भारतीय राष्ट्रीय राजमार्ग प्राधिकरण

(सड़क परिवहन और राजमार्ग मंत्रालय, भारत सरकार)

NATIONAL HIGHWAYS AUTHORITY OF INDIA

(Ministry of Road Transport & Highways, Government of india)

परियोजना कार्यान्वयन इकाई - वरंगल

1-8-630, बालासमुद्रम, हनमकेंडा, वरंगल - 506 001, तेलंगाना.

PROJECT IMPLEMENTATION UNIT - WARANGAL

1-8-630, Balasamudram, Hanamkonda, Warangal - 506 001, Telangana.

टेली // Phone : 0870-2553535 ईमेल / email : piuwarangal@nhai.org ; nhaiwarangal@gmail.com

UO2945/22/WL

24/2/2022

19 FEB 2022

NHAI/PIU-WGL/M-W/2022/ 251 **17.02.2022**

Prl.Chief Conservator of Forests(HoFF)
Aranya Bhavan
Saifabad, Hyderabad
Telangana-500004

Sub: Construction of Four Lane Access Controlled New Greenfield Highway section of Mancherial – Warangal section of NH 163G under Nagpur-Vijayawada Corridor in the state of Telangana under Inter corridor route of Bharatmala Pariyojana - **Submission of conservation plan for Shiwaram Wildlife Sanctuary for obtaining the clearance reg.,**

Ref: PIU, Warangal lr.no NHAI/PIU-WGL/M-W/2021/1394 dated 17.12.2021

Sir,

As you are aware that the Mancherial-Warangal Greenfield Alignment of NH 163G is proposed by Govt. of India for the development of highway in the Telangana State under Nagpur-Vijayawada corridor.

2. The proposed alignment is passing 200-300m away from the Shiwaram Wildlife Eco-sensitive zone, for which NOC is required as a part of Environment clearance from the Forest Department.

3. In view of the above, a conservation plan for Shiwaram Wildlife Sanctuary is herewith submitting and requested for issuing NOC/clearance at the earliest, please.

Yours faithfully

17/02/22

(Kishor Raghunath Fule)
Project Director

Encl : Conservation Plan

Copy to:
1.District Forest Officer, Mancherial for information, please.
2.Forest Divisional Officer, Chennur for information, please.
3.Regional Office, Hyderabad for information, please.

CONSERVATION PLAN
OF
Crocodile *(Crocodylus palustris)*
FOR

Proposed Construction of 4 lane Access Controlled New Greenfield Highway Section of Mancherial – Warangal, design Km 108+406 under inter corridor route under Bharatmala Pariyojana, Phase-I in the state of Telangana.

WL-I
We have received the covering letter in Tapal yesterday. Pl open a new file on this proposal & put up for perusal of CWLW
22/11/22

Prepared by

Enviro Infra Solutions Pvt Ltd
301, 302 Sector – 9, Vasundhara,
Ghaziabad, Uttar Pradesh - 201012
NABET Certificate No. & Issue Date: NABET/EIA/1922/RA 0157
valid till November 13, 2022

Mancherial – Warangal of length 112.240 km from Ramaraopet village to Oorugonda village (Design Chainage 0+000 to 112+240) under inter corridor route under Bharatmala Pariyojana, Phase - I in the state of Telangana.	Conservation Plan of Crocodile

Project Description

Ministry of Road Transport and Highways, Government of India, has decided to improve the efficiency of freight movement in India. National Highways Authority of India (NHAI) has been entrusted for preparation of DPR to improve the road networks in the state of Telangana.

In pursuance of the above M/s. K & J Projects Pvt. Ltd. has been appointed as Consultant for preparation of DPR for development of Economic Corridors, Inter Corridors and Feeder Routes to improve the efficiency of freight movement in India under Bharatmala Pariyojana.

The proposed project highway starts from Ramaraopet village in Macherial district and terminates at Oorugonda village in Warangal district in the state of Telangana from CH: 0+000 to 112+240 km. The length of the proposed alignment is 112.240 km approx. However initial 3.834 km of stretch is as section of NH-63, overlapping with greenfield alignment is excluded from the current project scope. (As overlapping stretch on NH-63 is developed State NH (R&BD), in different scheme. Present project highway starts on at Narva village of Manherial district and terminates at at Oorugonda village in Warangal district in the state of Telangana from CH: 3+834 to 112+240 km, revised design length is 108.406 km.

This is a green field alignment, access control and is proposed for 4-Lane. The main objective of the proposed project is to reduce the distance and travel time in Telangana and to give connectivity to remote area. The project lays emphasis on development of these areas and makes them available with the resources.

The proposed highway would act as the prime artery for the economic flow to this region. It will enhance economic development, provide employment opportunities to locals, strengthen tourist development, ensure road safety, and provide better transportation facilities and other facilities such as way side amenities. Vehicle operating cost will also be reduced due to improved road quality. The compensatory plantation and highway side plantation shall further improve the air quality of the region (Table – 1).

Table 1: – Salient Features of Project

Project name	"Construction of 4 lane access controlled new greenfield highway section of Mancherial – Warangal of length 108.406 km from Narva village to Oorugonda village (Design Chainage 0+000 to 112+240) under inter corridor route under Bharatmala Pariyojana, Phase-I in the state of Telangana." **Proposed Length** – 108.406 Km
Location	The proposed project highway starts from Narva village in Macherial district and terminates at Oorugonda village in Warangal district in the state of Telangana from CH: 3+834 to 112+240 km.
Latitude & Longitude	**Start Location** : 18°51'4.54" N 79°31'14.26" E **End Location**: 18° 2'36.76" N, 79°41'7.41" E
Land use	Agricultural land
Nearest railway station	Mancherial Railway Station (approx. 8.5 Km, aerial)
Nearest Airport	Warangal Airport (Approx. 18 Km, aerial)

Mancherial – Warangal of length 112.240 km from Ramaraopet village to Oorugonda village (Design Chainage 0+000 to 112+240) under inter corridor route under Bharatmala Pariyojana, Phase - I in the state of Telangana.	Conservation Plan of Crocodile

Seismic Zone	The area falls under seismic zone III which is categorized as low seismic zone. (As per 1893:2002)

The proposed project is the construction of 4 lane access controlled new greenfield highway section of Mancherial – Warangal of length 108.406 km from Narva village to Oorugonda village (Design Chainage 3+834 to 112+240) under inter corridor route under Bharatmala Pariyojana, Phase-I in the state of Telangana.

Alignment was approved on dated: 22.02.2019 vide reference no. NHAI/Planning/EC/ Misc /2019 (office memorandum) through meeting on dated 02.01.2019 under the chairmanship of secretary, RT&H, MoRT&H. The major settlements along the alignment are Mancherial, Manthani, Mutharam, Tekumatla, Mogullapally and Warangal.

The proposed highway shall be constructed to IRC: SP: 84 -2019, "Manual of Specifications and Standards for highway" design standards and as per NHAI latest circular vide NHAI/ Bharatmala /EC/DPR/2016 Dt. 14.05.2018. All safety measures will be provided as IRC: SP: 55 and prevailing circular/notification of govt. of India/NHAI. There is provision of 2 nos. toll plazas, 4 nos. trucks lay byes, 4 nos. of rest area and 43 nos. of high mast lights have been proposed.

The land use pattern on 10 km either side of the project highway is predominately agriculture followed by habitation, forest and waste land. The alignment does not pass through any wild life sanctuary, protected area and its eco sensitive zone. The proposed project is approx. 300m away from the proposed Eco Sensitive zone of Shivaram Wildlife Sanctuary as per draft Notification No. SO 2145(E) dated 246 May 2018.

The proposed land acquisition for the proposed alignment is approx. 595.686 ha. The proposed highway will have ROB - (1), Major Bridges - (5), Minor Bridges - (45), Intersection - (1), Vehicular underpasses - (24), Pedestrian underpasses - (35), LVUPs - (4), SVUPs - (9), Box Culverts – (146), Pipe Culverts – (36) and Flyovers – (5).

IDENTIFICATION OF PROJECT PROPONENT

Ministry of Road Transport and Highways, Government of India, has decided to improve the efficiency of freight movement in India. National Highways Authority of India (NHAI) has been entrusted for preparation of DPR to improve the road networks in the State of Telangana.

Need for the Project and Importance to the Country or Region

The proposed access controlled project with new alignment has been envisaged through an area which shall have the advantage of simultaneous development as well as shall result in a shorter distance to travel. The junctions with existing road will be planned in the form of interchanges and flyover to ensure uninterrupted flow of traffic.

