of Threatened Freshwater Fishes of India in 2010. As many as 120 freshwater fish species are included under the EN and VU categories by the IUCN but none of them is endemic or limited to EEGREE. Just a dozen of fishes is included in Schedule-I part 2(A) of Wildlife (Protection) Act, 1972 and none of them is reported from the study area. Similarly, only 6 Indian Freshwater Fishes are included in the IUCN Red List and none of them is reported from the study area. Though there is great concern about the growing demand and over exploitation of Hilsa Fish (Tenualosa ilisha) from the EGREE, the species is neither endemic nor restricted to India. It is not in the LC category of the IUCN.

Krishnan and Nishra (2011 summarized our knowledge of the distribution of 312 species of freshwater to marine elements of fishes belonging to 189 genera accommodated in 88 families. It is based on approximately 1400 samples collected from different localities of Godavari estuarine system by various survey parties from 1942 to 1995 and incorporation of information available in literature (Day, 1875-78 (1889); Raumans, 1941, 1953; Munro, 1955; de Beaufort and Briggs, 1962; Babu Rao 1962, 1973, 1976; Rao, 1971, 1972, 1974, 1976; Fischer and Whitehead, 1974; Fisher and Bianchi, 1984; Talwar and Kacker, 1984; Smith and Heemstra, 986; Whitehead et al., 1988; Venkateswarlu, 1990; Talwar and Jhingran, 1991; Samuel, 1993, Mahapatra and Venkateswarlu, 1995 and Talwar] 995].

New locality records of occurrence in Godavari estuarine system has been effected for 74 species, thus enhancing information available in literature from 240 species to 314 species.

Reproduction of the entire list may not be relevant to the project under consideration mainly because the threat to fishes to due to over fishing, pesticides, pollution and introduction of fast-growing, highly competitive exotic species. A short list of fishes recorded by many workers is given in **Table-9**. *Wallago attu* is the only NET (NT category of the IUCN) species recorded.

TABLE-9
LIST OF FISHES EITHER CAUGHT OR REPORTED / RECORDED FROM THE STUDY AREA

Scientific name	Common / Local name	Family
Alepes vivicus	Indian Threadfish	Carangidae
Ambassis gymnocephalus	Bald glassy	Ambassidae
Ambassis ambassis	Long-spined glassy fish	Ambassidae
Anabas cobojius	Gangetic Koi	Anabantidae
Anabas oligolepis	Climbing Perch	Anabantidae
Anabas testudineus	Climbing Perch	Anabantidae
Bagarius bagarius	Giant Catfish	Sisoridae
Ilisha melastoma	Hilsa / Ilisha	Clupeidae
Boleophthalmus boddarti	Dusky Mudskipper	Gobiidae
Butis butis	Duckbill Sleeper	Eleotridae
Butis melanostigma	Blackspot Sleeper	Eleotridae
Callichrous bimaculatus	Elongated Glassy	Chandidae
Callichrous pabda	Arrow shaped	Callichromidae
Caranx ignobilis	Giant Trevally	Carangidae
Carangoides chrysophrys	Cocktail trevally	Carangidae
Catla catla	Catla	Cyprinidae
Cirrhinus cirrhosus	Mrigal Carp	Cyprinidae
Cirrhinus mrigala	Mrigala	Cyprinidae
Cirrhinus reba	Reba carp	Cyprinidae
Clarias batrachus	Climbing perch	Clariidae
Clupeoides	Gold-striped pellona anchovy	Engraulidae
Cynoglossus lida	Tongue fish	Cynoglossidae
Cynoglossus semifasciatus	Long tongue sole	Cynoglossidae
Cynoglossus puncticeps	Tongue fish	Cynoglossidae
Danio devario	Giant danio	Cyprinidae
Etroplus canaraensis	Banded pearl spot	Cichlidae
Etroplus suratensis	Orange chromide	Cichlidae
Glossogobius giuris	Tank goby	Gobiidae
Glossogobius aureus	Fish-eating goby	Gobiidae
Heteropneustes fossilis	Stinging catfish	Heteropneustidae
Hilsa kelee	Kelee shad	Clupeidae
Kuhlia mugil	Indian flagtail	Kuhliidae
Labeo dyocheilus	Boga labeo	Cyprinidae
Labeo gonius	Gonius	Cyprinidae
Labeo fimbriatus	Fringe lipped carp	Cyprinidae
Labeo rohita	Rohu	Cyprinidae
Lactarius lactarius	Razorbelly scad / Salaya	Lactariidae
Lates calcarifer	Panisgappa	Centropomidae
Leiognathus brevirostris	Ponsola / Telaimanga	Leiognathidae
Liza macrolepis	Striped Mullet	Mugilidae
Liza parsia	Katta dhapa	Mugilidae
Liza tade	Katta dhapa	Mugilidae
Mene maculata	Pomfret	Menidae
Metapenaeus monoceros	Tiger prawn Spotty eel	Metapenaeidae
Megalops cyprinoides	Hardtail scad	Carangidae
Megalops cyprinoides	Kalbuchapa	Carangidae
Mugil cephalus	Kalamuchella	Mugilidae
Mugil parsia	Kayyanga	Mugilidae
Mystus sp.	Bagarolu / Vamalolu	Bagridae
Mystus gulio	Tengara	Bagridae

Scientific name	Common / Local name	Family
Mystus gulio	Kowtaga	Bagridae
Mystus tengara	Jella	Bagridae
Mystus vittatus	Sagarilla	Bagridae
Mystus sp.	Mottled catfish	Bagridae
Metapenaeus monoceros	Brown Natherbaddi	Penaeidae
Omobranchus ferox	Coastmar blenny	Clinidae
Omobranchus punctatus	Mustard blenny	Clinidae
Omobranchus zebra	Zebra blenny	Clinidae
Oreochromis sp.	Tilapia Fish / Jilebi	Cichlidae
Oreochromis mossambicus	Nile / Tilapia	Cichlidae
Ophiocephalus punctatus	Desert Snake-head Fish	Channidae
Ophiocephalus marulius	Bullseye snakehead	Channidae
Ophiocephalus punctatus	Snakehead	Channidae
Ophiocephalus striatus	Striped snakehead	Channidae
Penaeus chinensis	Chemmeen	Penaeidae
Penaeus indicus	Parupu Gaddi	Penaeidae
Periophthalmus argentilineatus	Mud skipper	Gobiidae
Perna viridis	Kallipindalu	Mytilidae
Polynemus indicus	Tapasi	Polynemidae
Polynemus paradiseus	Paradise threadfin	Polynemidae
Portunus sp.	Swimming crab	Portunidae
Rastrelliger kanagurta	Russell's Smooth-back Herring	Clupeidae
Sardinella fimbriata	Fringe-scale sardinella	Clupeidae
Scatophagus sp.	Scat fish	Scatophagidae
Silonia silondia	Vaeja	Schilbeidae
Stolephorus indicus	Nona	Engraulidae
Tachysurus sp.	Mud fish	Clupeidae
Tetraodon fluviatilis	Green puffer fish	Tetraodontidae
Trichiurus sp.	Short Cutlass (Jr.)	Trichiuridae

The area under consideration is famous for cultured Prawns. A list of Prawns cultivated / captured is given in **Table-10.**

TABLE-10

LIST OF PRAWNS GROWN IN THE AQUACULTURE FARMS AND CAPTURED FROM THE ESTUARY

Scientific name	Common / Local name	Family
Acetes indicus	Cheyyi Pottu	Penaeidae
Metapenaeus affinis	Kaadaanga / Kaiyd	Penaeidae
Metapenaeus brevicornis	Yellow prawn / peeneli	Penaeidae
Metapenaeus monoceros	Chemmikayya	Penaeidae
Metapenaeus stebbingi	Bonga Royyal/ Kalandari	Penaeidae
Palaemon serratus	GangaRayya	Palaemonidae
Parapenaeopsis hardwickii		Penaeidae
Parapenaeopsis sculptilis	GullaRayya	Penaeidae
Parapenaeopsis stylifera		Penaeidae
Penaeus indicus	Yel Rayya / Telaiyya	Penaeidae
Penaeus merguiensis	Banana Prawn	Penaeidae
Penaeus monodon	Tiger Prawn	Penaeidae
Penaeus semisulcatus	PGRFin Tiger Prawn	Penaeidae
Solenocera indica	YerraRayya	Penaeidae

4.0 ENVIRONMENTAL IMPACTS

Most likely environmental impacts of the project capable of influencing the Biodiversity of the study area:

Predicted Impacts of the Project on the Ecology, Biodiversity and Wildlife of the study area:

The study area comprises of the pipeline route with a distance of 500 m on either side (was taken as the core area) and an area of 10 Km radius from the pipeline was taken as the buffer zone. Detailed primary survey of flora and fauna of the study areas was carried out a highly competent NABET Accredited team keeping in view of the standards terms of reference. Baseline data collected indicates the following:

1. Presence of the Coringa wildlife sanctuary (CWS), an ecologically protected wildlife habitat and a Mangrove forest at a distance of 2.35 km away from the pipeline nearest point. The same had been verified by the officials of the Forest and Wildlife department, Government of Andhra Pradesh during 2019.
2. CWS is rich in Mangrove, Estuarine and Marine Biodiversity which is well documented and all species are recorded and reported.
3. A list of Schedule I species reported from CWS and their IUCN status is shown in **Table-11**.

TABLE-11
LIST OF RARE OR ENDANGERED OR THREATENED (RET) AND SCHEDULE I SPECIES REPORTED FROM THE CWS & ITS SURROUNDING AREA

Scientific name	Common name	IUCN Status	WPA Schedule
Lutra perspicillata	Smooth Indian Otter	VU	I
Prionailurus viverrinus	Fishing Cat	VU	I
Accipiter badius	Shikra	LC	I
Accipiter nisus	Eurasian Sparrow Hawk	LC	I
Aythya nyroca	Ferruginous Duck	NT	IV
Elanus caeruleus	Sparrow Hawk	LC	I
Gyps bengalensis	Indian White-backed Vulture	CR	I
Gyps indicus	Indian Long-billed Vulture	CR	I
Mycteria leucocephala	Painted Stork	NT	IV
Pavo cristatus	Indian Peafowl	LC	I
Threskiornis melanocephalus	Oriental White Ibis / Black-headed Ibis	NT	IV
Eretmochelys imbricata	Hawksbill sea Turtle	CR	I
Lepidochelys olivacea	Olive Ridley sea turtle	VU	I
Varanus bengalensis	Monitor lizard	LC	I
Rhinoceros hyplc	Whale Shark	EN	I

CR=Critically Endangered; LC= Least Concern; NT=Near Threatened; VU = Vulnerable

Principles of Impact Assessment and Impacts:

Prior to establishment of the project additional impact on the existing environment and habitat need to be examined and analysed. If the environment and habitat have the capacity to assimilate or absorb additional impacts due to the project and or if the overall adverse effect ofimpacts can be neutralized with suitable remediation plan / technology, the project can be established in the proposed site. With respect to biodiversity, according to International Association for Impact Assessment (IAIA), the project can be established if there is no net loss of biodiversity. The following are the results of the study of the impacts of the project on the existing environment and habitat:

1. The main threat to wildlife is shrinkage or fragmentation of habitat or both. But this pipeline project is not going to either reduce or modify or break the habitat by fragmentation.
2. It is a gas transport pipeline. There are no manufacturing facilities hence, no discharge of effluents and as there is there is no shock there is no air pollution
3. The adverse impacts during laying of the pipeline, if any, are very minor, short- lived and easily reversible once the disturbances related to laying of pipeline is over.
4. The fishing activities may get affected during the period of laying of pipeline. But the impacts are negligible when compared with overfishing and natural calamities like Cyclones
5. The fishermen will be compensated as per the directives of District Collector, East Godavari District.
6. The Bay of Bengal and the Gautami & Godavari River through which the pipeline passes have the capacity to absorb and assimilate the envisaged impacts.
7. The nearest distance between the pipeline and the CWS is 2.35 Km. In case of worst-case scenario such as an unlikely pipeline burst or explosion and fire, which as per Quantitative Risk Analysis conducted is low, the impact shall not be felt beyond 250m from the point of fire or explosion. Hence it is not going to pose any threat to the wildlife of CWS even under the worst circumstances.
8. No forest or Mangroves are going to be lost on account of the pipeline, as the pipeline wil be laid as Horizontal Directional Drilling (HDD) Technology in the Mangrove area.
9. There are similar pipelines and offshore gas storage and distribution facilities in the area.
10. There are no reports or records of any pipeline burst or explosion in any part of these gas pipes that are now extending from the East Coast to the West Coast of India.
11. The adverse impacts associated with the traditional practices of excavation, trenching, drilling, dredging associated with the laying of the pipeline, are eliminated by using HDD technology at Riverbank and Mangrove Areas
12. During the construction of pipeline and operations, some Mollusks, Crabs and other small mud dwelling fauna are likely to get buried and it can't be totally avoided. According to the research findings (Ref: Fauna of Godavari Estuary-Andhra Pradesh, Estuarine Ecosystem Series 4, published by the ZSI in 2001, there are no invertebrate species of great conservation value).
13. There are rare, endangered and threatened (RET) species of Birds, Reptiles, Mammals as shown in Table 11 and also one Mangrove (Cerlops decandra) in

the buffer zone of the proposed project but the project is incapable of posing even a slightest additional risk to them.

14. The overall impact of the proposed project at any point of time is not going to pose any additional threat to the Schedule I species either directly or indirectly since they are not found within a distance of 1 Km on either side of the pipeline.
15. Some of the Schedule I species (like Olive Ridley Turtle) reported here are coming from the sea to enter the area near CWLS. Conservation plan of these species is also suggested in this plan.