The proposed highway would act as the prime artery for the economic flow to this region. It will enhance economic development, provide employment opportunities to locals, strengthen tourist development, ensure road safety, and provide better transportation facilities and other facilities such as way side amenities. Vehicle operating cost will also be reduced due to improved road quality. The compensatory plantation and highway side plantation shall further improve the air quality of the region.

Climate Condition

Project area experiences typical Indian climatic conditions. Summer season is hot and the temperatures can climb rapidly during the day. Monsoon season brings certain amount of rainfall and the temperatures gradually reduce during this period. After the onset of the monsoon day temperatures are much lower and as the winter approaches they reduce further.

Summer season is from March and lasts till the end of May. During this time day temperatures are high and can reach 40 °C to 42 °C. Humidity is low as it is not located near the ocean. Conditions are generally dry during this period and the temperatures range from a minimum of 35 °C and can rise up to a maximum of 40 °C to 45 °C. Monsoon season brings much needed relief from the heat. Monsoon seasons are from the months of June to September. Temperatures average around 30 °C during this period. The place gets rain from the South West Monsoon. Some amount of rainfall can be experienced in the October as well. Winter season is from December to February. January is usually the coldest parts of the year. Temperatures range around 28 °C to 34 °C during this time.

Biological Environment

Biodiversity loss in natural ecosystems due to the developmental activities is a serious threat. Anthropogenic factors like cultivation encroachments, land use, acid rains, climate changes and introduction of exotic plant-animal are significant factors to degrade biological diversity of a region. Therefore, it is an essential practice to understand the status of the flora and fauna of an area before any development activities for an inclusive planning in advance.

The proposed project is a 108 km long National Highway which connects major settlements like Mancherial, Manthani, Mutharam, Tekumatla, Mogullapally and Warangal. The land use pattern on 10 km either side of the project highway is predominately agriculture followed by habitation, forest and waste land. The alignment does not pass through any wild life sanctuary, protected area and its eco sensitive zone.

Methodology

The data has been collected through primary sources (field survey, Interview) in addition to information gathered from various secondary sources (Concerned Departments).

All project's associate secondary data has been collected on regional environmental from various reports pertaining to Government Agencies / Institutions and through literature reviews. The study was carried out during pre-monsoon season (April 2021 to June 2021). Thus, the study sites were selected along the proposed road alignment based on the land use of the project area.

Total 08 nos. of sampling locations along roads and canals were selected within the proposed alignment/RoW and in the nearby sanctuary for Sampling location for ecological survey (Table – 2, Figure – 1).

Mancherial – Warangal of length 112.240 km from Ramaraopet village to Oorugonda village (Design Chainage 0+000 to 112+240) under inter corridor route under Bharatmala Pariyojana, Phase - I in the state of Telangana.	Conservation Plan of Crocodile

Table – 2: Sampling location for ecological survey

Site Code	Location Name and Nearest Channge	Geocoordinates
EB1	Starting Point (0+450)	18.85123°N 79.52061°E
EB2	At NH16 near Rasoolpally (3+900)	18.84210°N 79.55519°E
EB3	At Rommipur local forest (16+800)	18.75356°N 79.61923°E
EB4	Godavari River Along with Agriculture field (26+100)	18.69444°N 79.65277°E
EB5	Near to Potharam village (55+900)	18.52924°N 79.61591°E
EB6	At crossing with Mainer River (63+ 050)	18.47997°N 79.65518°E
EB7	Near to issipet, Warangal (89+400)	18.24761°N 79.67379°E
EB8	At Crossing with NH 163 (110 + 350)	18.06048°N 79.68271°E

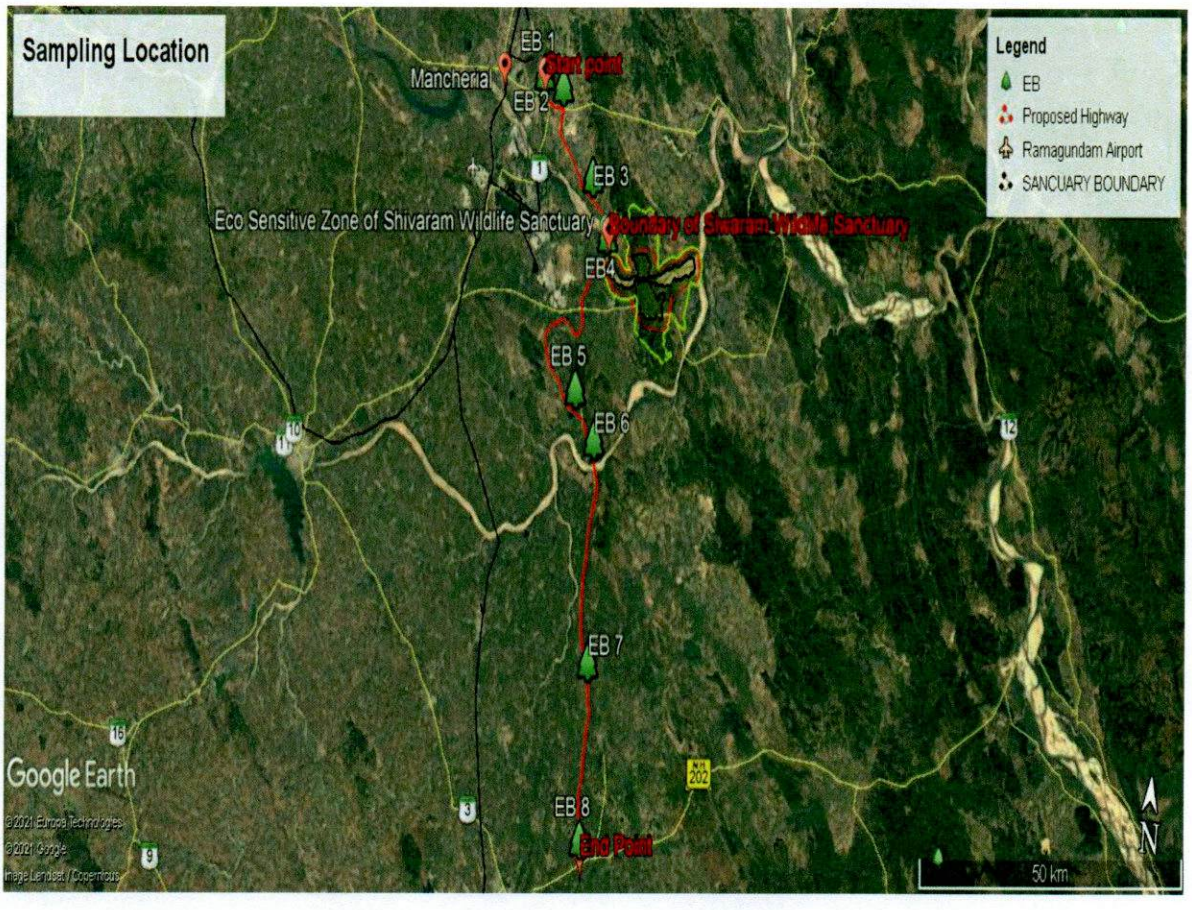

Figure – 1: Sampling location for ecological survey

Forest types

Telangana, located strategically in the central region of the Indian sub-continent, has representatives of Indian plant and animal life. The vegetation found in the state is largely of dry deciduous type with a mixture of teak, and species of the genera like Terminalia, Pterocarpus, Anogeissus etc. As per the Champion & Seth classification (1968), following types of the forests are found in the project area;

- **5A/C3 Southern Dry Mixed Deciduous Forest**
- **5B/DS1 Dry Deciduous Scrub**
- **5A/C1b Dry Teak Forest**
- **5/2S1 Secondary Dry Deciduous Forest**

The State of Telangana is endowed with rich diversity of Flora and Fauna. The State has dense Teak forests on the northern part along the banks of river Godavari. Three National Parks and nine Wildlife Sanctuaries constitute the Protected Area network of the State covering 5.08% of its geographical area.

As per the SFR, FSI 2019, the Forest Cover in the State is 20,582.31 sq km which is 18.36 % of the State's geographical area. In terms of forest canopy density classes, the State has 1,608.24 sq km under Very Dense Forest (VDF), 8,787.13 sq km under Moderately Dense Forest (MDF) and 10,186.94 sq km under Open Forest (OF) mentioned in Table – 3 and 4.