16. The adverse impacts if any are limited to the construction period only.

Beyond these minor and purely temporary adverse impacts, there shall be no direct or indirect adverse impacts. Under any circumstances there shall be no Net Loss of Biodiversity. The proposed activity is fully compatible with the National and International objectives of wildlife conservation. The list of Plants observed within 10 m wide stretch of Proposed pipeline route (Onshore) are given in Table-**Table-12.** The Impacts are listed at **Table-13.**

TABLE-12
LIST OF PLANTS THAT WERE FOUND WITHIN THE 10 M WIDE STRETCH OF PIPELINE ON THE SHORE

Scientific name	Family	Vernacular Name	Habit	IUCN
Mangroves				
Acanthus ilicifolius	Acanthaceae	Aduki	Shrub	LC
Avicennia alba	Avicenniaceae	Elamanadu	Tree	LC
Avicennia marina	Avicenniaceae	Telamada	Tree	LC
Avicennia officinalis	Avicenniaceae	Kalla nadu	Tree	LC
Bruguiera gymnorrhiza	Rhizophoraceae	Kanduga	Tree	LC
Excoecaria agallocha	Euphorbiaceae	Tilla	Tree	LC
Mangrove Associates				
Aeluropus lagopoides	Poaceae	Kappu gaddi	Grass	LC
Cressa cretica	Convolvulaceae	Aputa vine	Climber	LC
Cyperus arenarius	Cyperaceae	Thikki	Small tree	LC
Dactyloctenium aegyptium	Poaceae	Chikkiga	Shrub	LC
Desmostachya bipinnata	Poaceae	Kakkichaga	vine	LC
Fimbristylis ferruginea	Cyperaceae	Tunga	Sedge	LC
Ipomoea pes-caprae	Convolvulaceae	Morning glory	vine	LC
Ipomoea stolonifera	Convolvulaceae	Tigakaaga	Vine	LC
Myriostachya wightiana	Poaceae	Dhaba gaddi	Grass	LC
Sporobolus coromandelianus	Poaceae	Pedagaddi	Grass	LC
Suaeda maritima	Chenopodiaceae	Konda	Herb	LC
Suaeda monoica	Amaranthaceae	Bakkaada chenga	vine	LC
Sesbania grandiflora	Apocynaceae	Vaijayanthikuda	Herb	LC
Suaeda maritima	Chenopodiaceae	Elakura	Herb	LC
Suaeda monoica	Chenopodiaceae	Elakura	Herb	LC
Invasive species				
Prosopis juliflora	Mimosaceae	English chaama	Thorny bush	Invasive

TABLE-13
DETAILS OF PROJECT IMPACT STATEMENT

Sr.No.	Environmental Impact	Yes / No
1	Shrinkage of habitat	No
2	Fragmentation of habitat	No
3	Degradation or deterioration of habitat	No
4	Pollution of water bodies	No
5	Air pollution	No
6	Long lasting adverse impacts	No
7	Adversely impacting the managements plants under implementation	No
8	Sustaining the Ecology and biodiversity of the area	Yes
9	Posing an additional threat to any RET species	No

Thus, the project is not going to be a threat either to the CWLS or the RET flora or fauna of the study area either directly or indirectly.

5.0 CONSERVATION OF BIODIVERSITY

5.1 Conservation of Godavari River Estuarine Ecosystem

According to a detailed survey carried out by Mr. T Rajasekhar (2019) and others, among the RET animals that are most likely to be present within the 2000m wide buffer zone along the pipeline are the Olive Ridley turtles (Lepidochelys olivacea). There are reports of sporadic nesting / breeding activity during the winter season from October to January on the sand dunes / sand bars on either side of the Godavari and Gautami Rivers. But there are no mass nesting grounds in the East Godavari River Estuarine Ecosystem (EGREE). The major (50% of total) threat to the hatching of Olive Ridley eggs in the area is due to inundation on account of high tides and cyclones. Rest is due to poaching, predation of eggs by locals, dogs and birds. As the proposed pipeline is passing through the River, it is not going to disturb or unsettle the Olive Ridley Turtle nesting grounds (which are always located in sandy beaches). However, the project proponent is going to take care to ensure that no pipeline activity is carried out during the breeding season (October to January) within a distance of 1 Km from the nesting areas. No lighting or illumination shall be used during the breeding season. The project proponent will join hands with the Andhra Pradesh Forest Department (APFD) for protection of Olive Ridley Turtle Nests under the Olive Ridley Sea Turtle Conservation Programme.

In the worst case, some Molluscs are likely to get buried under coats during the time of pipe laying. Beyond these minor and purely temporary adverse impacts and the ecosystem is endowed with the capacity to return to normal conditions once the disturbances are over on account of homeostatic (self-control) regulatory mechanisms. These shall be no long lasting or recurring direct or indirect adverse impacts. Under any circumstances there shall be no Net Loss of Biodiversity. The proposed activity is fully compatible with the National and International objectives of wildlife conservation.

As revealed by the baseline data, the area is rich in ecosystem and species diversity. It is a home for some of the rare, endangered or threatened (RET)

species as shown in **Figure-2**. The Mangrove Forests and the Coringa Wildlife Sanctuary have immense protective and productive functions. Hence, their conservation is given due consideration and importance both by the National and International organizations including voluntary agencies. The M.S.Swaminathan Research Foundation (MSSRF), and supported by the Ministry of Environment, Forests and Climate Change, Government of India (GoI), Government of Andhra Pradesh (GoAP), UNDP GEF (Global Environment Facility), EGREE foundation and Nature Protects if She is Protected, Organisation have joined hands together for Mainstreaming Coastal and Marine Biodiversity Conservation into Production Sectors in East Godavari River Estuarine Ecosystem Region (Ref: **Figure-3**).

Yellow Mangrove (*Ceriops decandra*), found in KondiKuppa R.F besides the CWLS

Fishing Cat (*Prionailurus viverrinus*)

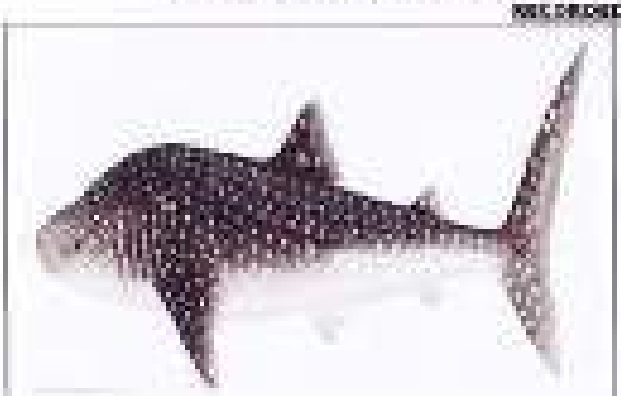
Smooth Indian Otter (*Lutra perspicillata*)

Shikra (*Accipiter badius*)

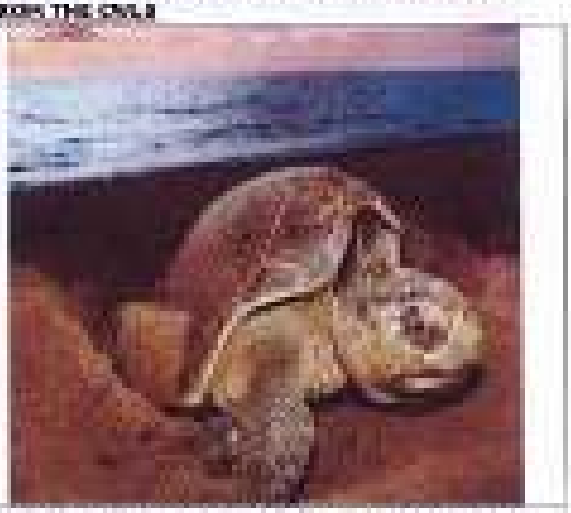
European Sparrow Hawk (Accipiter nisus)

Black winged Kite or Sparrow Hawk (Elanus caeruleus)

FIGURE-3(A)
PICTURES OF THE RARE / ENDANGERED / THREATENED (RET) FLORA AND FAUNA REPORTED / RECORDED FROM THE CWLS



Whale Shark (Rhincodon typus)



Olive Ridley sea turtle (Lepidochelys olivacea)

FIGURE-3(B)
PICTURES OF THE RARE / ENDANGERED / THREATENED (RET) FLORA AND FAUNA REPORTED / RECORDED FROM THE CWLS AND ITS SURROUNDINGS

FIGURE-3
PHOTO SHOWING THE TITLE OF THE PROJECT AND THE AGENCIES INVOLVED IN THE OVERALL DEVELOPMENT OF THE FORESTS, WILDLIFE AND GENETIC DIVERSITY AND THE WELFARE OF THE PEOPLE DEPENDENT ON THEM

The objectives of the multi-agency project are not just preservation of the wildlife but to translate the ecological benefits into social and economic benefits by mainstreaming Coastal and Marine Biodiversity Conservation into Production Sectors. Sustainable production of fish and fisheries, the mainstay of life in the area; integration of wildlife conservation with habitat improvement; enhancement of floristic diversity by introducing the Mangroves from the other regions of India; protection of genetic diversity.

5.2 Role of the Project Proponent

All the RET species listed (**Figure-2**) with the exception of Olive Ridley Sea Turtles and Shark Catfish are mainly limited to the CWLS. Their conservation is given due consideration and importance by the National/ International organizations including voluntary agencies.

Project proponent is prepared for protection of flora and fauna of CWLS and around it in the project area. For protecting the spawning nest grounds within a distance of 500 m on either side of the pipeline on either side of the mouth of the Gautharni Godavari River, the project proponent is prepared to provide foot guards (similar to tree guards) for protection of Olive Ridley Turtle Nests and fund the forest Department for activities like deploying watchmen and engaging the services of voluntary organizations for protection of nests, eggs and hatchlings till they find their way in to the Bay of Bengal. All these activities shall be undertaken in association with the Andhra Pradesh Forest Department (APFD) as a part of the Olive Ridley Sea Turtle Conservation Programme.

In view of the ongoing scientific efforts under the direct supervision of MSSRF with the support of the State and Central Governments; International organizations like the UNDP and GEF, the project proponent, ONGC, is ready to support the efforts made by State and Central Governments for the ecological conservation of Coringa Wild Life Sanctuary and around it.

6.0 WILDLIFE CONSERVATION PLAN

6.1 Coringa Wildlife Sanctuary (CWLS)

The Coringa Wildlife Sanctuary is being managd under approved management plan for the period from 2013-14 to 2022-23

The 'Coringa Wildlife Sanctuary' is situated in the East Godavari District of Andhra Pradesh, India. Characterized by tidal/Mangrove forests of the Godavari estuary, having specific biological and ecological characteristics, it is the second - largest mangrove formation in India. Flora and Fauna of this sanctuary along with the habitat constitute a unique ecosystem, besides being highly sensitive and fragile zone, this sanctuary also acts as a prolific zone for shrimp, shell, fin-fish etc. Flora and Fauna occurring in the mangrove forests have the special ability to tolerate various degrees of salinity. During favorable and suitable conditions, the mangroves form an extensive productive eco-system of dense forests in the coast and function as reservoirs for several species of plants and animals associated with each other.

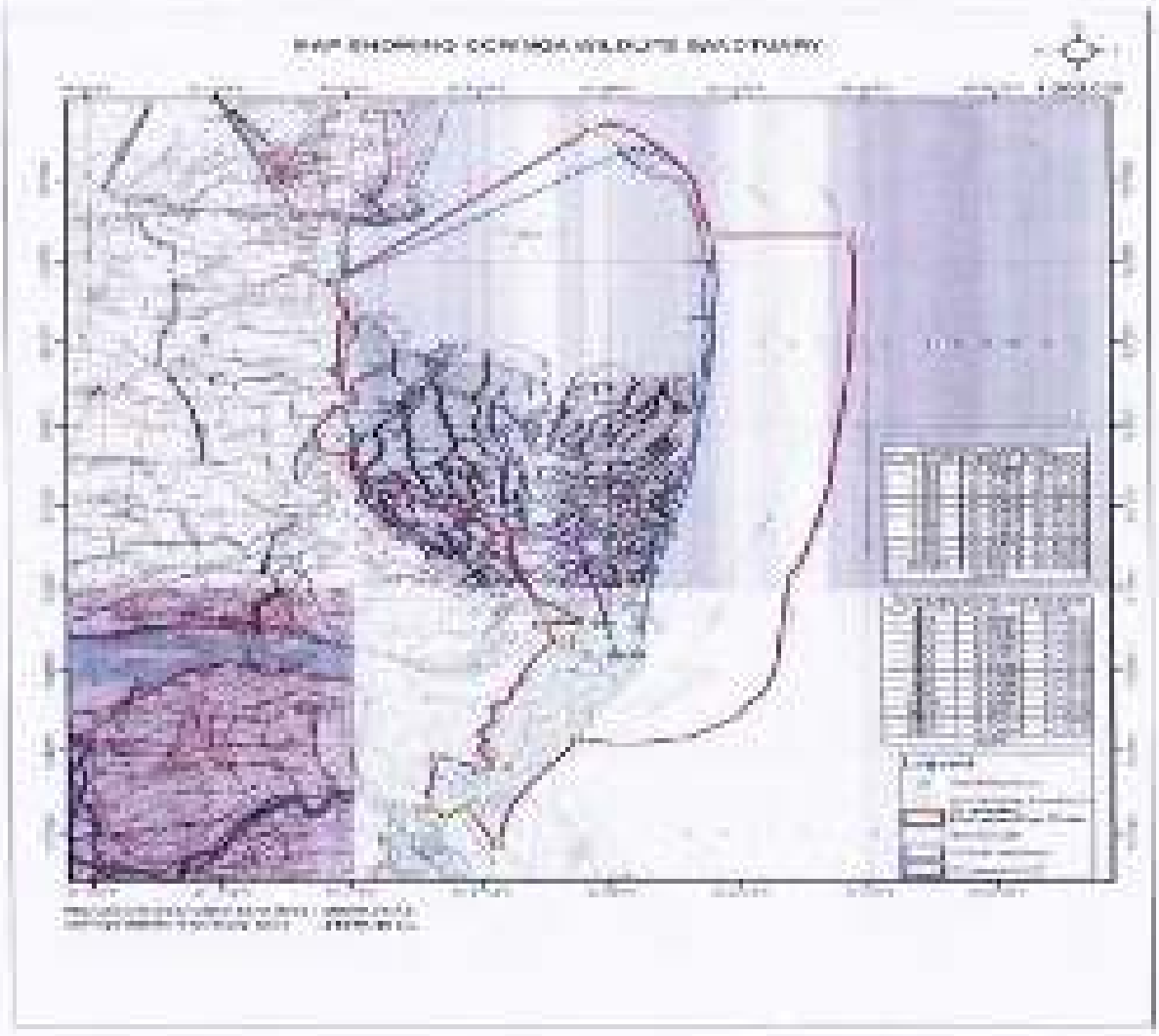
Coringa Wildlife Sanctuary is confined to the tidal forest area in the estuarine areas of Godavari and Bay of Bengal. Coringa sanctuary comprises of Reserve Forests of Coringa, Coringa extension and Bhiravapalem, extending over an area of 23,570 ha. It has got a unique ecosystem, characteristic of Tidal Forests that exist at the estuarine area, along with the special habitat that hosts various Fauna and multifarious organisms. The area was declared as Coringa Wildlife Sanctuary under section 26A of the Wildlife Protection Act, 1972 (Central Act No. 53 of 1972) vide G.O.Ms.No.45 EFS & Technology (For.III) 13th April 1978.