Table – 3: Forest Cover of Telangana (Sq km)

Class	Area	% of GA
VDF	1,608.24	1.43
MDF	8,787.13	7.84
OF	10,186.94	9.09
Total	**20,582.31**	**18.36**
Scrub	3,615.04	3.23

Source: FSI Report 2019

Table – 4: Forest cover of State and Districts Under Proposed Project (km^2)

District	Geographical Area (km^2)	Very Dense Forest (km^2)	Mod. Dense Forest (km^2)	Open Forest (km^2)	Total (km^2)	% of GA
Adilabad	16,105	150.25	3,247.07	2,324.00	5,721.32	35.53
Warangal	12,846	327.54	1,340.50	1,285.37	2,953.45	22.99
Telangana State	1,12,077	1,608.24	8,787.13	10,186.94	20,582.31	18.36

Source: FSI Report 2019

Note: the Mancherial district has been recently formed from the district Adilabad.

Eco-sensitive Areas in the Project Area

The proposed project alignment is passing close to the draft ESZ of the Siwaram (Crocodile) Wildlife Sanctuary from Ch. 25+000 to Ch. 26+000 near village Gopalpur . The Siwaram (Crocodile) Wildlife Sanctuary is one of the oldest Protected Areas of the State of Telangana established vide GO Ms.No.364 Forest & R&D (For.III) Dt.20.05.1978. It is an abode for a variety of flora and fauna. The Siwaram (Crocodile) Wildlife Sanctuary is an ideal Crocodile Habitat with perennial water source in River Godavari in the form of

a pond, locally called as "Madugu". The total area of the Siwaram Sanctuary is 29.81 Sq. Kms.

The Siwaram (Crocodile) Wildlife Sanctuary is a largely perennial water body of Godavari River with rich aquatic fauna including Crocodiles, Turtles, Mammals, Reptiles, Fishes, Amphibians, Birds and Invertebrates. The terrestrial fauna found around the sanctuary are Indian Flying Fox (Vulpes bengalensis), Common Langur (Presbytis entellus), Sloth bear (Melursus ursinus), Indian Wild Dog (Cuon alpinus), Indian Fox (Vulpes bengalensis), Jackal (Canis aureus), Spotted deer (Axis-Axis), Chousingha (Tectracerus quadricormis), Nilgai (Boselaphus tragocamelus) etc., the adjacent forests is mainly tropical dry deciduas mixed forest.

The main Flora available in the Eco-sensitive zone are Anogeissus latifolia, Terminalia tomentose, Cleistanthus collinus, Sterculia urens, Hardwickia binata, Madhuca indica, Lagerstroemia parviflora, Lannea coromandelica , Terminalia tomentosa, Terminalia arjuna, Wrightia tinetoria, Diospyros melanoxylon, Strychnos potatorum, Strychnos nux-vomica, Semicarpus anacardium, The Siwaram Crocodile Wildlife Sanctuary is a natural aquatic eco-system with crocodile as apex species. The status of Crocodile reflects not only the health of the eco-system and its prey species, but also the effectiveness of the conservation efforts . The Siwaram Crocodile Wildlife Sanctuary also supports other variety of herbivorous fauna like Spotted deer. Nilgai etc. and carnivorous fauna like Leopard etc.

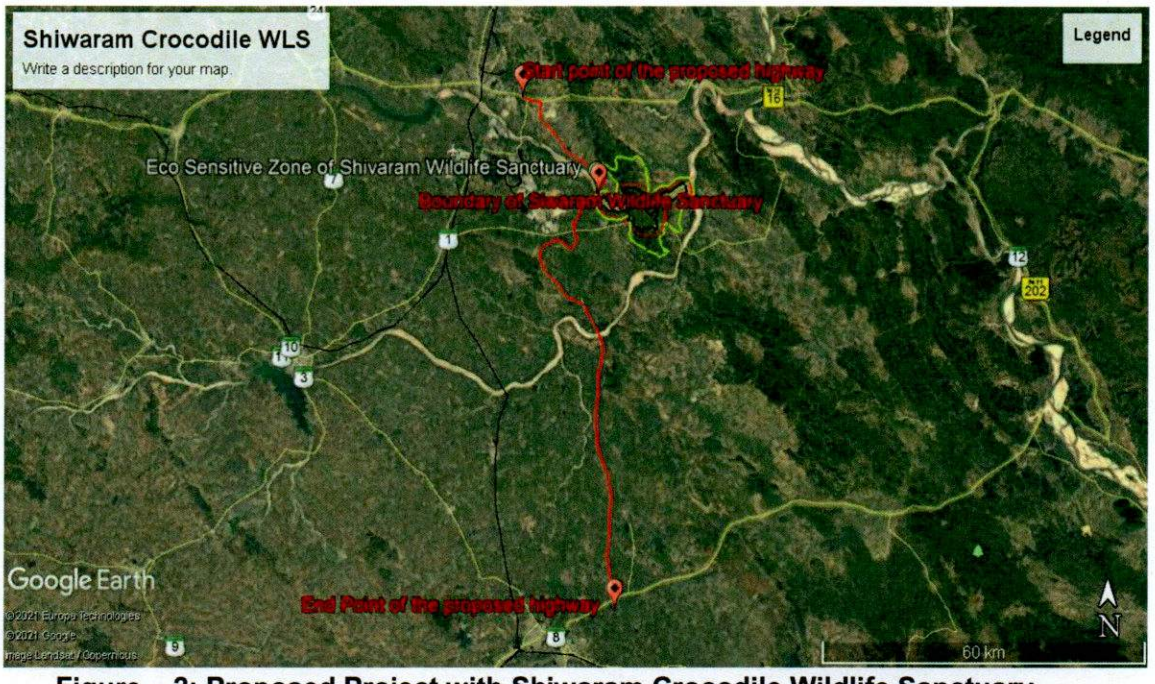

Figure – 2: Proposed Project with Shiwaram Crocodile Wildlife Sanctuary

DESCRIPTION OF FLORA IN THE STUDY AREA IN BUFFER ZONE

A total 93 tress were found in project laying area. Dominant species are Palmyra palm (*Borassus flabellifer*), Karanj (*Pongamia pinnata*), babul (*Acacia Arabica*) (Table – 5). In shurbs a total of 26 species have been recorded among which the most common are *Abutilon indicum, Calotropis gigantean, Cassia tora, Dodonaea viscosa, Gardenia gummifera Ixora parviflora, Urena lobata,* Vitex negundo(Table – 6). In herbs, a total of 87 species have been recorded among which the most common species are *Ageratum conyzoides, Blepharis boerhaavia, Borreria hispida, Cassia occidentalis, Cassia tora, Eclipta alba, Mollugo nudicaulis, Oldenlandia corymbosa, Sida cordata, Triumfetta rhomboidea*

(Table – 7). In Grasses a total of 42 Species are recorded and among which the most common species are *Apluda mutica, Chloris tennella, Chloris barbata, Cyperus rotundus, Cynodon dactylon, Eriochloa procera, Eleusine indica, Tragus biflorus, Sporobolus coromandelianus* spcies are found in the project area (Table – 8).). In Climbers a total of 37 Species are recorded and among which the most common species are *Abrus precatorius, Asteracantha longifolia, Cissampelos pareira, Cyperus iria, Echinochloa colona* (Table – 9).

Table – 5: Trees found in the Project area

S. No.	Botanical Name	Family	Local / Common name
1.	*Acacia arabica*	Fabaceae	Babul
2.	*Acacia ferruginea*	Fabaceae	Safed Khair
3.	*Acacia leucophloea*	Fabaceae	Safed babul
4.	*Acacia sundra*	Fabaceae	Khair Sundra
5.	*Adina cordifolia*	Rubiaceae	Bandaru
6.	*Aegle marmelos*	Rutaceae	Maredu
7.	*Ailanthus excelsa*	Simaroubaceae	Peddammanu
8.	*Alangium salvifolium*	Alangiaceae	Udaga
9.	*Albizia lebbeck*	Fabaceae	Durshanam
10.	*Albizia odoratissima*	Fabaceae	Siris
11.	*Albizia odoratissima*	Fabaceae	Ceylon Rosewood
12.	*Albizia procera*	Fabaceae	Safed siris
13.	*Annona squamosa*	Annonaceae	Seetaphal
14.	*Anogeissus latifolia*	Combretaceae	Tirman, Dhaura
15.	*Azadirachta indica*	Meliaceae	Neem Vepa
16.	*Bauhinia racemosa*	Fabaceae	Ari
17.	*Bombax ceiba*	Malvaceae Juss.	Buruqu
18.	*Borassus flabellifer*	Arecaceae	Taad, Palmyra palm
19.	*Boswellia serrata*	Burseraceae	Anduk, Shallaki,Salai
20.	*Bridelia retusa*	Phyllanthaceae	Mulmaddi, Kaji
21.	*Buchanania angustifolia*	Anacardiaceae	Chironji
22.	*Buchania latifolia*	Anacardiaceae	Achar, Chironji
23.	*Butea monosperma*	Fabaceae	Palas
24.	*Careya arborea*	Lecythidaceae	Budhadharmi
25.	*Cassia fistula*	Fabaceae	Rela, Amaltas
26.	*Cassia siamea*	Caesalpiniaceae	Nalla thangedu , Amaltas
27.	*Chloroxylon swietenia*	Rubiaceae	East Indian Satin
28.	*Cleistanthus collinus*	Phyllanthaceae	Nalla Kodsha, Garrar
29.	*Cochlospermum religiosum L. Alston*	Cochlospermaceae	Kondagogu, Buttercup Tree
30.	*Dalbergia paniculata*	Fabaceae	Sopera/Pancharri
31.	*Dalbergia sissoo*	Fabaceae	Sisu, Indian Rosewood
32.	*Dichrostachys cinerea*	Fabaceae	Veluturu, Kalahari Christmas tree
33.	*Diospyros chloroxylon*	Ebenaceae	Illintha, Kala Tendu
34.	*Diospyros melanoxylon*	Ebenaceae	Abnus Tunki
35.	*Dolichandrone falcata*	Bignoniaceae	Waddi, Hawar
36.	*Elaeodendron glaucum*	Celastraceae	Bhuthankush, Jamrasi
37.	*Erythrina suberosa*	Fabaceae	Mullu Modugu
38.	*Erythroxylum monogynum*	Erythroxylaceae	Devadaru, Bastard Sandal

39.	*Eucalyptus globulus*	Myrtaceae	Nilgiri
40.	*Eugenia jambolana*	Myrtaceae	Jamun Neredu
41.	*Feronia elephantum*	Rutaceae	Kaweet
42.	*Ficus bengalensis*	Moraceae	Marri, Indian banyan tree
43.	*Ficus glomerata,*	Moraceae	Medi Gular, Cluster Fig
44.	*Ficus religiosa*	Moraceae	Peepal Ragi
45.	*Gardenia gummifera*	Rubiaceae	Chitmit/ Dikamali, Cumbi-gum tree
46.	*Gardenia latifolia*	Rubiaceae	Peddakaringa
47.	*Garuga pinnata*	Burseraceae	Garugu
48.	*Givotia rottleriformis*	Euphorbiaceae	Punki, White Catamaran Tree
49.	*Gmelina arborea*	Lamiaceae	Gummadi Teku
50.	*Grewia tiliaefolia*	Malvaceae Juss.	Teku, Dhaman
51.	*Gyrocarpus jacquini*	Hernandiaceae	Kumarpunki
52.	*Hardwickia binata*	Fabaceae	Nara yepa, Indian Blackwood
53.	*Holarrhena antidysenterica*	Apocynaceae	Istaripala
54.	*Holoptelea integrifolia*	Ulmaceae	Namalinara, Indian Elm
55.	*Hymenodictyon excelsum*	Rubiaceae	Chidippa
56.	*Ixora arborea*	Rubiaceae	Korvi
57.	*Lagerstroemia parviflora,*	Lythraceae	Channangi, *Crepe Flower*
58.	*Lannea coromandelica*	Anacardiaceae	Gumpena, Jhingam
59.	*Madhuca indica Madhuca Longifolia*	Sapotaceae	Mohwa
60.	*Mallotus philippinensis*	Euphorbiaceae	Kum kum, Kamala Dye Tree
61.	*Mangifera indica*	Anacardiaceae	Mamidi Aam
62.	*Melia azadirachta*	Meliaceae	Truka Vepa
63.	*Millingtonia hortensis*	Bignoniaceae	Akashneem
64.	*Mimusops hexandra*	Sapotaceae	Khirni
65.	*Mitragyna parvifolia*	Rubiaceae	Battaganam
66.	*Morinda tinctoria*	Rubiaceae	Togarmogli
67.	*Ougeinia oojeinensis*	Fabaceae	Dargu, Chariot Tree
68.	*Phoenix sylvestris*	Arecaceae	Eetha, Date palm
69.	*Phyllanthus emblica*	Phyllanthaceae	Amla, Indian Gooseberry
70.	*Polyalthia cerasoides*	Annonaceae	Chilkaduddi
71.	*Pongamia pinnata*	Fabaceae	Karanj Kanuga, Hongay oil tree
72.	*Prosopis cineraria*	Fabaceae	Jammi, Jand
73.	*Pterocarpus marsupium*	Fabaceae	Bijasal, Bastard teak
74.	*Schleichera trijuga*	Sapindaceae	Pusku
75.	*Schrebera swietenioides*	Oleaceae	Mokab, Weaver's Beam Tree
76.	*Semecarpus anacardium*	Anacardiaceae	Bhilawa Jeedi
77.	*Soymida febrifuga*	Meliaceae	Somi
78.	*Spondias mangifera*	Anacardiaceae	Jungli anar
79.	*Sterculia urens*	Malvaceae Juss.	Tapsi
80.	*Stereospermum chelonoides*	Bignoniaceae	Kappa gargu

81.	*Streblus asper*	Moraceae	Bajar Danti
82.	*Strychnos nux-vomica*	Loganiaceae	Kuchala Musti
83.	*Strychnos potatorum*	Loganiaceae	Chilla
84.	*Tamarindus indica*	Fabaceae	Chinta, Imli
85.	*Tectona grandis*	Lamiaceae	Teku Saganan, Indian Oak
86.	*Terminalia arjuna*	Combretaceae	Yermaddi Tellamaddi, Arjun
87.	*Terminalia bellerica*	Combretaceae	Tado, Bahera
88.	*Terminalia chebula*	Combretaceae	Halela, Harra
89.	*Terminalia tomentosa*	Combretaceae	Nalla Maddi
90.	*Wrightia tinctoria*	Apocynaceae	Palakodsha, Dudhi
91.	*Xylia dolabriformis*	Fabaceae	Boja
92.	*Ziziphus mauritiana*	Rhamnaceae	Requ, Ber
93.	*Ziziphus xylopyrus*	Rhamnaceae	Gotti, Katber

Source: Primary field survey and Shiwaram Wildlife Sanctuary, Working Plan

Table – 6: Shrubs found in the Project area

Sr.No.	***Botanical Name***	**Family**	**Common Name**
1.	*Abutilon indicum*	Malvaceae	Itawari
2.	*Acalypha wilkesiana*	Euphorbiaceae	Panchotkam
3.	*Bridelia hamiltoniana*	Euphorbiaceae	Tadwad, Gondni
4.	*Calotropis gigantea*	Apocynaceae	Jiledu, Arka
5.	*Canthium coromandelicum*	Rubiaceae	Wild jessamine
6.	*Cassia auriculata*	Caesalpiniaceae	Tangedu
7.	*Cassia tora*	Caesalpiniaceae	Jungle anar, Chakunda
8.	*Dodonaea viscosa*	Sapindaceae	Diemali
9.	*Euphorbia pulcherrima*	Euphorbiaceae	Poinsettia
10.	*Flemingia strobilifera*	Fabaceae	Dandola, Kanphuta
11.	*Gardenia gummifera*	Rubiaceae	Cumbi-gum tree
12.	*Grewia sp.*	Tiliaceae	
13.	*Gymnosporia montana*	Celastraceae	Mountain Spike Thorn
14.	*Gymnosporia spinosa*	Celastraceae	Danti
15.	*Helicteres isora*	Malvaceae Juss.	Morophal
16.	*Ixora parviflora*	Rubiaceae	Korvi, Jilpai
17.	*Jasminum arborescens*	Oleaceae	Jungle mogra, Tree jasmine
18.	*Lantana camara*	Verbenaceae	Common lantana
19.	*Mimosa sp*	Leguminosae	
20.	*Nyctanthes arbor-tristis*	Oleaceae	Morophal, coral Jasmine
21.	*Randia dumetorum*	Rubiaceae	Manga
22.	*Streblus asper*	Moraceae	Vajradanti, Sewra
23.	*Tephrosia purpurea*	Fabaceae	Vempali, Common Tephrosia
24.	*Urena lobata*	Malvaceae	Nalla benda, Caesar's weed
25.	*Vitex negundo*	Lamiaceae	Shimbaloo, Nirgundi
26.	*Zizyphus nummularia*	Rhamnaceae	Regu kampa

Source: Primary field survey and Shiwaram Wildlife Sanctuary, Working Plan

Table – 7: Herbs found in the Project area

Sr.No.	***Botanical Name***	**Family**	**Common Name**
1.	*Acalypha ciliata*	Euphorbiaceae	
2.	*Acalypha indica*	Euphorbiaceae	Poonamayakki
3.	*Acanthospermum hispidum*	Asteraceae	Horn spine
4.	*Achyranthes aspera*	Amaranthaceae	Uttarenu