The mangrove forests contain a highly specialised community of plant species and associated fauna, not capable of flourishing under any other situations. These forests are the abode of species like Fishing cats, Otters, Brahmini kites and varieties of King fishers and waders. Mangrove forests therefore present a unique ecosystem which needs to be protected and preserved.

The sanctuary is located in the estuarine forest area of coastal region of the Bay of Bengal (in the East Godavari District of Andhra Pradesh). Here, Godavari River (Coringa) joins the back-waters of Bay of Bengal. Between this area and the sea, Hope Island blocks the direct connection between the sea and Godavari waters. As a result about 40% area of this sanctuary is only sea back-waters. Rest of the area is riddled with creeks and gets inundated with tidal waters. The peculiar nature of the soil and saline water allows only "PANDA" (Avicennia) type of vegetation to come up in the area.
Mangroves are a highly productive ecosystem which cycle it's own vegetation and also transports the nutrients received from the land to the sea which are important for the near shore fish population which is commercially highly valuable. Mangroves play an important role in building up and extension of coastal soils through accumulation of sediments and protecting the shores. The

vegetation acts as a very good natural coastal belt protecting the area behind it from cyclones etc.

The canopy of trees and the ecosystem provides a habitat system congenial for special Birds, Mammals and Insects. The Sea coast of the sanctuary is the home of Sea-turtles.



"Coringa Wildlife Sanctuary" is declared under sec. 18 of the Wildlife Protection Act 1972 (Central Act No. LIII of 1972) in 1978 through G. O. Ms. No. 484 Forests and Rural Development (For.III) Department dated 5-7-1978 and was notified in the East Godavari District Gazette No. 8 Dated 22-8-1978 and under section 26-A of wildlife protection Act, 1972 (Central Act No. 53 of 1972) in 1998 through G.O.Ms.No.45, Environment, Forests, Science and Technology Department (For.III) dated 13-4-1998 and was notified in the Andhra Pradesh state Gazette vide notification No. 199 dated 24-04-1998 (Annexure-1A). The sanctuary comes under IUCN category V.

6.2 Constitution and the Extent of area

The block wise forest area of Godavari Delta and the Sanctuary is presented in Table-14.

TABLE-14
BLOCK WISE FOREST AREA OF GODAVARI DELTA AND THE SANCTUARY

Sr. No.	Name of R.F	Area (ha)	Area of CWLS
1	Coringa R.F.	4242.00	3156.54
2	Coringa Extension	19474.12	19941.70
3	Bhyravapalem	972.05	972.05
4	Hasanbipps	1032.00	-
5	Kandlaggpa R.F.	3434.00	-
6	Hatlabipps	115.00	-
7	Kadakaka	2040.00	-
8	Balusubipps	476.00	-
	Total	**32222.17**	**23570.29**

6.3 Area

Mangrove forests of Godavari delta extend over 32222.17 ha (322.21 Sq. Km.). Out of this, 235.70 Sq.Km of reserve forest of Tallarevu and I.Polavaram mandals has been declared as a sanctuary under the Management control of Wildlife Management Division, Rajahmundry. The block-wise details are furnished in table -1. All the above Reserve forests are settled under section 16 of Madras Forest Act and Sec.15 of A.P. Forest Act 1967 and their position is intact. The entire sanctuary is covered by Coringa Reserve Forests, Coringa Extension Reserve Forests and Bhyravapalem Reserve Forests. Out of the total area of the sanctuary, vegetation cover occupies 11716.20 ha (49.71%) and water body is 11851.80 ha (50.28%) [GIS Lab A.P.F.D Statistics 2007 (IRS LISS III)].

i. Coringa Reserve Forest: Notified as Reserve Forest in G.O.Ms. No. 302 Revenue Dept. Dated 12-5-1888 to take effect from 15-6-1888.

ii. Coringa Extensive Reserve Forest: Notified as Reserve Forest vide Fort Saint George Gazette. No.30, Dated 3-2-1921. Notification copy of Coringa Extension.

iii. Bhavanipalem Reserve Forest: Notified as Reserve Forest in G. O. Ms. No. 103 Forest and Rural Development (For.III), Dated 24-6-1974. Notification copy of Bhavanapalem Reserve Forest.

6.4 Approach and Access:

The name of Coringa Wildlife Sanctuary is drawn from Coringa Village which is accessible by road from Kakinada town. Kakinada town is connected by train with major cities like Hyderabad, Chennai, Kolkata, Visakhapatnam, Vijayawada etc. Samalkot junction is the nearest railway junction in South Central railway. The Kakinada town is also approachable by sea, as it is a major port. One can also reach Rajahmundry by air and then reach Kakinada by road or train (Distance 70 km.). The Sanctuary can be reached by Road up to Ramanmaidam village. But the sanctuary can be seen only through boat or launch as the sanctuary is a wetland, connected with streams and creeks originated from the river Godavari and the tidal waves of Bay of Bengal.

6.5 Statement of Significance

Coringa Wildlife Sanctuary is an important wetland as it covers the major portion of mangrove forests in the delta of the Godavari river. The coastal and marine environment of this region plays a vital role in human welfare by its immense biological and mineral resources and the life-supporting systems it provides. The area is a major habitat and breeding ground for several species of fish, prawns and holds one of the seasonal populations of fishing cats in India. The mangrove forests are the first line of defense against the tropical cyclones which frequent the area. Uppada Island, which is a part of the Coringa Wildlife Sanctuary plays an important role in preventing the sea waves reaching the Kakinada Port and the city protects the port area. Coringa Wildlife Sanctuary and its adjoining landscape in Andhra Pradesh plays a crucial role in regional, economic and livelihood development besides providing various ecosystem services, essential as life-supportingsystemforthe East Godavari region.

6.6 Geomorphology Physical Features

Coringa does not show any major topographical features, except for the Kakinada coast, which is largely a low-lying area. The lower part of the delta is made of a series of sand ridges interpreted to be ancient beach ridge forms, due to the high waves and debris. Geomorphology of Coringa matter brought by the river Gautami-Godavari from its drainage basin. Fractures have controlled the drainage and truncated some of the river courses. Geomorphology of the area is classified as mudflat, mangrove swamp, sandy beach and Sandy Island.

River dominated allochthonous type

Characteristic of coast at low tidal range setting. In this case, freshwater discharged by Godavari River and sediment leads to the rapid deposition of bodyminous sands, silts and clay to form "gro-delta" sediments. The delta geometry consists of multiple branching distributaries leading to form elongate, finger-like protrusions. The result is the formation of highly convoluted coastline with shallow bays and lagoons.

Tide dominated geomorphologic setting

Observed near Coringa sanctuary, alongKatapalem and Ramanayadam creeks. These tides are responsible for the dispersion of the sediments brought to the coast by the Godavari River, forming elongate sand bodies. Wave power is often quite low because of frictional attenuation over broad inter-tidal shoals. They also persist seaward along the promontories, which separate the tidal channels.

Composite river and tide dominated geomorphologic setting

Observed near Bhairavapalem, represented bya combination of high wave energy and high river discharge. Sand debouched by the river is rapidly redistributed by waves along the shore to form extensive sand sheets. Much sand deposited on the inner continental shelf during lower sea level is reworked landward during marine transgression and subsequent sea-level still stands. the result is a coastal plain dominated by sand beach ridges, narrow discontinuous lagoons with an alluvial plain to landward.

Soil

The entire area in the mainland is plain as a table top but riddled with a network of streams and creeks. However, the Hope Island which is also known as "Godavari Sandspit" is a nice sandy seashore. The deltaic region mostly contains black cotton soil with deep extensions in sub surfaces. The soils are moderately drained. The texture of the soil is 'silt clay' with 50-65% of clay. The dominant clay mineral is steatite. These soils are low in organic carbon, which ranges from 0.3-0.5% indicating rapid mineralization. The sediments are of silt clay in nature, where silt levels increased in the direction of Gautami-Godavari Estuary and clay characterized. The Godavry/seaward channels with a strong neritic incursion had higher salinity (>20‰) compared to Coringa and/or the estuary. Most of the sediments in mangroves are characterized by mud Clay of mud and sandy mud. Sand content in Mangrove sediments is generallylessthan10%, silt is predominant in mangrove areas and those are as which contain silt content more than 50% are characterized by dense Mangrove vegetation. Though the clay content ranges from 15 to 90%, yet the majority of the sediments contain 30 to 50% clay only. Tidal channels and creeks of the Mangroves are characterized by Sandy mud, and sandy sediments. However, in some places clayey sandy silt and sandy clay sediments are found in which sand content is more and ranges between 3 to 89%, 3 to 90% and 10 to 76% whereas silt content ranges from 1 to 52% and clay content ranges from 4 to 84%.

Soils in the mangrove belt are characterized by high silt and water content. Generally, these soils are highly slushy muddy and very sticky with less oxygen component and are clayey with abundant Hydrogen Sulphide. They are drained soils, often semi-fluid and poorly consolidated, and in parts with abundant humus which is called mangrove peat, a fibrous soil composed largely of remains of roots and other woody structures and silt brought in, from the sea by the tidal action, which contains shells and other debris. The alluvium deposited, helps in holding large quantities of algae, which form major food resource for the fauna of the mangroves. These mudflats and soil in mangroves, which have formed through several biological processes, form various niches for different organisms to thrive, thus making the mangroves a unique ecosystem.

Lagoon

Lagoon sediments are mainly muddy sand and sandy in nature. The average content of sand is about 30.9% and content varies between 6 to 82%. The silt content varies between 10 to 57% and the average content of silt is about 21.3%. The clay varies between 5 to 82% and the average content of clay is 44.8%.

Terrain

Coringa mangroves are bordered on the northern side of Kakinada Bay and on the western side mainland formed of deltaic and flood plains. The coastal strip north of Kakinada consists of windblown sand and sand dunes which succeed landward by lakelets, sandstones and khondalites. The southeastern part has marshy islands known as Hope Island.

Shoreline Changes – Sandspit Formation

A sandspit has formed near Kakinada Bay over a period of 200 years. Based on British Admiralty charts, Hydrographic Survey of India charts and field investigations, (Reddy and Prasad, 1982) have presented the possible reasons for the sand spit formation and growth (Map).

Godavari River was discharging into Coringa Bay (present Kakinada Bay). During 1840-1851, the major confluence of Godavari River shifted its course from Coringa Bay to about 5 miles south-east. Dam construction at Dowleswaram (1946-1852) and deforestation in Godavari basin during this period could have reduced the flushing capacity of the river and increased sediment transport, which ultimately resulted in silting up of Coringa creeks. Silting up of Coringa creeks caused the opening of the major branch of Godavari River in the open sea near Hope Island. The increased sediment input resulted in the formation of a shoal in 1851 (Sacramento shoal). Littoral currents (flowing north) tend to deposit the littoral drift material, while tidal currents (perpendicular to shore) tend to remove the deposited material. Since tidal currents were weak (due to large area of bay mouth), littoral currents dominated the deposition of littoral drift materials and the shoal developed into a sand spit and started growing northward along the direction of the littoral current. With an increased growth rate of sandspit northward, the bay entrance (between Sandspit and mainland) became reduced during 1895-1970. Reduced bay entrance caused strong tidal currents that carried littoral drift materials into the bay and the spit deflected in North-West direction. The strong ebb currents from bay removed materials and caused deepening of the bay and thus the sand spit has attained a quasi-equilibrium state.

An an estimate 9.3 km length of Andhra Pradesh coast is affected by erosion. Erosion of coastline is noticed along the Bay of Bengal at Uppada, Vishakhapatnam, Bheemunipatnam and on the northern side of the Godavari River, i.e., from the Godavari River mouth to the tip of Hope Island. Elongation and enlargement of Hope Island in the north and northwest directions are remarkably visible from the increase in the length of sand spit in the last century.