5.	*Aerva lanata*	Amaranthaceae	Pindidonda
6.	*Aerva monsoniae*	Amaranthaceae	
7.	*Ageratum conyzoides*	Asteraceae	Visadodi, Appa grass
8.	*Allmania nodiflora*	Amaranthaceae	Gurugu Koora
9.	*Alocasia indica*	Araceae	Man kachu
10.	*Alternanthera pungens*	Amaranthaceae	Thevadiyaal mul
11.	*Alyscarpus vaginalis*	Fabaceae	Chauli
12.	*Alysicarpus hamosus*	Fabaceae	
13.	*Alysicarpus monilifer*	Fabaceae	
14.	*Amaranthus spinosus*	Amaranthaceae	Mullatotakura
15.	*Amaranthus viridis*	Amaranthaceae	Chilaka-thotakoora
16.	*Andrographis echioides*	Acanthaceae	Lavalata
17.	*Bidens pilosa*	Asteraceae	Mukkuthi
18.	*Biophytum sensitivum*	Oxalidaceae	Little tree plant, Pulicenta
19.	*Blainvillea dichotoma*	Asteraceae	Murray
20.	*Blepharis boerhaavia*	Acanthaceae	
21.	*Blepharis molluginifolia*	Acanthaceae	
22.	*Boerhavia diffusa*	Nyctaginaceae	Atakamamidi
23.	*Borreria hispida*	Rubiaceae	Vasuka, Tartaval
24.	*Cassia absus*	Caesalpiniaceae	
25.	*Cassia obtusifolia*	Fabaceae	Sicklepod, Chinese Senna
26.	*Cassia occidentalis*	Fabaceae	Hawaii, septic weed
27.	*Cassia pumila*	Caesalpiniaceae	
28.	*Cassia tora*	Fabaceae	Foetid cassia
29.	*Catharanthus pusillus*	Apocynaceae	Gaddipoolu
30.	*Catharanthus roseus*	Apocynaceae	Nithyakalyaani
31.	*Cattleya labiata*	Orchidaceae	Cattleya Orchid
32.	*Celosia argentea*	Amaranthaceae	Wheat Celosia
33.	*Chlorophytum comosum sp*	Asparagaceae	
34.	*Cleome viscosa*	Cleomaceae	Asian spider flower
35.	*Commelina benghalensis*	Commelinaceae	Benghal dayflower
36.	*Corchorus acutangulus*	Malvaceae	Nalta jute, Jute mallow
37.	*Corchorus capsularis*	Malvaceae	White jute
38.	*Corchorus tridens*	Malvaceae	Jew's Mallow
39.	*Crinum asiaticeum*	Amaryllidaceae	poison bulb
40.	*Crotalaria juncea*	Fabaceae	Indian Hemp
41.	*Crotalaria medicaginea*	Fabaceae	Trefoil Rattlepod
42.	*Crotalaria sp*	Fabaceae	
43.	*Croton bonplandianum*	Euphorbiaceae	
44.	*Curculigo orchioides*	Hypoxidaceae	Black musale
45.	*Cyanotis papilionacea*	Commelinaceae	
46.	*Cyanotis tuberosa*	Commelinaceae	Greater Cat Ears
47.	*Desmodium gangeti*	Fabaceae	
48.	*Desmodium triflorum*	Fabaceae	creeping tick trefoil
49.	*Digera muricata*	Amaranthaceae	Chenchali Koora
50.	*Dipteracanthus prostratus*	Acanthaceae	Bell Weed
51.	*Drimia indica*	Asparagaceae	
52.	*Eclipta alba*	Compositae	
53.	*Elytraria acaulis*	Acanthaceae	Patharchatta
54.	*Emilia sonchifolia*	Asteraceae	Muyalccevi
55.	*Enicostema axillare*	Gentianaceae	Vellaragu

56.	*Euphorbia hirta*	Euphorbiaceae	Nanapala
57.	*Euphorbia hypericifolia*	Euphorbiaceae	
58.	*Euphorbia prostrata*	Euphorbiaceae	
59.	*Euphorbia thymifolia*	Euphorbiaceae	Nilappala
60.	*Evolvulus alsinoides*	Convolvulaceae	Little Glory
61.	*Glossocardia bosvallia*	Asteraceae	dagad Shepu
62.	*Gomphrena celosioides*	Amaranthaceae	Neervadamalli
63.	*Grangea Maderaspatana*	Asteraceae	Bhediachim, Mastaru
64.	*Heylandia latebrosa*	Fabaceae	Godhadi
65.	*Hibiscus micranthus*	Malvaceae	Tiny Flower Hibiscus
66.	*Indigofera cordifolia*	Fabaceae	Gokhru
67.	*Indigofera enneaphylla*	Fabaceae	
68.	*Indigofera glandulosa*	Fabaceae	Befri
69.	*Indigofera hirsuta*	Fabaceae	Hairy indigo
70.	*Indigofera linifolia*	Fabaceae	Pandarphali
71.	*Indigofera trifoliata*	Fabaceae	
72.	*Iphigenia indica*	Colchicaceae	Indian Grass Lily
73.	*Justicia procumbens*	Acanthaceae	Ghati Pitpapad
74.	*Justicia simplex*	Acanthaceae	
75.	*Justicia vahlia*	Acanthaceae	
76.	*Lagasca mollis*	Asteraceae	Silk Leaf
77.	*Leucas aspera*	Lamiaceae	Common Leucas
78.	*Leucas cephalotes*	Lamiaceae	
79.	*Lindernia ciliata*	Linderniaceae	
80.	*lindernia crustacea*	Linderniaceae	Malaysian Lindernia
81.	*Lonidium suffruticosum*	Violaceae	Ratna-purush
82.	*Ludwigia sp.*	Onagraceae	
83.	*Martynia annua*	Martyniaceae	Ulat-kanta
84.	*Melochia corchorifolia*	Malvaceae	Bundava, Kura
85.	*Mollugo nudicaulis*	Molluginaceae	
86.	*Mollugo pentaphylla*	Molluginaceae	Lajvanthi
87.	*Murdannia nudiflora*	Commelinaceae	Spreading Dayflower
88.	*Ocimum canum*	frankeniaceae	
89.	*Oldenlandia corymbosa*	Rubiaceae	flat-top mille graines,
90.	*Oldenlandia herbacea*	Rubiaceae	Paper-bhed, Verri Nelavaemu
91.	*Oldenlandia umbellata*	Rubiaceae	Chay Root, Chayaveru
92.	*Pavonia zeylanica*	Malvaceae	Joli, Chinamuttam
93.	*Phyla nodiflora*	Verbenaceae	Capeweed
94.	*Phyllanthus maderaspatensis*	Phyllanthaceae	Nalla Usirika
95.	*Phyllanthus niruri*	Phyllanthaceae	Stonebreaker
96.	*Phyllanthus virgatus*	Phyllanthaceae	Virgate Leaf
97.	*Physalis minima*	Solanaceae	Kupanti
98.	*Polycarpaea corymbosa*	Caryophyllaceae	Machechi
99.	*Polygala sp*	Caryophyllaceae	
100	*Portulaca oleracea*	Portulacaceae	Lunia, Common Purselane
101	*Pulicaria wightiana*	Asteraceae	Sontikli
102	*Pupalia lappacea*	Amaranthaceae	Chithramoolam
103	*Rungia repens*	Acanthaceae	Creeping Rungia
104	*Scilla indica*	Asparagaceae	Kanthanga
105	*Sesbania sesban*	Fabaceae	Egyptian riverhemp
106	*Sida acuta*	Malvaceae	Baraira, Horn bean leaved sida

107	*Sida cordata*	Malvaceae	Bhuinii, Benda
108	*Sida cordifolia*	Malvaceae	Balu, Bala
109	*Sida glutinosa*	Malvaceae	
110	*Sida spinosa*	Malvaceae	Baryar, Prickly mallow
111	*Solanum virginianum*	Solanaceae	Gurrapu-gatt-aku
112	*Spermacoce pusilla Wall.*	Rubiaceae	Safed Phooli, Tsukka-kada
113	*Tephrosia hirta*	Fabaceae	
114	*Tephrosia maxima*	Fabaceae	
115	*Tephrosia purpurea*	Fabaceae	Sarphanka
116	*Trianthema Portulacastrum*	Aizoaceae	Ice plants
117	*Trichodesma indicum*	Boranginaceae	Kali Thumbae
118	*Tridax procumbens*	Asteraceae	Coat-button
119	*Triumfetta rhomboidea*	Malvaceae	diamond burbark, Chinese bur
120	*Vernonia cinerea*	Asteraceae	Ash colored fleabane, Puvamkozhinjal
121	*Waltheria indica*	Malvaceae	Uhaloa, Shengalipoondu
122	*Xanthium strumarium*	Asteraceae	Sankhahuli
123	*Zornia gibbosa*	Fabaceae	Grasslike Zornia

Source: Primary field survey and Shiwaram Wildlife Sanctuary, Working Plan

Table – 8: Grasses found in the Project area

Sr.No.	***Botanical Name***	**Family**	**Common name**
1.	*Apluda mutica*	Poaceae	Mauritian Grass
2.	*Aristida adscensionis*	Poaceae	Cheevam pul
3.	*Aristida setacea*	Poaceae	Broom Grass
4.	*Bambusa arundinacea*	Poaceae	Bongu-veduru
5.	*Bothriochloa pertusa*	Poaceae	
6.	*Brachiaria distachya*	Poaceae	
7.	*Brachiaria ramosa*	Poaceae	Chamapothaval
8.	*Chloris barbata*	Poaceae	Swollen windmill grass
9.	*Chloris tennella*	Poaceae	
10.	*Cynodon dactylon*	Poaceae	Bahama grass
11.	*Cyperus aristatus*	Cyperaceae	
12.	*Cyperus bulbosus*	Cyperaceae	
13.	*Cyperus compressus*	Cyperaceae	
14.	Cyperus nivens	Cyperaceae	
15.	*Cyperus rotundus*	Cyperaceae	
16.	*Cyperus triceps*	Cyperaceae	
17.	*Dactyloctenium aegyptium*	Poaceae	Crow foot grass
18.	*Dendrocalamus strictus*	Poaceae	Potu Veduru
19.	*Digitaria longiflora*	Poaceae	
20.	*Digitaria sanguinalis*	Poaceae	
21.	*Eleusine coracana*	Poaceae	African millet
22.	*Eleusine indica*	Poaceae	Crab Grass
23.	*Eragrostiella bifaria*	Poaceae	
24.	*Eragrostis japonica*	Poaceae	
25.	*Eragrostis tremula*	Poaceae	
26.	*Eramopo gonfoveolat*	Poaceae	
27.	*Eragrostis oaeoides*	Poaceae	
28.	*Eriochloa procera*	Poaceae	Agrostis procera
29.	*Oplismenus burmann*	Poaceae	Wavy-leaf Basketgrass
30.	*Oplismenus composite*	Poaceae	

31.	*Panicum antidotale*	Poaceae	Blue panic
32.	*Panicum montanum*	Poaceae	
33.	*Panicum repens*	Poaceae	Torpedo Grass
34.	*Perotis indica*	Poaceae	Nari vaal pul
35.	*Setaria pumila*	Poaceae	
36.	*Setaria verticillata*	Poaceae	Bristle grass
37.	*Sporobolus coromandelianus*	Poaceae	Kunth
38.	*Sporobolus diander*	Poaceae	
39.	*Sporobolus minutiflorus*	Poaceae	
40.	*Sporobolus pamelae*	Poaceae	
41.	*Tragus biflorus*	Poaceae	bur gras
42.	*Urochloa panicoides*	Poaceae	

Source: Primary field survey and Shiwaram Wildlife Sanctuary, Working Plan

Table – 9: Climbers found in Study area

S.NO	Botanical Name	Scientific Name	Common Name
1.	*Abrus precatorius*	Fabaceae	Bead Vine
2.	*Acacia intsia*	Fabaceae	
3.	*Alternanthera sessilis*	Amaranthaceae	Sessile joyweed
4.	*Aponogeton natans*	Aponogetonaceae	Drifting Sword Plant
5.	*Asparagus racemosus*	Colchicaceae	Ettavaludutige
6.	*Asteracantha longifolia*	Acanthaceae	Talmakahana
7.	*Butea superba*	Fabaceae	
8.	*Cajanus scarabaeoides*	Fabaceae	
9.	*Calycopteris floribunda*	Combretaceae	Murugudutige
10.	*Cissampelos pareira*	Menispermaceae	Pata Visah Boddi
11.	*Cocculus hirsutus*	Menispermaceae	Farid Buti
12.	*Cryptolepis buchanani*	Asclepiadaceae	Maattaankodi
13.	*Cyperus iria*	Cyperaceae	Iria flatsedge
14.	*Dioscorea bulbifera*	Dioscoreaceae	Air potato
15.	*Diplocyclos palmatus*	Cucurbitaceae	Linga-donda
16.	*Echinochloa colona*	Poaceae	Corn panicgrass
17.	*Echinochloa crus galli*	Poaceae	Barnyard Millet
18.	*Eriocaulon tuberiferum*	Eriocaulaceae	Tuberous Pipewort
19.	*Fimbristylis dichotoma*	Cyperaceae	
20.	*Gloriosa superba*	Colchicaceae	Agnisikha
21.	*Hemidesmus indicus*	Apocynaceae	Sugandhi
22.	*Ipomoea pes-tigridis*	Convolvulaceae	Bindweed, Pulichovadi
23.	*Lemna polyrhiza*	Araceae	Spirodela polyrrhiza
24.	*Lippia nodiflora*	Verbenaceae	Capeweed
25.	*Merremia tridentate*	Convolvulaceae	
26.	*Momordica dioica*	Cucurbitaceae	Adavikakara
27.	*Najas gramineae*	Hajadaceae	Hydrocharitaceae
28.	*Oryza sativa*	Poaceae	Paddy
29.	*Panicum maximum*	Poaceae	Guinea Grass
30.	*Paspalidium flavidum*	Poaceae	Yellow Watercrown Grass
31.	*Paspalum scrobiculatum*	Poaceae	Kodo millet
32.	*Pergularia daemia*	Apocynaceae	Jittupaku
33.	*Polygonum glabrum*	Polygonaceae	Sivappu
34.	*Thunbergia alata*	Acanthaceae	Black - eyed Susan
35.	*Typha angustata*	Typhaceae	Lesser Indian Reed Mace
36.	*Wolffia arrhiza*	Araceae	Lemna arrhiza
37.	*Zizyphus oenoplia*	Rhamnaceae	Jackal jujube

Mancherial – Warangal of length 112.240 km from Ramaraopet village to Oorugonda village (Design Chainage 0+000 to 112+240) under inter corridor route under Bharatmala Pariyojana, Phase - I in the state of Telangana.	Conservation Plan of Crocodile

Source: Primary field survey and Shiwaram Wildlife Sanctuary, Working Plan

Table – 10: Hydrophytes found in Study area

S.No	Botanical name	Family	Common Name
1.	*Aeschynomene Indica*	Fabaceae	Kat Sola, Budda Pea, Curly Indigo
2.	*Ammannia baccifera*	Lythraceae	Monarch redstem
3.	*Caesulia axillaris*	Asteraceae	Pink node flower
4.	*Cleome chelidonii*	Capparacea	Spider Flower
5.	*Cyanotis axillaris*	Commelinaceae	Creeping Cradle
6.	*Hydrilla verticillata*	Hydrocharitaceae	Waterthymes
7.	*Monochoria vaginalis*	Pontederiaceae	Heartshape false pickerelweed
8.	*Nymphaea pubescens*	Nymphaeaceae	pink water-lily, Allitamarai
9.	*Nymphaea stellata*	Nymphaeaceae	Blue lotus
10.	*Ottelia alismoides*	Hydrocharitaceae	Duck lettuce, Neeru Veniki
11.	*Sagittaria sagittifolia*	Alismataceae	Arrowhead

Source: Primary field survey and Shiwaram Wildlife Sanctuary, Working Plan

Table – 11: Epiphytes in Study area

1.	*Cassytha filiformis*	Lauraceae	Love vine, Akasa-valli
2.	*Loranthus sp*	Viscaeae	
3.	*Striga sp*	Scrophulariaceae	
4.	*Vanda sp*	Orchidaceae	