6.7 Water Sources

Drainage Directions

The river Godavari after traversing a distance of 1,400 km divides into two branches – the Gautami (major branch) and the Vasista (minor branch) at the township of Dowleswaram about 50 km from the mouth of the sea. The sanctuary area can be described as a part of the Godavari Estuarine Delta Complex. The Godavari river channels in the estuary zone are funnel-shaped and are wrapped by numerous tidal creeks. These creeks are separated by extensive tidal-flat surfaces. Small channels/creeks are detected in the dense mangrove forest using satellite. Mudflats with mangrove forests are more extensive along the estuarine part of Gautami river. The Gautami branch of Godavari flows South-East and opens into the Bay of Bengal at two places, namely Bhyravapalem and Kothapalem villages. The Gautami Godavari is connected to Kakinada bay by two major streams namely, the Coringa River at Yanam and the GaderuRiver at Bhyravapalem. There are many other major streams and creeks such as Chollangi creek, Nattapalem canal and many other creeks which ultimately join either the Kakinada Bay in its Southern part within the sanctuary or join the two main rivers i.e. Coringa and Gaderu, which cut across the entire sanctuary and ultimately join the sea. The tidal effect is felt up to 45 km in the major branch and about 40 km in the minor branch with mean tidal differences between the high and low tide being134mc53cm respectively. In between these two estuarine mouths, a swampy backwater area exists, covering an area of 15,000 ha. Further, major branch the Gautamis connected by a multitude of tidal creeks intersecting the mangrove swamps on its eastern and and some of these connect to the shallow coast of Bay of Bengal near the township of Kakinada.

The MajorRivers in the Sanctuary:

i) Coringa River:

This is a small river starting on the Western side of Yanam town cutting across the four westerly delta regions line to the west of the sanctuary and enters the sanctuary area near Coringa village in the eastern side of the sanctuary and travel towards the easterly direction and joins the Kakinada Bay.

ii) Gaderu River:

This river arises about 5 km. down to Yanam town near Bhyravapalem village. It enters the sanctuary area at the southern tip near Bhyravapalem and divides the sanctuary area into two parts, travelling towards North and ultimately joining the Kakinada Bay.

6.8 Biodiversity

The Coringa WLS is rich in bio diversity, principal components being phytoplankton, zooplankton, macrophytes and aquatic avifauna. The bio diversity of this Wetland comprises of Phytoplankton:107 species; Zooplankton: 61 species; 138 fish species, 24 species of crabs, 130 species of molluscs, 12 Prawn species,269 bird species (including water/terrestrial/migratory/ local migratory/local residents etc.). The major plant invasive alien species includes *Prosopis juliflora*.

Mammals

Nine species of mammals have been recorded, of which the endangered species like the Fishing Cat – *Prionailurus viverrinus*, Indian Smooth coated Otters – *Lutrogale perspicillata* were sighted during the field visits.

Birds

There were around 257 species of birds identified from the Coringa Wildlife Sanctuary. About 130 species of resident and migratory birds (Egrets, Cormorants, etc.) depend on this area for breeding and nesting. Coringa WLS is an extremely essential area for waders and mangrove birds and has been designated as an IBA. This area is reported to have been used by about 30,000 waders in a year. Among the near threatened species, Painted stork *Mycteria leucocephala*, Oriental White Ibis *Threskiornis melanocephala* and Ferruginous Pochard *Aythya nyroca* were also reported from Coringa Wildlife.

Reptiles

There are about 25 reptiles have been identified in and around Coringa Wildlife Sanctuary. Sea Turtles (5), Snakes (16), and Lizards (4) etc., are the reptiles found in the sanctuary. Olive Ridley Sea Turtles *Lepidochelys olivacea* which is listed under "Schedule I" of IWPA 1972 and "Vulnerable" as per the IUCN Red List.

Flora

Mangrove vegetation in the Godavari estuary is tropical inter-tidal forest composed of halo-tolerant plant species. They are often located in muddy, anoxic soils, lagoons and river deltas where their complex of aerial roots provides support and gas exchange. Mangroves are viviparous and propagate by their ability to quickly establish under the parental tree or float away and colonize a new area. Mangrove vegetation consists of Ecosystem approaches.

Ecosystem Services

- ✓ Supports livelihoods for the fishing community
- ✓ Provides essential products and services such as oxygen, food, water and medicine to humans.
- ✓ Regulation of water regimes and stream flows.
- ✓ Ground water recharge
- ✓ Nutrient recycling
- ✓ Buffer communities against floods and cyclones
- ✓ Support a variety of life forms through extensive food webs

- ✓ Habitat to diverse flora and fauna, including resident and migratory species.
- ✓ Habitat for migratory species such as water birds and fish.
- ✓ Provide recreational Opportunities.
- ✓ Enhance landscape aesthetics.
- ✓ Stabilize local climate.
- ✓ Sink for sediments.
- ✓ Cultural and religious values.
- ✓ Medicinal Plants.

Socioeconomics and Livelihoods

Fishing is normally the primary livelihood of local communities residing along the coast. However, seasonality plays a major role in determining the availability of fish catch.

Importance of Mangroves

Ecosystem Service Provided by Mangroves of East Godavari Coastal Region

Provisioning services:

i) **Food:** Mangroves here are permanent or temporary habitats for many aquatic animals such as fin fish, shell fish, crustaceans and are hatching and nursery grounds for many marine fish. It is estimated that up to 80 percent of regional fish catches are directly or indirectly dependent on mangroves.

ii) **Timber and fuel wood:** The villagers of this region mostly use the timber of Mangrove flora to build houses and make furniture, rafters, fences, bridges, poles, boats and as fuel wood.

iii) **Medicines:** There were a few traditional uses for mangroves and associates like *Cassipourea lanceolata* (L.) Roxb., *Clerodendrum inerme*, *Gardenia spinosa* Roxb., *Derris trifoliata* Lour. and *Abiscus filicium*. The bark of *Ceriops decandra* is used traditionally to enhance the durability of the fishing nets. The barks of many species produce gums and tannins, which are still used for curing leather and strengthening fishnets.

iv) **Other non-timber forest products (NTFPs):** The breathing roots of Sonneratia species are used to make corks and fish floats. Mangrove plants are sources of sodium, and the ash of some species, such as *Avicennia*, is used as soap.

v) **Enrichment of Coastal Sea:** The coastal vegetation like Algae, seaweeds and mangroves play a significant role in enriching the coastal sea. They transport the dissolved organic matter, nutrients etc., besides serving as a nursery area for the larvae and juvenile marine animals and thus support the benthic population of the sea.

vi) **Fawning ground for commercially valued fish, crabs etc.:** These forests are the home ground for a variety of commercially important fish, prawns, crabs and other species in their early stages, thus providing a big economic source to the country in general and state in particular.

Existing services:

i) **Protecting the shoreline:** Mangroves in this region acting as physical buffers between the elements and the shore and can absorb 70-90 percent of the energy of the waves, depending on their ecological condition. The mangroves of Coringa serves as a big barrier, safeguarding the Kakinada town. The opportunity cost of saving a life by retaining mangroves and it was assessed to be Rs. 13.7 million per life saved.

ii) **Carbon sequestration:** Mangroves are important carbon sinks. They sequester about millions of tonnes of carbon per year. A 20-year-old plantation of mangroves has a carbon build rate of 580 grams per square meter per year.

iii) **Promoting accretion:** Mangroves function much like a living grove to build up sediment, stabilizing the ground and fixing mud banks. It is estimated that there is an annual sedimentation rate ranging between 1 and 8 millimeters in mangrove areas that are expanding in land area. Therefore, they prevent erosion.

iv) **Flood attenuation:** Mangrove wetlands function as gigantic sponges to trap and slowly release surface water. A one-acre wetland can typically store about three acre-feet of water.

v) **Trapping pollutants:** Mangrove roots that help trap sediments also function as filters to sift out pollutants reaching the sea from inland waters.

vi) **Support for fauna:** The canopy of mangrove trees provides an essential terrestrial habitat for fauna which prefer arboreal life. Mangrove soils are soft; mud mixed with sand and contains fauna which is not found in sandy and rocky shores. These forests are the abode of species like fishing cats, Otters, Wolves, and Rheaus Monkeys etc. Apart from these residential species a number of birds are attached to these forests since they provide food for them in the form of fish, crabs, micro organisms, mud skippers etc.

6.9 Administrative Setup

Coringa Wildlife Sanctuary is under the administrative control of Andhra Pradesh Forest department and comes under the jurisdiction of Wildlife Management Division, Rajahmundry.

The Forest department organization structure is in place.

Divisional Forest Officer (DFS) - 1 No.

↓

Forest Range Officer - 1No.

↓

Forest Section Officer – 2 Nos.

↓

Forest Beat Officers – 7 Nos.

↓

Assistant Beat Officers - 6 Nos.

At present 1 Divisional Forest Officer, 1 Forest Range officer, 2 Forest Section Officers are present. Out of 7 Nos sanctioned posts of F.B.Os, 2 posts are vacant and Out of 6 Nos sanctioned posts of A.B.Os, all are vacant. So human resource needs to be supplemented.

Vision

"By 2023, Biodiversity of Coringa Wildlife Sanctuary (CWLS) and its surroundings is valued, conserved, restored and wisely used, maintaining a healthy mangrove, estuarine and Bay ecosystem services and sustaining benefits essential for people living in the region".

Goal:

Take effective and urgent action through "Conservation and restoration of ecological integrity and to ensure that by 2023 the Godavari Riverine, Estuarine, Coastal, Marine and Mangrove ecosystems of Coringa Wildlife Sanctuary are resilient and continue to provide essential services, thereby securing the variety of life in the region, and contributing to human well-being and poverty eradication".

To ensure this, pressures on biodiversity are reduced, ecosystems are restored, biological resources are sustainably used and benefits arising out of utilization of genetic resources are shared in a fair and equitable manner; adequate financial resources are provided, capacities are enhanced, biodiversity issues and values mainstreamed, appropriate policies are effectively implemented and decision-making is based on sound science and the precautionary approach.

Strategic Goals and Objectives

To reach the above broad goal the following strategic goals and objectives are defined.

Strategic Goals

StrategicGoalA: Address the underlying causes of biodiversity loss by mainstreaming Biodiversity

StrategicGoalB: Reduce the direct pressures on biodiversity and promote sustainable use.

StrategicGoal C: Improve the status of biodiversity bysafeguarding ecosystems, species and Genetic diversity.

StrategicGoalD: Enhance the benefits to all from diversity andecosystem services.

StrategicGoalE: Enhance implementation through participatory planning, knowledge management and capacity building.

Principles: The most important principles are that human beings are at the centre of sustainable development concerns. The other relevant principles on which the objectives are premised include: right to development; precautionary approach; economic efficiency; entities with 'incomparable' value; equity; public trust doctrine; decentralization; integration; preventive actions; and environmental offsetting. These principles, which have an established genealogy, provide the necessary overall guidance for implementation of objectives which are broad based and relate to current perceptions of key threats and constraints to biodiversity conservation. These may accordingly evolve over time. The objectives are to be realized through various strategic interventions by different public authorities at centre, state and local government levels. They are also to form the basis of diverse partnerships.

Objectives:

1. Protecting critical habitats of Coringa sanctuary both on the land-ward and the sea ward sides including the Bay and benthic habitats.

2. To improve natural resource base and to enhance harmony, synergy and linkages between conservation and management of biological diversity by empowering local communities, improving livelihoods by adopting sustainable practices that increase long term food security and reduce poverty while creating equity, transparency and accountability through society and community.

3. Enhance the capacities of communities and sector institutions for effective implementation of biodiversity-friendly sector plans.

Problems in Achieving Objectives:

Inadequacy in addressing the biodiversity related issues from a landscape/seascape level perspectives.

SWOT ANALYSIS:

Strengths:

- Mangrove area of Godavari region is rich in flora and fauna diversity that generates significant ecological and economic benefits such as shoreline protection, sustaining livelihoods and carbon sink services.
- Diverse physiographical and ecological features constituting the desired habitat conditions for various species to exist.

Weakness:

- Acting of anthropogenic pressures of highest degree on the Bay and Mangrove areas from adjoining villages.

Opportunities:

- Availability of excellent scenic and suitable sites for various Eco-tourism activities.
- Strong political will for development of the communities through various Rural Development Schemes.
- A structured national and international support programme (UNDP/GEF/GoI/GoAP) in ongoing programmes with well established institutional arrangements.

Threats:

Natural threats:

- Cyclones, gales and occasional tsunamis are the natural threats to the mangrove ecosystem.
- Accretion of large amount of sand due to tidal wave actions and growth of sand spit towards the port.
- Invasive alien species; weeds such as Prosopis juliflora, which often occupy deforested mangrove areas and restrict the re-growth of mangroves

Human threats:

- Habitat degradation/conversion by clearance of mangrove forests for development projects, land reclamation for shrimp farming and aquaculture and diversion of inland freshwaters.
- Over exploitation, destructive fishing practices and contamination of coastal and marine resources.

- Chemical contamination by aqua farms, Urban and Industrial effluent discharges in to mangrove forest areas.
- Oil pollution from oil leaks, oil and natural gas explorations by ships / motor boats.