Source: Primary field survey and Shiwaram Wildlife Sanctuary, Working Plan

Table – 12: Medicinal Plant in Study area

S no.	Botanical name	Family	Local name
1.	*Acacia concinna*	Mimosaceae	Shikaka
2.	*Acacia nilotica*	Mimosaceae	Babul
3.	*Acacia sundra*	Fabaceae	Khair Sundra
4.	*Aegle marmelos*	Rutaceae	Maredu
5.	*Albizia lebbeck*	Fabaceae	Black Siris
6.	*Argemone mexicana*	Papaveraceae	Pila Dhatora
7.	*Azadirachta indica*	Meliaceae	Neem, Vepa
8.	*Bauhinia variegata*	Fabaceae	Kachnar
9.	*Boswellia serrata*	Burseraceae	Salai
10.	*Butea monosperma*	Fabaceae	Palas
11.	*Calotropis gigantea.*	Apocynaceae	Ak (jilledu)
12.	*Cassia auriculata*	Caesalpiniaceae	Tangedu
13.	*Cassia fistula*	Fabaceae	Amaltas
14.	*Emblica officinalis*	Phyllanthaceae	Amla
15.	*Ficus bengalensis*	Moraceae	Banyan tree
16.	*Ficus glomerata*	Moraceae	Gular
17.	*Ficus religiosa*	Moraceae	Pipul tree
18.	*Holarrhena antidysenterica*	Apocynaceae	Indrahawa
19.	*Pongamia pinnata*	Fabaceae	Karanj
20.	*Pterocarpus marsupium*	Fabaceae	Bijasal
21.	*Randia dumetorum*	Rubiaceae	Chela
22.	*Salmalia malabarica*	Malvaceae	Semal
23.	*Semecarpus anacardium*	Anacardiaceae	Bhilawan
24.	*Soymida febrifuga*	Meliaceae	Soymida
25.	*Syzygium cumini*	Myrtaceae	Jamun

26.	*Tamarindus indica*	Fabaceae	Imli
27.	*Tectona grandis*	Lamiaceae	Teak
28.	*Terminalia arjuna*	Fabaceae	Anjan
29.	*Terminalia bellerica*	Combretaceae	Bahera
30.	*Terminalia chebula*	Combretaceae	Harida
31.	*Zizyphus jujuba*	Rhamnaceae	Ber

Source: Primary field survey and Shiwaram Wildlife Sanctuary, Working Plan

Fauna Reported in the project area

In birds, a total 90 birds species were recorded, among them schedule – I species are Brahminy Kite Crested Serpent Eagle, Grey Hornbil, Indian Peafowl, Indian Pied hornbill, Shikra, Spotted Owlet (Table – 13). In mammals, a total 28 mammals species were recorded, schedule – I species are Blackbuck, Chinkara, Wild Dog, Four Horned Antelope, Gaur, Grey Wolf, Indian Pangolin, Leopard, Leopard Cat, Ratel /Honey Badger, Sloth Bear, Tiger (Table – 14). In reptiles, a total 19 reptiles found in project area, schedule – I are Yellow Monitor Lizard, Python, Indian Black Turtle, Mugger (Table – 15). In amphibions, a total 12 amphibions species found in project area (Table – 16). Similarly, 51 fishes species found in project area (Table – 17)

Table – 13: Birds found in the project area

S.No.	Name of the birds	Scientific Name	IUCN Status	Schedule
1.	Alexandrine Parakeet	*Palaeornis eupatria*	NT	IV
2.	Asian Green Bee-eater	*Merops orientalis*	LC	-
3.	Asian Palm-swift	*Cypsiurus balasiensis*	LC	IV
4.	Barn Owl	*Tyto alba*	LC	IV
5.	Baya Weaver	*Ploceus philippinus*	LC	IV
6.	Black Drongo	*Dicrurus macrocercus*	LC	IV
7.	Black Headed Woodpecker	*Picus erythropygius*	LC	IV
8.	Black Partridge	*Melanoperdix niger*	VU	IV
9.	Black winged Stilt	*Himantopus himantopus*	LC	IV
10.	Black-Rumped Flameback	*Dinopium benghalense*	LC	IV
11.	Blossom Headed Parakeet	*Himalayapsitta roseate*	NT	IV
12.	Blue Jay	*Cyanocitta cristata*	LC	IV
13.	Blue Tailed Bee-eater	*Merops philippinus*	LC	-
14.	Brahminy Kite	*Haliastur indus*	LC	I
15.	Brown Fish Owl	*Ketupa zeylonensis*	LC	IV
16.	Brown Shrike	*Lanius cristatus*	LC	-
17.	Cattle Egret	*Little egret*	LC	IV
18.	Cinereous Vulture	*Aegypius monachus*	NT	IV
19.	Common Crane	*Grus grus*	LC	IV
20.	Common Iora	*Aegithina tiphia*	LC	-
21.	Common Kingfisher	*Alcedo atthis*	VU	IV
22.	Common Moorhen	*Gallinula chloropus*	LC	IV
23.	Common Myna	*Acridotheres tristis*	LC	IV
24.	Common Ringed Plover	*Charadrius hiaticula*	LC	-
25.	Common Sandpiper	*Actitis hypoleucos*	LC	IV
26.	Common Snipe	*Gallinago gallinago*	LC	IV
27.	Common Teal	*Anas crecca*	LC	IV
28.	Common Wood Shrike	*Tephrodornis pondicerianus*	LC	-

29.	Crested Serpent Eagle	*Spilornis cheela*	LC	I
30.	Eastern Spotted Dove	*Spilopelia chinensis*	LC	IV
31.	Eurasian Collared-dove	*Streptopelia decaocto*	LC	IV
32.	Eurasian Nuthatch	*Sitta europaea*	LC	-
33.	Glossy Ibis	*Plegadis falcinellus*	LC	IV
34.	Golden Oriole	*Oriolus kundoo*	LC	IV
35.	Great Barbet	*Psilopogon virens*	LC	IV
36.	Great Cormorant	*Phalacrocorax carbo*	LC	IV
37.	Great White Egret	*Ardea alba*	LC	IV
38.	Greater Rocket tailed drongo	*Dicrurus paradiseus*	LC	IV
39.	Grey backed Shrike	*Lanius tephronotus*	LC	-
40.	Grey Hornbill	*Ocyceros birostris*	LC	I
41.	Grey Partridge	*Perdix perdix*	LC	IV
42.	Grey Wagtail	*Motacilla cinerea*	LC	IV
43.	House Crow	*Corvus splendens*	LC	V
44.	House Sparrow	*Passer domesticus*	LC	-
45.	Indian Blue Robin	*Larvivora brunnea*	LC	IV
46.	Indian Nightjar	*Caprimulgus asiaticus*	LC	IV
47.	Indian Peafowl	*Pavo cristatus*	LC	I
48.	Indian Pied hornbill	*Anthracoceros albirostris*	LC	I
49.	Indian Pitta	*Pitta brachyuran*	LC	IV
50.	Indian White Eye	*Zosterops palpebrosus*	LC	IV
51.	Jungle Babbler	*Turdoides striata*	LC	IV
52.	Jungle Myna	*Acridotheres fuscus*	LC	IV
53.	Jungle Owlet	*Glaucidium radiatum*	LC	IV
54.	Large-Billed Crow	*Corvus macrorhynchos*	LC	IV
55.	Little Buttonquail	*Turnix velox*	LC	IV
56.	Little Cormorant	*Microcarbo niger*	LC	IV
57.	Little Egret	*Egretta garzetta*	LC	IV
58.	Night-Heron	*Nycticorax nycticorax*	LC	IV
59.	Oriental Darter	*Anhinga melanogaster*	NT	IV
60.	Oriental Magpie-Robin	*Copsychus saularis*	LC	IV
61.	Pheasant Tailed Jacana	*Hydrophasianus chirurgus*	LC	IV
62.	Pied Bushchat	*Saxicola caprata*	LC	IV
63.	Pied Kingfisher	*Ceryle rudis*	LC	IV
64.	Plum-Headed Parakeet	*Himalayapsitta cyanocephala*	LC	IV
65.	Purple Heron	*Ardea purpurea*	LC	IV
66.	Purple Sunbird	*Cinnyris asiaticus*	LC	IV
67.	Rain Quail	*Coturnix coromandelica*	LC	IV
68.	Red Rumped Swallow	*Cecropis daurica*	LC	-
69.	Red Turtle Dove	*Streptopelia tranquebarica*	LC	IV
70.	Red Vented Bulbul	*Pycnonotus cafer*	LC	IV
71.	Red Wattled lapwing	*Vanellus indicus*	LC	-
72.	River Tern	*Sterna aurantia*	VU	-
73.	Rose Ringed parakeet	*Alexandrinus krameri*	LC	IV
74.	Rufous Treepie	*Dendrocitta vagabunda*	LC	IV

75.	Scaly-Breasted Munia	*Lonchura punctulata*	LC	IV
76.	Shikra	*Accipiter badius*	LC	I
77.	Short toed Eagle	*Circaetus gallicus*	LC	IV
78.	Small Minivet	*Pericrocotus cinnamomeus*	LC	IV
79.	Spotted Owlet	*Athene brama*	LC	I
80.	Thick-Billed Green Pigeon	*Treron curvirostra*	LC	IV
81.	Tree Creeper	*Certhia familiaris*	LC	-
82.	Tricoloured Munia	*Lonchura Malacca*	LC	IV
83.	Western Koel	*Eudynamys scolopaceus*	LC	IV
84.	Western Spotted Dove	*Spilopelia suratensis*	LC	IV
85.	Whit Ibis	*Eudocimus albus*	LC	IV
86.	White Bellied Munia	*Lonchura leucogastra*	LC	IV
87.	White Throated Kingfisher	*Halcyon gularis*	LC	IV
88.	Yellow Wagtail	*Motacilla flava*	LC	IV
89.	Yellow Wattled lapwing	*Vanellus malabaricus*	LC	-
90.	Yellow-Crowned Woodpecker	*Leiopicus mahrattensis*	LC	IV