Other Challenges

Coastal and offshore developments

- Dredging & Disposal
- Power plant cooling water intake and outfall
- Desalination plants – Brine disposal
- Deep sea mining and oil prospecting
- Deep sea Drilling Projects
- Ocean Noise" – Impact of Human generated noise on marine life
- Deeper Minimum Zones (OMZ)

Overexploitation of coastal & marine resources

- Environmental degradation
- Low levels of investment in alternative coastal livelihood programs
- Mariculture
- Tourism

Coastal Governance

- Lack of institutional coordination
- Lack of Monitoring, Control and Surveillance (MCS) of
- Fishing operations
- Illegal, unregulated and unreported (IUU) catches

Challenges faced from maritime traffic:

- Noise
- Abrasion from grounding
- Scarring from anchoring and propeller turbulence

Challenges from the Aquaculture

- Introduction of non-native species, and Leaching of toxic anti-foulants into coastal waters.
- Declining water quality.
- Release of dead and diseased fish.
- Losses of shrimps and other crustaceans.
- Human health issues

Challenges – Oil & Gas sector:

- Oil and gas exploration and production
- Noise & Vibration
- Physical destruction
- Operational discharges and emissions
- Drill cuttings and Drill fluids
- Water discharges
- Air emissions
- Solid waste discharge
- Oil spill
- Impact on Fishery/ Fishery related livelihoods
- Light pollution near RigsSerious threat to nesting behavior and hatchling survival
- Human health
- Social pressures and other secondary impacts

Challenges – Fisheries

- Destruction of mangrove, wetlands, and other sensitive aquatic habitat by aquacultureprojects.
- Conversion of agricultural land toponds.
- Water pollution resulting from pondeffluents.
- Excessive use of drugs, antibiotics, and other chemicals for aquatic animal disease control.
- Inefficient utilization of fish meal and other natural resources for fish and shrimp production.
- Salinization of land and water by effluents, seepage, and sediment from brackish water ponds.
- Excessive use of ground water and other freshwater supplies for filling ponds.
- Spread of aquatic animal diseases from culture of organisms to native populations.
- Negative effects on biodiversity caused by escape of non-native species introduced for aquaculture, destruction of birds and other predators.
- Conflicts with other resource users and disruption of nearby communities.

6.10 Eco-Development Committees

The aim of the eco development activities is to provide a package of site specific ecologically friendly measures to enhance alternative income generating activities and judicious use of bio-mass resources by the local people there by help relieve pressure on the resources of protected areas. This component aims at 3 distinct outputs.

1. Eco development through protection, regeneration and increase productivity of Forest resources through joint forest management.

2. Improvement and diversification of Non-forest related activities like Agriculture, Horticulture.

3. Activities connected with other line Departments like live stock improvement use of alternate energy sources.

Due to implementation of the above activities the success achieved in bringing a change in the attitude of the people towards mangroves and their active participation in the conservation of mangrove is only a beginning of an era and this is to be nurtured and sustained in future. The success would not have been achieved but for the cooperation and coordination of N.S.Swaminathan Research Foundation, Kakinada (NSRF) which motivated the people and acted as an interface between people and Forest Department. All the Eco development Committees have started which is and it is the first step in the direction of a committed partnership between the Government and local community.

6.11 Community based Eco-Tourism(CBET)

More than 75% of the state population are living in rural areas, where in the absence of worthwhile income generation opportunities, people have to largely live on subsistence agriculture, fishing sale proceeds of NTFP collected from the forests and occasional labour provided by various government departments. This concept of 'Community Based Eco-tourism' would go a long way in providing better income generation options to the rural people. This would also mean less dependence upon the natural resources in as far as it amounts to removal of produce from these areas. There would be, moreover, greater incentive in conservation of local traditions, culture, heritage and environs, as these would be seen as aiding in local economy rather than an impediment to it.

Community Based Eco-tourism (CBET) is a responsible tourism that, besides being ecologically and culturally sensitive, helps the local communities in realizing the social and economic benefits. Basically, it is an involvement of local communities in the eco-tourism that would support their livelihood needs and consequently create their direct stake in conservation of local culture, ecology and environment.

6.12 Need for Community-based Ecotourism

One of the major and viable options to address the above issue is to adopt "Community Based Eco-tourism" (C.B.E.T) mode, as it offers the following benefits both to the community, natural resources and the protected areas. There will be benefits for an individual or family: Accommodation based in local homes (Homestead) will channel revenue directly to the families and will also require managerial skills.

6.13 Benefits to the Local Community

C.B.E.T will generate direct revenue for community members, in addition to upgrading housing standards while avoiding huge public infrastructure expenses.

Community-based Ecotourism projects are increasingly seen as providing an incentive for people to manage the wild lands and wildlife in a sustainable way, since the economic benefits distributed to communities depend on this wise management. Many nature tourism projects assume that nature tourism can be a powerful force for conservation by providing benefits to local people. But, meeting such conservation objectives requires careful project design so that benefits are appropriately targeted and, in fact, act as an incentive.

6.14 Criteria for Sustainable Community-Based Eco-tourism

A.P. Forest Department ensures the following for sustainable Community Based Eco Tourism to support economic development of local communities:

i. Local participation
ii. Empowerment of local people
iii. Participation in the project cycle
iv. Creating stakeholders
v. Linking benefits to conservation
vi. Distributing benefits
vii. Involving community leaders
viii. Using change agents
ix. Understanding site-specific conditions
x. Monitoring and evaluating progress

6.15 Proposed Activities

<u>Mangroves Restoration</u>

Nearly an area of 1694.85 ha has already been regenerated within the sanctuary area from 1987 to 2020. The standard method of Rhizome channelling shall be adopted for regeneration. It has been observed in all the planted areas earlier, many of the natural fish nursery ponds have disappeared as they have not been given due importance at the time of designing itself. Simulation or restoration of mangrove ecology shall be based on nature's design. It is recommended to explore possibilities to restore all natural breeding ponds of the fish the ceased to exist and other invertebrates. Care should be taken while regenerating the areas

such that all natural aquatic ponds are protected and the courses of water inflows into them shall be maintained.

The areas outside the sanctuary adjacent to the western border wherever possible should also be taken up for plantation to maintain the cushioning effect for the sanctuary.

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Methodology and Techniques

Restoration of the mangroves shall be done only when the salinity of the degraded area is brought down. In order to reduce the salinity, fishbone type canals are to be dug and tidal flushing and draining of stagnant water is facilitated. This results in toning the salinity levels to 60 ppt in summer to fresh water level during monsoon seasons. After a buffer period of three months, the nursery shall be raised, mangrove saplings are planted along the trapezoid shaped canals in the degraded areas. Canals are designed like fishbone in order to facilitate easy inflow and outflow of tidal water. The main canals shall be dug at an angle of 45° to the natural creek, while the side canals are dug at an angle of 30° to the main canal. This needs a preplanning of marking canals using Pegs and chalk powder. The canal dimensions shall be determined as per the contour levels and the tidal amplitude of the degraded area chosen for restoration; the canals are to be dug in a trapezoidal shape in order to plant the saplings at the mid level of the canal. This is to ensure that the plants receive tidal water, but at the same time they are not submerged. Geomorphology and hydrology in mangrove restoration based on the contour survey and hydrology study, the canal depths and dimensions shall be fixed, corresponding to the topography and tidal amplitude of the selected restoration site. The topography study reveals whether the areas lying close to the banks of creeks /rivers or elevated (levee) compared to the areas inside. The levees are formed due to the deposition of silt during floods. Secondly, the soil subsided in the river-filled area due to changes in bulk density, making the topography saucer shaped. As a result, tidal water entering during the highest of the high tides stagnates in the saucer shaped area due to the elevation of the edges. The temperature and the salinity of the stagnant water increases and shoots up to 314 ppt during summer. This phenomenon prevents natural regeneration of the mangroves and thus enhances the process of degradation. The area gets flooded only during the monsoon period and cyclones and storms.

The **dimensions** of the canals were determined based on the contour levels and tidal amplitude. The top width of the main canal can be between 3.0 m and 2 m and the respective bottom width could be between 1.0m and 0.4m depth. The dimensions of the side canals shall be 1.2 m top width, 0.3 m bottom width and 0.40m depth. The distance between the two side canals at the maximum 12.5m

during the first year of plantation. The planting of mangrove saplings shall be done 2 m apart along the canals at about 30 cm down the slope. In the subsequent years, distance between side canals will be reduced up to 5 m in order to ensure dense canopy. In case the canals are dug deeply the dimension of the side canals shall be reduced accordingly to 1.25m top width, 0.2m bottom width and 0.4 m deep.

Mangroves namely ***Aegiceras corniculatum, Bruguiera gymnorrhiza, Rhizophora apiculata, Rhizophora mucronata and Xylocarpus moluccensis*** shall also planted to ensure genetic diversity. Eight-month-old mangrove saplings raised in the nursery may be used for planting. The mangrove saplings shall be planted along the slopes (20-25cm from the top) of the canals with an inclination of 2 m.

Desilting:

The bunds formed by the deposition of the excavated soil during canal digging will silt the canals during the monsoon seasons. The silted canals have to be de-silted before the onset of summer, because during summer the tidal amplitude is generally low. Tidal flushing is very important during summer because the soil salinity will shoot up due to high temperature and cause damage to the roots of the seedlings. Such seedlings will be replanted in the following monsoon season. The survival percentage is measured in the initial period for better monitoring. Initially the growth rate was slow and after 2 to 3 years the seedling growth rate was faster. The natural regeneration of the seedlings also occurs simultaneously. After four years, the planted saplings start bearing fruits, which will regenerate, and the density of the area will increase.

The trenches are silted with the flow of water during high tides resulting in decrease of the depth of the channels. Hence, if the channels are not de-silted, the flow of the water will be reduced and consequently with lack of fresh water the young seedlings may tend to damage. So the desilting the channels is necessary in the interest of the plantations. Hence, it is proposed to take up desilting of channels in the old channels with 0.15cm depth restricting to 40% area of the total areas.

Removal of Exotic Species like *Prosopis juliflora* and Other Thorny Species:

Exotic species like *Prosopis juliflora* are coming up scarcely along the creeks in the Sanctuary. It's occurrence and increase are an unhealthy for the regeneration of mangroves. Hence, it is proposed for removal of the species is proposed during plan period.

Enrichment planting in Mangroves:

Still small pockets of unplanted areas are available for regeneration and they may be taken during planting season in the plan period. Certain areas damaged and needs for re-channelling. Hence, it is proposed to take up Enrichment planting in the gap areas during the plan period.

Conservation of Sea Turtles (Olive Ridley)

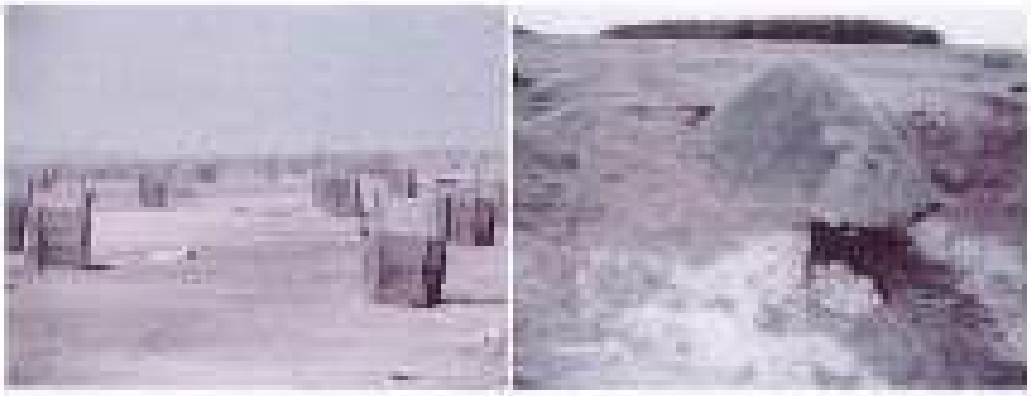
Protection of Turtle nests:

The lifespan of sea turtles has been speculated at 80 years. It takes decades for sea turtles to reach sexual maturity. After mating at sea, adult female sea turtles return to land to nest at night. Generally, females return to the same beach where they were hatched. This can take place every two to four years in maturity.

The mature nesting female hauls herself onto the beach and finds suitable sand on which to create a nest. Using her hind flippers, she digs a circular hole 40 to 50 centimetres (16 to 20 in) deep. After the hole is dug, the female then starts filling the nest with a clutch of soft-shelled eggs one by one until she has deposited around 50 to 200 eggs, depending on the species. Some species have been reported to lay 250 eggs, such as the hawksbill. After laying, she re-fills the nest with sand, re-sculpting and smoothing the surface until it is relatively undetectable visually. The whole process takes thirty to sixty minutes. She then returns to the ocean, leaving the eggs unguarded.

The hatchling's gender depends on the sand temperature. Lighter sands maintain higher temperatures, which decreases incubation time and results in more female hatchlings. Incubation takes about two months. The eggs in one nest hatch together over a very short period of time. When ready, hatchlings tear their shells apart with their snout and dig through the sand. Once they reach the surface, they instinctively head towards the sea. Only a very small proportion of each hatch (usually 0.01%) succeeds.

Every year Olive ridley sea turtles visit the coastal districts and lay eggs during the month of December to March and proceeds up to June of succeeding year. Young turtles come out of the hatched eggs and join the sea. The main predators are Jackals, Foxes, Wild boars which feed on eggs. Monitoring the hatching of sea turtles was taken up in and around the Coringa Wildlife Sanctuary during the plan period.



Conservation of Major Bird Congregation sites:

Around 257 species of birds identified from the Coringa Wildlife Sanctuary. About 120 species of resident and migratory birds (Egrets, Cormorants, etc) depend on this area for breeding and nesting. Coringa WLS is an extremely essential area for waders and mangrove birds, and has been designated as an IBA. This area is reported to have been used by about 20,000 waders in a year and species such as Oriental White-backed Vulture Gyps bengalensis and Long billed Vulture G. Indicus had been reported in past but presently these are not found in the CWLS. Survey can be conducted to identify the present population and the plan can be revised to include the conservation measures for these species, if found in the CWLS. Among the near threatened species, Painted stork Mycteria leucocephala, Oriental White Ibis (Threskiornis melanocephala) and Ferruginous Pochard (Aythya nyroca) were also reported from Coringa Wildlife Sanctuary. Hence, there is proposal for Conservation of Major Bird Congregation sites inside and outside the Sanctuary during the plan period.

Research and Monitoring:

Research and monitoring are very significant in strengthening wildlife management. Qualitative and quantitative inventory of floral and faunal diversity studies on their habitat requirements, ecological aspects, dynamics of change etc., are essential for better management of the Protected Areas (PAs) as well as non-PAs. The management of Coringa wildlife Sanctuary firmly believes that scientific research, monitoring and training are key tools for successful wildlife management. At the most fundamental level, scientific research helps generate baseline data on key floral and faunal elements and this in turn feeds into a long term data base.

Research approach shall generate necessary information pertaining to the following research priorities of the P.A.

A) **P.A. Management:**

i. Zonation and PA boundary with reference to the types and extent of various eco-systems, and animal ranges.
ii. Impacts of PA management.
iii. Impacts and control of forest fire
iv. Fragile eco-systems or habitats
v. Key species requiring attention.

vi. Connectivity with surrounding areas
vii. Population relocation initiatives
viii. Community based eco-tourism

B) PA-People Interactions:

i. Impacts of legal or customary human uses such as grazing and NWFP collection
ii. Illegal human activities: encroachment, poaching
iii. Injuries or death to human, livestock and crop depredation by wildlife

C) Village Eco-development:

i. Structure and dynamics of local communities; cultural heritage and institutions; traditional knowledge systems
ii. Socio-economic: tenure rights, participatory processes in traditional organizations, access to, use and management of resources
iii. Income generation opportunities; subsistence employment opportunities

D) Need for data collection:

- Data that provide a baseline for monitoring conservation action.
- Data on the social and economic values of biodiversity and protected areas.
- Data supporting policy and conservation programmes.
- Data on genetic resources, including medicinal plants and wild ancestors of domesticated species
- Data on species that could serve as indicators of ecosystem health.
- Data on 'Keystone' and 'Flagship' species and habitats.
- Data on alien or exotic species, potential threats to indigenous biodiversity.
- Data on biodiversity known to be threatened.
- Data on threats to biodiversity.
- Data on potential rates of biodiversity loss.
- Data on species and habitat distribution.
- Data on biodiversity function and ecosystem services provided.
- Data on landscape infrastructure and pattern.

Monitoring of Mammals in Mangroves:

Conservation and monitoring of Otters

Indian Smooth-Coated Otter (Lutrogale perspicillata)

Smooth otters are named for their shorter, smoother coats, as compared the similar sized sympatric Lutrogale sp. Sources reveal that this species occur in variety of habitats from mangroves of freshwater wetlands. Among all Asian otters this is the one, occurs to be most common through most of its ranges.

Legal Status:

Indian Smooth-Coated Otters are the semi-aquatic members of the family Mustelidae and is the most common of Asian otters. These otters are the indicators of healthy aquatic environments. Indian Smooth-Coated Otters are included in Schedule II (Part II) of the Indian Wildlife (Protection) Act of 1972 and covered under Part-A of Schedule I of the Export (Trade) Control Order, 1988.

Research needs

a. Geographical range, present distribution and population densities.
b. Behavior, ecology, food and habitat requirements.
c. Habitat and resource requirement.
d. The size and configuration of suitable habitats necessary to maintain viable population.
e. Direct and indirect influences of otters as predators in aquatic ecosystems, including the interactions of otters with fisheries and aquaculture.
f. Fish populations and their limitations, effects on otters, interaction with human fisheries.
g. Habitat use and requirements (incl. mangrove & other coastal, dams), habitat
change & effects on populations.
h. Role in ecosystems.

Conservation and monitoring of Fishing cat

About twice the size of a typical house cat, the fishing cat (Prionailurusviverrinus) has feline with a powerful build and stocky legs. The size of an adult ranges from 57-78cm and weighs between 5-16 kg. The fishing cat is an adept swimmer and underwater frequently to prey on fish as its name suggests. It is known to even dive to catchfish. Wetlands are the favourite habitats of the fishing cat. In India, fishing cats are mainlyfound in the mangrove forests of the Sundarbans (W.B), Bhitarkanika (Orissa), Coringa (A.P.), on the foothills of the Himalayas along the Ganga and Brahmaputrariver valleys and in the Western Ghats.

The fishing cat is listed as Endangered in the IUCN Red List, which means that it faces a high threat of extinction in the wild. The Convention on International Trade inEndangered Species (CITES) lists the fishing cat on Appendix II part of Article IV of CITES, which prevents international trade in this species. In India, the fishing cat isincluded in Schedule I of the Indian Wildlife (Protection) Act, 1972 and thereby protected from hunting.

Research Needs:

1. Distribution and conservation status involving the compilation of all current and historical data on fishing cat occurrence throughout the region.
2. Detailed ecological study of fishing cats in their natural habitat.
3. Live capture to screen animals for the presence of several emerging zoonotic diseases. Avian influenza, SARS, and other diseases are now significant health concerns for wildlife.
4. Education and outreach. Using presentations, posters, and other tools to raise awareness of wetland dependency by fishing cats to encourage more sustainable use of wetland landscapes upon which they depend.
5. Survey for presence through scat collection and analysis.

Survey of fishes, Invertebrates and Amphibians for Providing Supplements to the Otters/Fishing Cats:

It is proposed to conduct a survey of invertebrates and amphibians and fish varieties in the sanctuary area. This survey will be useful to know about the availability food to the existing Otters and Fishing cats in the sanctuary.

Conservation of whale shark all along the East Godavari Sea coast:

Introduction:

Whale sharks are the largest shark, and indeed largest of any fishes alive today. They mainly feed on plankton and travel large distances to find enough food to sustain their huge size, and to reproduce. The distribution of whale sharks indicates the presence of plankton and the overall health of our oceans. Whale sharks are highly valued in international markets. Demand for their meat, fins and oil remains a threat to the species, particularly by unregulated fisheries. They are victims of bycatch, the accidental capture of non-target species in fishing gear. Owing to the vulnerability of the species, whale sharks have been listed in Appendix II of CITES (Convention on International Trade in Endangered Species) and also listed under Schedule-I of Indian Wildlife Protection Act, 1972.

Threats:

Targeted fishing for whale sharks stopped globally since 1990–2000s. However, incidental catch of whale sharks is still occurring worldwide and whale shark products are still available in international markets. Serious injury and inferred mortality because of vessel strike and fishing activities are threats to whale shark aggregations globally. In the absence of a proper conservation action, population declines are likely to continue into the future.

Whale Shark: EGREE region

As per the available literature, the total number of Whale Sharks killed through by catch was 20 along the Andhra Pradesh coast between 1989 and 1998 (10 years). But, as per the surveys conducted by the EGREE Foundation between June, 2013 to September 2014, totally 50 Whale Sharks have been killed. The nine individuals killed between 25th June and 24th July, 2014; and 22 individuals between 13th and 20th September, 2014 has created worrisome among the scientists and the Forest Department, Government of Andhra Pradesh. Fishery experts, researchers and local fishermen opine that till late 2007, it was a rare

visitor to the coastal zone of East Godavari. The number is increasing in recent years and aggregation also happens sometimes along the Coast.

As part of study conducted by WTI a total of 653 interviews were conducted (including fishers and representatives of scientific and professional organization). Among the respondents interviewed along the AP coast, 45% reported to have sighted the whale shark in the Bay of Bengal during fishing. It can be inferred from the interviews, that the probability of whale shark sighting is highest in the offshore waters of East Godavari, Krishna and Guntur. Whale sharks are largely planktonic feeders and their seasonal feeding aggregations are largely associated with productive areas.

In all the eight coastal districts surveyed, whale shark was observed by the respondents during winter months (September to March) after the monsoon and upto early summer. Fishers however reported seeing whale sharks during summer months as well, with less frequency. Overall, gill nets contributed to 80%, trawl nets contributed to 15% and shore seines contributed to 5% of incidental whale shark catches along the AP coast. During the survey, 11% of fishers responded that they have seen whale shark pups ranging from 80-150 cm while fishing and have landed as well.

Specific recommendations of the study for immediate action:

- ✓ Awareness campaign targeted at the fisher-folks about the whale sharks and its ecological importance.
- ✓ In depth scientific research, such as Satellite tagging can give information about their movements, growth, size at first maturity and longevity.
- ✓ Coastal cleanup program may also be required to conduct all along the coastline to minimize the levels of toxic pollutants.

Objectives:

- To take up massive awareness campaign in all important fish landing centres and fishermen villages.
- To encourage fishermen to release whale shark if accidentally caught and compensate adequately for damage of fishing nets.
- To conduct periodical survey in all fish landing centres and create database for future research.
- To carry out regular coastal clean up programme by involving all stakeholders.

<u>Vulture Conservation</u>

Vultures are large birds of prey that usually feed on carrion (dead or dying animals and rocks). **Vultures** use their large wings to soar in the air for many miles without having to flap. New World **vultures** are related to storks and use their sense of smell to find their food.

The presence and population data related to the different species of vulture with respect to East Godavari district currently not available and research has to be carried out in this aspect. As per the information from forest department One Cinereous Vulture (Aegypius monachus) rescued by the Forest Range Officer, Wildlife Management, Kakinada and their staff on 20.11.2018 in Nadupalli village in Atreyapi Mandal in East Godavari District and the same was handed over to Indira Gandhi Zoological Park, Visakhapatnam.

The Coringa WLS and surrounding area is reported to have been used by about 20,000 waders in a year and species such as Oriental White-backed Vulture *Gyps bengalensis* and Long-billed Vulture *G. indicus* had been reported in past but presently these are not found in the CWLS and its surroundings within the project area. In any case this project is not going to have any negative impact on vulture species. A proper survey can be conducted to identify the present vulture species and its population and the plan can be revised to include the conservation measures for these species as prescribed in the **Action plan for Vulture Conservation in India 2020-2025** formulated by MoEF&CC, GoI, if found in the CWLS and its surroundings.

Vulture surveys

Vulture surveys will be carried out to locate the remnant population of vultures in the proposed safe zone, to evaluate the population size as well as the location. Fixed road transects will be laid and periodic surveys will be carried out. Local help from NGOs and local population can be initially used before performing the vulture surveys. Once the vulture populations are located and their size are known, regular monitoring will be carried out to determine if there is any change in the size of the population. The change in population during the follow up surveys could be indicative of the impact of the vulture conservation efforts.

<u>Development of Eco-tourism infrastructure at Coringa Wildlife Sanctuary:</u>

The following activities are proposed under this component.

- Development and Maintainance of Infrastructure in Eco tourism zone
- Development of Interpretation centre of International Standard at Coringa Wildlife Sanctuary.
- Providing trainings to local communities on hospitality, eco tourism management
- Procurement of boats and maintainance of existing boats
- Engaging a livelihood expert to assist in Livelihood generation activities
- Development of Fish Nurseries and Seed Banks

<u>Development of Interpretation Centre of International Standard at Coringa</u>

Because of development of Eco-Tourism in Coringa Sanctuary a greater number of visitors are coming to visit the sanctuary. For creating awareness among the visitors, school children and college students on the conservation of flora and fauna, more particularly on the Mangrove Forests IEC building was constructed at

Coringa. It is proposed to develop this interpretation centre with international standard during the plan period.

Establishment of Floating Jetty and Other Visitors Amenities

Chalangi is located in Coringa Wildlife Sanctuary which is very near to Kakinada. Already infrastructure is developed i.e., board walk, boarding, sitting places, etc., It is observed that a large number of visitors mainly students are visiting this place to have an understanding about mangrove eco-system, flora and fauna of mangrove forest and also wetland bird species. In the interest of creating better facilities for the visitors, it is proposed to establish floating jetty and other amenities like construct Pagodas, seating benches etc., during the plan period.

Alternate livelihood Generation activities in villages around CWLS

The following activities are proposed under this component.

- Training for Palmyrah products making and providing handholding
- Other livelihood activities like providing fish drying kilns, smoke kilns, making products from jackfruit etc.
- Providing dobler lights
- Establishing RO plants
- Conducting trainings, workshops, exposure visits for locals
- Supply of TEDS and improvement of fishing nets.
- Promoting apiculture activities.

Office support

The following activities are proposed under this component.

- Capacity building training programs to staff
- Improvements to staff quarters, Forest Rest House and Cottages at Coringa
- Maintenance of Interpretation Centre and EEC
- Engaging Data entry operators, clerical assistances for maintenance of office records.

During 2012 UNDP-GEF scheme was established in Coringa Wildlife Sanctuary for a period of 5 years. The UNDP-GEF intervention aims to mainstream biodiversity conservation into the production sectors of EGREE through (1) Cross-sectoral planning in the East Godavari River Estuarine Ecosystem (EGREE) that mainstreams biodiversity conservation considerations. 2) Enhanced capacity of sector institutions for implementing biodiversity-friendly sector plans 3) Improved community livelihoods and sustainable natural resource use.

The following developmental activities are taken up during 2015 in Coringa Wildlife Sanctuary under UNDP Scheme.

Sr. No.	Item of work
1	Estimate for repairs to tailoring machines at Coringa and Mallapalem during 2015
2	Conducting World Wetland Day celebration at Z.P.High School Coringa on 02-02-2015
3	Protection and Development of Sea turtles at Vellayyapeta during 2015
4	Desilting work in Coringa Wildlife Sanctuary during 2015
5	Protection and Development of Sea turtles at Hope Island during 2015
6	Training, awareness programme to I.A.S Officers and their supporting staff on 05-04-2015
7	Protection and Development of Sea turtles at Kondhakurpa during 2015
8	Facilitating Inspection of Midterm evaluation team of UNDP on 20-02-2015
9	Providing Uniform to Boat helpers at Challangi CBET during 2015
10	Repairs and replacement of Godhrem boat at Coringa WLS
11	Repairs and painting to Wooden Bridge at Challangi CBET during 2015
12	Repairs & replacements of 40 HP Mariner Engine at Coringa WLS during 2015
13	Painting to Wooden bridge at Old light House during 2015
14	Construction of New Wooden bridge at the right side of (310 mtrs) part 1 challangiCBET during 2015
15	Construction of New Wooden bridge at the right side of (310 mtrs) part 2 challangiCBET during 2015
16	Construction of New Wooden bridge at the right side of (285 mtrs) part 3 challangiCBET during 2015
17	Facilitating inspection of Midterm evaluation team of UNDP on 20.02.2015 & 21.2.2015
18	Providing Uniform to Base camp workers in Coringa Wildlife Sanctuary during 2015
19	Improvement works to Forest Guest house at Coringa during 2015
20	Improvement works to Shopping complex at Kakinanchettupeta
21	Distributing fishing nets to EDC members at Mallapalem
22	Distributing fishing nets to EDC members at Kothuru
23	Distributing fishing nets to EDC members at Bhyravapalem

7.0 WILDLIFE CONSERVATION PLAN- SCHEME PROPOSAL

The project has minimal affect on the ecology/environment in the buffer zone of 10 km. It is not going to pose any threat either to the CWLS or the RET flora or fauna of the study area either directly or indirectly.

Project proponent is prepared for protection of flora and fauna in CWLS and around the project area. ONGC, is ready to support the efforts made by State and Central Governments for the ecological conservation of Coringa Wild Life Sanctuary and around it.

A Wildlife Conservation Plan of Rs.500 lakhs for the Coringa Wild Life Sanctuary and its surroundings has been prepared in consultation with Divisional Forest Officer, Wildlife Management, Rajamahendravaram and District Forest Officer, Kakinada for a period of 10 Years. ONGC undertakes to extend the financial support and the funds shall be earmarked in the budgets.

The plan proposed is for a duration of ten years and the amount indicated is suggestive. The items can be modified based on the needs from time to time. After approval of the proposed plan Forest authorities may constitute a committee with suitable members along with ONGC representatives as one of the members for review of the proposal, annual plans, periodic review of implementation, modification or review of the plans and timely release of funds.

Financial Outlay:

A detailed financial outlay has been proposed in annexure where a total of **Rs. 800 lakhs (Rs. Eight Crore only)** spread over ten years have been allocated for various activities. A detailed year wise expenditure plan is also included as follows.

1. Coringa Wildlife Sanctuary (WLM Division, Rajahmundry) – 650 lakhs
2. Outside Coringa Wildlife Sanctuary (Kakinada Division) – 150 lakhs
   Total: – **800 lakhs**

Fund Providers:

The Project proponents or Oil and Natural Gas Corporation Limited (ONGC), Kakinada would be responsible for providing all funds towards the implementation, monitoring, evaluation and review of this Wildlife Conservation Plan.

Placement of Funds:

Funds estimated to be spent in the plan period of 10 years shall be placed with PR.CCF (WL) & Chief Wildlife Warden, AP and designated as "Wildlife Conservation Plan, Coringa WLS & Outside CWLS, ONGC Funds" PR.CCF (WL) & Chief Wildlife Warden would then release it to DFO(WL), Rajamahendravaram and DFO, Kakinada according to the expenditure plan. It shall be ensured that "Wildlife Conservation Plan, Coringa WLS & Outside CWLS, ONGC Funds" are not utilised for any purposes other than those mentioned in this Wildlife Conservation Plan under any circumstances whatsoever. In case there is any particular work which can be conveniently handled by the user agency, the funds for the same can be left with the project authorities with the consent of CF/CCF, Rajamahendravaram.

Monitoring Committee:

A committee shall be formed under Chairmanship of DFO/DDF (WL) Rajamahendravaram. Other members of committee would be DFO, Kakinada and FRO, WLM Kakinada, FRO(T) kakinada and one representatives of User Agency.

Main responsibilities of Monitoring Committee would be as follows:

This committee shall monitor the implementation of this Wildlife Conservation Plan and the disbursement of the funds.

- The committee will look after proper documentation of outcomes of this plan implementation.
- The committee would also review the progress of the recommended measures at least twice every year and take action to correct the course, if required.
- The committee would also need to send an annual report to the Chief Wildlife Warden, Andhra Pradesh.

Reviewing Authority:

Principal Chief Conservator of Forests (WL) & Chief Wild Life Warden of Andhra Pradesh State would be the Reviewing Authority. The Monitoring Committee would present its annual report to Principal Chief Conservator of Forests (WL) & Chief Wildlife Warden through Conservator of Forests/Chief Conservator of Forests, Rajahmundry circle, Rajamahendravaram.

Outcome Documentation:

Proper documentation of wildlife conservation plan implementation shall be done by forest department and that document need to be shared with project authorities.

TABLE-15

Proposed Wildlife Conservation Plan funded by ONGC for development of Coringa Wildlife Sanctuary of Wildlife Management Division, Rajamahendravaram and Outside Coringa Wildlife Sanctuary of Kakinada Division for a period of 10 years for a period of 10 years ie., from 2021-22 to 2030-31

Sl. No.	Item of work	Proposals (Rs. in Lakhs)		
		Inside CWLS (DFO, WLM, K/Y)	Outside CWLS (DFO, KKD)	Total
1	2	3	4	5
I	**Habitat improvement**			
1	Weed removal in Mangroves	9.80	0.00	**9.80**
2	Enrichment planting in Mangroves	25.61	23.16	**48.77**
II	**Conservation activities**			
3	Marine turtle conservation programme at both inside and outside CWLS	40.00	0.00	**40.00**
4	Protection & improvement of bird congregation sites both inside and outside CWLS and its maintenance.	10.00	0.00	**10.00**
5	Whale shark conservation Programme along the Kakinada coast.	20.00	0.00	**20.00**
6	Vultures conservation Programme	10.00	0.00	**10.00**
III	**Research activities**			
7	Procurement of Camera traps/ DSLR Camera/ Binoculars/ GPS/ Compass/ Laptop/ Drone etc., and its maintenance for monitoring of wildlife	25.00	10.00	**35.00**
8	Service charges to Research Scholar for inventory on Flora and Fauna and data collection through camera trapping exercise, producing research documents and report etc., for 12 months for a period of 8 years.	54.84	0.00	**54.84**
IV	**Habitat protection activities**			
9	Procurement of vehicles for inspection purpose of DFO's and Forest Range Officers for inspection purpose.	40.00	40.00	**80.00**
10	Maintenance of Govt.vehicles of DFO's and Forest Range Officers for inspection purpose.	25.00	13.50	**38.50**
11	Procurement of boats for patrolling and inspection purpose	25.00	0.00	**25.00**
12	Maintenance of boats for patrolling and inspection purpose.	24.00	10.00	**34.00**

13	Construction of boundary pillars	6.00	0.00	6.00
V	**Wildlife rescue operations**			
14	Procurement of Rescue Van, Darting equipment, trap cages etc., and its maintenance	40.00	5.00	45.00
VI	**Development of Eco-tourism infrastructure at Coringa WL Sanctuary**			
15	Establishment of modern interpretation centre at Chollangi CBET area of Coringa Wildlife Sanctuary and its maintenance	40.00	0.00	40.00
16	Improvement works to existing interpretation centre at Coringa	10.00	0.00	10.00
17	Establishment of floating jetty and its maintenance	22.00	0.00	22.00
18	Construction/Maintenance of board walk	27.43	0.00	27.43
19	Improve visitor's facilities at CBET, Chollangi.	25.00	0.00	25.00
VII	**Publicity and Awareness creation**			
20	Conducting awareness camps for school, college students etc.,	11.00	10.00	21.00
21	Conducting workshops /Training to Staff members	15.00	5.00	21.00
22	Publicity material like hoardings, sign boards, brochure, posters and other souvenir items like caps, keychains, etc.,	16.00	5.50	21.50
23	Erection of display boards in prominent locations and along the boardwalk at Chollangi.	15.00	0.00	15.00
24	Conducting Bird festival/ Fishing cat day/ Otter day/ World wet land day/ World Forest Day/Mangrove Day/ Wetland Day/Wildlife week celebration etc.,	20.00	5.00	25.00
VIII	**Eco-Development/Livelihood Generation activities.**			
25	Distribution of TEDs to the fishermen community for conservation sea turtles.	5.00	3.00	8.00
26	Alternate Livelihood Generation training activities in Villages around Coringa WLS	10.00	9.00	19.00
IX	**Office support**			
27	Service charges to Unit- A clerical assistance for Assisting in Accounts (1 no for 12 months)	26.80	0.00	26.80

28	Service charges to Computer operator (1 no for 12 months)	43.65	0.00	43.65
29	Administrative expenditure like stationery, travelling allowance to officers and staff, CA audit fee and other Misc. items.	18.07	9.84	27.91
	Total:	**650.00**	**150.00**	**800.00**

Note: Detailed break-up of above plan both in Coringa Wildlife Sanctuary and Outside Coringa Wildlife Sanctuary is attached in Annexures-A & B

For the budget mentioned in Sl.no.9 (Rs. 80 Lakhs): Two (2 Nos) Toyota Innova crysta vehicles for DFO WL Rajahmundry and DFO, Kakinada & Two(2Nos) Mahindra Bolero vehicles for FRO WLM Kakinada and FRO Kakinada can be procured by the user agency and hand it over to forest department for inspection & monitoring purpose.

Chief General Manager(M)
Head HSE
BDA, ONGC KAKINADA

Divisional Forest Officer
Wildlife Management
Rajamahendravaram

District Forest Officer,
Kakinada Division,
Kakinada.

LIST OF REFERENCES AND SOURCES OF SECONDARY DATA:

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5) Krishnan S and S. S. Mishra (1991) Fishes: Zool. Surv. India Estuarine Ecosystem Series4: Fauna of Godavari Estuary: 85-166.

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11) UNDP (2012)Research Strategies for Conservation of Coastal and Marine Biodiversity in the East Godavari River Estuarine ecosystem (EGREE), Andhra Pradesh, India.

Proposed Wildlife Conservation Plan funded by ONGC for development of Coringa Wildlife Sanctuary of Wildlife Management Division, Rajamahendravaram for a period of 10 years for a period of 10 years ie., from 2021-22 to 2030-31

(Amt. Rs. in lakh s)

Sl. No.	Name of work	Rate (Rs. in lakhs)	Per	2021-22		2022-23		2023-24		2024-25		2025-26		2026-27		2027-28		2028-29		2029-30		2030-31		Total	
				Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
I	**Habitat improvement**																								
1	Weed removal in Mangroves	0.15	Ha	3	0.75	3	0.82	3	0.90	3	0.81	3	0.79	3	0.81	3	0.73		0.79		0.80	3	0.80	30	8.00
2	Construction of earthen bunds in Mangroves	0.05	Km	9	2.25	9	2.25	9	2.25	9	2.25	9	2.25	9	2.25	9	2.25		2.25		2.25	9	2.25	90	22.50
II	**Conservation activities**																								
3	Patrol under conservation programme (Land and water)	0.03	Boat operation	1	4.00	1	4.00	1	4.00	1	4.00	1	4.00	1	4.00	1	4.00	1	4.00	1	4.00	1	4.00	10	40.00
4	Procurement & improvement of Boat engine as per MoEF SOP, Engine cost as applicable	2.00		10	1.00	10	1.00	10	1.00	10	1.00	10	1.00	10	1.00	10	1.00	10	1.00	10	1.00	10	1.00	100	10.00
5	Boat trips for visitors (Departure to mangrove creek)	2.00		2	2.00	2	2.00	2	2.00	2	2.00	2	2.00	2	2.00	2	2.00	2	2.00	2	2.00	2	2.00	20	20.00
6	Patrol operation on Helicopter	1.00			5.00	2	5.00	2	5.00	2	5.00	2	5.00	2	5.00		5.00		5.00		5.00		5.00	10	50.00
III	**Research activities**																								
7	Development of Canopy walks, Tree Centred Elevated DFS, Canopy Lookout Cabins etc., and its upkeep and maintenance of wildlife	0.10	each	5	0.50	5	0.50	5	0.50	5	0.50	5	0.50	5	0.50	5	0.50	5	0.50	5	0.50	5	0.50	50	5.00
8	Study on changes in Physico Chemical, Hydrological Parameters in Water and Fauna and Flora and their relations in through Carbon Trading Activities, preparation of scientific documents and report etc., for 10 months for a consolidated Report	0.50	p.m.		6.00		6.00	1	5.00	1	5.00	1	5.00	1	5.00	1	5.00	1	5.00	1	5.00	1	5.00	6	51.00
IV	**Habitat protection activities**																								
9	Procurement of vehicles for patrolling purpose @ 1+0 (1 HP) Petrol Vehicle for day to day purpose	Actuals	Nos		8.00	2	16.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	2	40.00
10	Procurement of boat engines of 15HP & 40 Petrol Engine (DFS) for Mangrove protection	Actuals	Nos	2	0.60	2	1.60	2	1.60	2	1.60	2	1.60	2	1.60	2	1.60	2	2.00	2	2.00	2	2.00	20	17.00
11	Procurement of boats for patrolling and protection purpose	Actuals	Nos.		8.00	1	20.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	2	20.00
12	Procurement of boats for patrolling and protection purpose	Actuals	Nos	10	3.00	10	3.00	10	3.00	10	3.00	10	3.00	10	3.00	10	3.00	10	3.00	10	3.00	10	3.00	100	30.00
13	Construction of boundary bunds	3.00	Kms.		8.00		8.00	2	6.00	2	6.00	2	6.00	2	6.00	2	6.00	2	6.00	2	6.00	2	6.00	20	6.00
V	**Wildlife conservation activities**																								
14	Procurement of Canopy Van, Training Vessel, Tour Jeeps etc., and its maintenance	Actuals		1	0.10	1	10.00	1	0.00	1	0.00	1	0.00	1	0.00	1	0.00	1	0.00	1	0.00	1	0.00		10.00
VI	**Development of Eco-tourism activities at Coringa WL Sanctuary**																								
15	Procurement of boats in connection with activities of Drifting DFS area of Coringa Wildlife Sanctuary and its maintenance	1	no	1	1.00	1	10.00	1	0.00	1	0.00	1	0.00	1	0.00	1	0.00	1	0.00	1	0.00	1	0.00	10	10.00
16	Construction of jetties for drifting DFS boats/Mangrove nature trail/Canopy	Actuals	No.	1	1.00	1	1.00	1	1.00	1	1.00	1	1.00	1	1.00	1	1.00	1	1.00	1	1.00	1	1.00	10	10.00
17	Construction of Drifting DFS and its maintenance	Actuals	No.	1	1.00	1	5.00	1	1.00	1	1.00	1	1.00	1	1.00	1	1.00	1	1.00	1	1.00	1	1.00	10	22.00
18	Construction of Nature Trail	0.30	Kms		0.30		0.00	50	0.15	50	0.15	50	0.15	50	0.15	50	0.15	50	0.15		0.15	50	0.15	350	1.05
19	Erection of Watch Towers at DFS	Actuals		10	2.50	10	2.50	10	2.50	10	2.50	10	2.50	10	2.50	10	2.50	10	2.50	10	2.50	10	2.50	100	25.00
VII	**Public Relations activities**																								
20	Exhibition and awareness programmes	0.10	each	4	0.40	4	0.40	4	0.40	4	0.40	4	0.40	4	0.40	4	0.40	4	0.40	4	0.40	4	0.40	40	4.00
21	Exhibition and awareness Tents and Vehicles	0.50	Nos.	5	0.50	5	0.50	5	0.50	5	0.50	5	0.50	5	0.50	5	0.50	5	0.50	5	0.50	5	0.50	50	5.00
22	Publication of Brochures, Posters and other awareness materials like books, boys caps, etc.	Actuals			0.50		0.50		0.50		0.50		0.50		0.50		0.50		0.50		0.50		0.50		5.00
23	Collection of display boards in connection with awareness and training for schools in Villages	0.10	Nos	5	0.50	5	0.50	5	0.50	5	0.50	5	0.50	5	0.50	5	0.50	5	0.50	5	0.50	5	0.50	50	5.00
24	Conducting Boat Festival/ Rallying all over Godavari Estuary Region and Bay of Bengal Area, Photo Exhibition, Essay Competition, Poem Competition, Quiz Competition, awards to schools etc.,	0.50	Nos	1	0.50	1	0.50	1	0.50	1	0.50	1	0.50	1	0.50	1	0.50	1	0.50	1	0.50	1	0.50	10	5.00
VIII	**River Bank protection & Flood Water Harvesting activities**																								
25	Construction of RCC cc Wall Retaining wall/ bank of Gosthani river in Coringa	0.10	each	5	1.00	5	1.00	5	1.00	5	1.00	5	1.00		0.00		0.00		0.00		0.00		0.00	25	3.00
26	Afforestation in the Coringa Wildlife Sanctuary, Activities of Nallajeru and Gosthani Estuary etc.,	0.10	each	5	1.00	5	1.00	5	1.00	5	1.00	5	1.00	5	1.00	5	1.00	5	1.00	5	1.00	5	1.00	50	10.00
IX	**Office expenses**																								
27	Service charges to Staff & Vehicles engaged for Protection of Mangroves in the Coringa Wildlife Sanctuary	0.1000	Per Month		0.00		0.00	1	0.00	1	0.00	1	0.00	2	0.00	2	0.00	1	0.00	1	0.00	1	0.00	1	0.00
28	Service charges to Staff & Vehicles engaged for Protection of Mangroves in the Coringa Wildlife Sanctuary	0.0500	Per Month		0.00		0.00	1	0.00	1	0.00	1	0.00	1	0.00	1	0.00	1	0.00	1	0.00	1	0.00	1	0.00
29	Maintenance of Vehicles, Boats, Engines, Equipments, Travelling allowances to officers and staff, POL and other miscellaneous items	Lumpsum		10	1.00	10	1.00	10	1.00	10	1.00	10	1.00	10	1.00	10	1.00	10	1.00	10	1.00	10	1.00	100	10.00
	TOTAL																								

R.K. Patchamatla
CCF (HoD)
CWLW, Eastern Ghats Road
Rajamahendravaram - 533 105 (A.P.)

Divisional Forest Officer
Wildlife Management
Rajamahendravaram

Proposed Wildlife Conservation Plan funded by ONGC for development of Outside Coringa Wildlife Sanctuary through Divisional Forest Officer, Kakinada Division, Kakinada for a period of 10 years ie., from 2021-22 to 2030-31

(Amt. Rs. In Lakhs)

Sl. No.	Item of work	Unit cost (Rs. In Lakhs)	Unit	2021-22		2022-23		2023-24		2024-25		2025-26		2026-27		2027-28		2028-29		2029-30		2030-31		Total	
				Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
I	**Habitat improvement**																								
1	Enrichment planting in Mangroves	0.425	Ha	5	2.13	5	2.23	5	2.45	5	2.70	5	2.96	5	3.26	5	3.59	5	3.95		0.00	0	0.00	40	**23.18**
II	**Conservation activities**																								
III	**Research activities**																								
2	Procurement of Camera trapy/ DSLR Camera/ Binoculars/ GPS/ Computer/ Laptop/ Drone etc., and its maintenance for continuance of wildlife	0.25	each	4	1.00	4	1.00	4	1.00	4	1.00	4	1.00	4	1.00	4	1.00	4	1.00	4	1.00	4	1.00	40	**10.00**
IV	**Habitat protection activities**																								
3	Procurement of vehicles for inspection purpose of DFO and Forest Range Officer for inspection purpose	Actuals	nos.		0.00	2	40.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	2	**40.00**
4	Maintenance of Field vehicles of DFO and Forest Range officer for inspection purpose.	Actuals	nos.		0.00	2	1.50	2	1.50	2	1.50	2	1.50	2	1.50	2	1.50	2	1.50	2	1.50	2	1.50	20	**13.50**
5	Maintenance of books for patrolling and manpower expenses.	Actuals	nos.	1.0	1.00	1.0	1.00	1.0	1.00	1.0	1.00	1.0	1.00	1.0	1.00	1.0	1.00	1.0	1.00	1.0	1.00	1.0	1.00	10	**10.00**
V	**Wildlife rescue operations**																								
6	Cost of Caring equipment, trap cages etc., and its maintenance	Actuals		1	0.50	1	0.50	1	0.50	1	0.50	1	0.50	1	0.50	1	0.50	1	0.50	1	0.50	1	0.50	10	**5.00**
VI	**Development of Eco-tourism infrastructure**																								
VII	**Publicity and Awareness creation**																								
7	Conducting Awareness camps in Inland range/ Outlands etc.,	0.50	each	2	1.00	2	1.00	2	1.00	2	1.00	2	1.00	2	1.00	2	1.00	2	1.00	2	1.00	2	1.00	20	**10.00**
8	Conducting workshops /Training to Staff members	0.50	Nos.	1	0.50	1	0.50	1	0.50	1	0.50	1	0.50	1	0.50	1	0.50	1	0.50	2	1.00	2	1.00	12	**6.00**
9	Publicity material like hoardings, sign boards, brochures, posters and other tourist items like mats, brochures, etc.,	Actuals			Ls	0.50	Ls	0.50	Ls	0.50	Ls	0.50	Ls	0.50	Ls	0.50	Ls	0.50	Ls	0.50	Ls	1.00	Ls	0.50	**5.50**
10	Conducting Bird Festival/ Fishing cat day/ Otter day/ World wet land day/ World Forest Day/Mangrove day/ Wetland Day/Wildlife week celebration etc.,	0.50	Nos.	1	0.50	1	0.50	1	0.50	1	0.50	1	0.50	1	0.50	1	0.50	1	0.50	1	0.50	1	0.50	10	**5.00**
VIII	**Eco-Development/ Livelihood Generation activities.**																								
11	Distribution of LPGs to the fishermen community for conservation and SHGs	0.20	each	4	0.80	4	0.80	3	0.60	3	0.60	2	0.40		0.00		0.00		0.00		0.00		0.00	15	**3.00**
12	Alternate Livelihood Generation Activity activities in Inland Wetland Coringa WLS	0.50	each	2	1.00	2	1.00	2	1.00	2	1.00	2	1.00	2	1.00	2	1.00	2	1.00	1	0.50		0.00	17	**8.50**
IX	**Office support**																								
13	Administrative expenditure like stationery, Travelling allowance to officers and staff, TA/ audit fee and other miscellaneous	Actuals			Ls	1.14	Ls	1.07	Ls	1.42	Ls	1.40	Ls	1.11	Ls	0.74	Ls	0.51	Ls	0.50	Ls	0.50	Ls	0.50	Ls	**9.84**
	Total:					**10.00**		**12.20**		**12.00**		**12.00**		**12.00**		**11.50**		**10.00**		**10.00**		**9.00**		**7.50**		**180.00**

B.L. Pakkanaik
CCA(Retd)
ONGC, Eastern Onshore Asset
KAKINADA - 533 005 (A.P.)

District Forest Officer,
Kakinada Division
Kakinada

Unit cost for Conservation of Sea Turtles at Hope Island

Sl. No	Item of work	Qty	Rate	Per	Amount in Rs.
1	Wages to unskilled labour for protection to turtles 5 months	5 nos. x 150 days	370	Day	277500
2	Hospitality charges for protection helpers.	5 nos x 150 days	70	Day	52250
3	Construction of hatchery.		Actuals		20000
4	Communication and supervision charges.	10 camps	7500	Camp	75000
5	Preparation of INSITU hatchery.	300 nos	100	each	30000
6	Misc. expenditure such as Torch lights, Dry Cells, Kerosine lamps, cycles etc.		Actuals		41250
	Total :				500000

Abstract for 2021-22

1 Hope island	500000
Total :	**500000**

R.K. Pattanayak
CSM Hindu,
DMS, Rajam Division Head,
KAKINADA - 533 005 (A.P.)

Divisional Forest Officer,
Wildlife Management,
Rajamahendravaram

Data Sheet

Calculation of Wage rates

Sl. No.	Unit	Base Rate	TA/ Food	EPF (13%)	ESI (3.25)	Service Charge (5%)	G.S.T (18%)	Remuneration as per for the year 2020-21	Remarks
1	Data Entry Speator (Rs. 715 p.d x 28 days)	18590	0	1950	604	550	3980	25608	As per SSR
1	Research Scientist	20800	5000	3950	676	640	5076	33376	As per SSR
2	Unit-A Class clericle assistance (Rs. 450 p.d x 28 days)	11960	0	1555	389	359	2567	16830	Dist.Collector wage rate
3	Unit: B Class watch and ward (Rs.370 p.d x 28 days)	9630	0	1251	313	289	2069	13537	Dist.Collector wage rate

Divisional Forest Officer,
Wildlife Management,
Rajamahendravaram.

R.M. Patnaik
CFSM (Hon)
DFO, Eastern Circle, Now
RAJAHMUNDRY - 533 103 (A.P.)

DATA SHEET FOR ENRICHMENT MANGROVE PLANTATING IN CORINGA WILDLIFE SANCTUARY OF WILDLIFE MANAGEMENT DIVISION, RAJAMAHENDRAVARAM DURING THE YEAR 2021-22

Sl. No.	Name of the work	FSR Item No	Qty	Rate as per FSR 2021-22	per	Total amount per ha.
1	2	3	4	5	6	7
	Chanelling					
A	Advance operations:					
1	Digging of field channels Earthwork Excavation in slippy soils in wet and slushy condition cst 144.00 cum per ha	As per RSSR	144	198.32	cum	28736.16
2	Transport of labour and labour amenities	2.3.17	4/4	10.13		6111.12
	Planting					
3	Planting Bag Plants for mangrove plantations	2.3.5	800	237.31	100 nos	1917.68
4	Transportation of mangrove plantations (Nursery to Planting point upto 2 km) transport of mangrove Bag plants 10 x 12.5 cm size upto 5 km	2.3.5	800	187.32	100 nos	1008.56
5	Transportation of mangrove plantations (Nursery to Planting point upto 2 km) transport of mangrove Bag plants 10 x 12.5 cm size upto 5 km	2.3.5	800	44.16	100 nos	360.28
6	Transportation of mangrove seedlings by boats beyond 5 to 10 km for each km (4.74/5= 22.53)	2.4.5	800	23.68	100 nos	188.48
7	Contingencies				Ls	166.42
	Total:					48500.00

Quantity of Earthwork excavation per Ha

1) DIMENSIONS PROPOSED

Field chan nels

$\frac{2.00+0.40}{2} \times 0.15 \times 600$ rm = 144 cum

144 cum

Rate for 2021-22 — 48500

R.M. Pandiaraju
Chief Planner
Chief Extn Officer Hqrs
Kakinada - 533 003 (A.P.)

Divisional Forest Officer,
Wildlife Management,
Rajamahendravaram