(LC = Least Concern, NT = Near Threatened, VU= Vulnerable, En = Endangered)
Source: Primary field survey and Shiwaram Wildlife Sanctuary, Working Plan

Table – 14: Mammals in Study area

Sl No.	Common Name	Scientific name	Local name	IUCN Status	Schedule
1.	Barking Deer	*Muntiacus muntjak*	Konda gorre	LC	III
2.	Blackbuck	*Antelope cervicapra*	Krishna jinka	LC	I
3.	Chinkara	*Gazella bennettii*	Gaddimeka	LC	I
4.	Chital/Spotted Deer	*Axis axis*	Duppi	LC	III
5.	Common Palm Squirrel	*Funambulus palmarum*	Udatha	LC	IV
6.	Common Langur	*Presbytis entellus*	Kondamuchu	LC	II
7.	Common Palm Civet	*Paradoxurus hermaphroditus*	Msnupilli	LC	II
8.	Dhole or Wild Dog	*Cun alpinus*	Rechu Kukka	EN	II
9.	Four Horned Antelope	*Tetracerus quadricornis*	Kondagorre	VU	I
10.	Gaur	*Bos gaurus*	Adavi Dunna	VU	I
11.	Golden Jackal	*Canis aureus*	Gunta Nakka	LC	II
12.	Grey Wolf	*Canis lupus*	Thodelu	LC	I
13.	Indian Crested Porcupine	*Hystrix Indica*	Mullapandi	LC	IV
14.	Indian Fox	*Vulpes bengalensis*	Nakka	LC	II
15.	Indian Giant Squirrel	*Ratufa indica*	Betty udatha	LC	II
16.	Indian Hare	*Lepus nigricollis*	Chevula pilli	LC	-
17.	Indian Pangolin	*Manis crassicaudata*	Adavi valluga	EN	I

18.	Jungle Cat	*Felis chaus*	Jangu Pilli	LC	II
19.	Leopard	*Panthera pardus*	Chirutha Puli	VU	I
20.	Leopard Cat	*Felis bengalensis*	Chukkalapilli	LC	I
21.	Nilgai	*Boselaphus tragocamelus*	Manubothu	LC	III
22.	Ratel /Honey Badger	*Mellivora capensis*	Puridu Banti	LC	I
23.	Rhesus Macaque	*Macaca mulatta*	Kothi	LC	II
24.	Sambar	*Rusa unicolor*	Kanuju	VU	III
25.	Sloth Bear	*Melursus ursinus*	Yelugugoddu	VU	I
26.	Striped Hyaena	*Hyaena hyaena*	Dummulagondo	NT	III
27.	Tiger	*Panthera tigris*	Peddapuli	EN	I
28.	Wild Boar	*Sus scrofa*	Adavi pandi	LC	III

(LC = Least Concern, NT = Near Threatened, VU= Vulnerable, En = Endangered)
Source: Primary field survey and Shiwaram Wildlife Sanctuary, Working Plan

Table – 15: Reptiles in Study area

S. No.	REPTILES	Scientific Name	Local name	IUCN Status	Schedule
1.	Asian Chameleon	*Chemellian zeylanicus*	Usaravelli.	LC	II
2.	Banded Krait	*Bungarus fasciatus*	Katla Pamu	LC	IV
3.	Checkered Keelback	*Fowlea piscator*	Neetipamu	NA	II
4.	Cobra	*Naja naja*	Nagupamu	LC	II
5.	Common Krait	*Bungarus caeruleus*	Katla pamu	NA	IV
6.	Common Skink	*Scincus scincus*	Nallikesu	LC	-
7.	Fan Throated Lizard	*Sitana ponticeriana*	Thonda	LC	-
8.	House Lizard	*Hemidactylus frenatus*	Thonda	LC	II
9.	Indian Black Turtle	*Melanochelys trijuga*	Neeti Tabelu	LC	I
10.	Indian Star Tortoise	*Geochelone elegans*	Metta Tabelu	VU	IV
11.	Mugger	*Crocodylus palustris*	Mosali	VU	I
12.	Olivaceous Keelback	*Atrium schestorum*	Neerukattu	LC	-
13.	Python	*Python molurus*	Kondachiluva	NA	I
14.	Rat Snake	*Ptyas mucosus*	Jerripothu	NA	II
15.	Roux's Forest Calotes	*Monilesaurus rouxii*	Adavi thonda	LC	-
16.	Russell's Viper	*Vipera ruselli*	Popamu	LC	II
17.	Snake-Eyed Skink	*Cryptoblepharus nigropunctatus*	Nallikesu	NT	-
18.	Soft Shelled Terapin	*Nilssonia gangetica*	Neeti Tabelu	EN	-
19.	Yellow Monitor Lizard	*Varanus flavescens*	Udumu	LC	I

(LC = Least Concern, NT = Near Threatened, VU= Vulnerable, En = Endangered)
Source: Primary field survey and Shiwaram Wildlife Sanctuary, Working Plan

Table – 16: Amphibions in Study area

S.No.	Common Name	Scientific Name	IUCN Status
1.	Indian Globular Frog	*Uperodon globulosus*	LC
2.	Common Indian Toad	*Duttaphrynus melanostictus*	LC
3.	Indian Painted Frog	*Kaloula taprobanica*	LC
4.	Jerdon's Bull Frog	*Hoplobatrachus crassus*	LC
5.	Marbled Balloon Frog	*Uperodon systoma*	LC
6.	Marbled Toad	*Duttaphrynus stomaticus*	LC
7.	Orissa Cricket Frog	*Fejervarya orissaensis*	LC
8.	Ornate narrow-mouthed frog	*Microhyla ornata*	LC
9.	Guangdong Rice Frog	*Microhyla rubra*	LC
10.	Rough Dwarf Toad	*Duttaphrynus scaber*	LC
11.	Skittering Frog	*Euphlyctis cyanophlyctis*	LC
12.	Bombay Wart Frog	*Minervarya syhadrensis*	LC

Table – 17:Fishes in Study area

S.No	English name	Species	Vernacular name	IUCN Status
1.	Barna Baril	*Opsarius barna*	Kodipe	LC
2.	Barred Baril	*Barilius barila*	Kodipe	LC
3.	Boggut Labeo	*Labeo boggut*	Nusigadu	LC
4.	Bombay Labeo	*Labeo porcellus*	Moyya	LC
5.	Catla	*Labeo catla*	Bocha	LC
6.	Deccan Labeo	*Labeo kawrus*		LC
7.	Deccan Labeo	*Labeo potail*	Baman-chapra	EN
8.	Deccan Mahseer	*Tor khudree*	Kudis	LC
9.	Deccan Nangra	*Gagata itchkeea*	*Menamama Bakkalu*	VU
10.	Dwarf Snakehead	*Channa gachua*	Erra Matta	LC
11.	Fringed-lipped Peninsula Carp	*Labeo fimbriatus*	Chitra	LC
12.	Giant River-catfish	*Sperata seenghala*	Nara-jella	LC
13.	Godavari	*Osteobrama vigorsii*	Kaydam-chepa	LC
14.	Golden Barb	*Pethia gelius*		LC
15.	Goonch	*Bagarius bagarius*	Raati jella	NT
16.	Grass Carp	*Ctenopharyngodon idella*	Ela-mosa	
17.	Greenstripe Barb	*Puntius vittatus*	Parigi chepa	LC
18.	Hamilton's Baril	*Opsarius bendelisis*	Kodipe	LC
19.	Hora Razorbelly	*Salmostoma horai*	Chela	VU
20.	Indian Flying Barb	*Esomus danrica*	Meesagadu	LC
21.	Indian Flying Barb	*Esomus danrica*	Meesagadu	LC
22.	Indian Glass Barb	*Laubuka laubuca*	Getchu	LC
23.	Indian Taakree	*Proeutropiichthys*	Siriva-jella	LC
24.	Khavalchor Catfish	*Pachypterus khavalchor*		DD
25.	Konti Barb	*Osteochilichthys*	Pedda Parka	LC

26.	Kuria Labeo	*Labeo gonius*	Mosoo	LC
27.	Long snouted Barb	*Puntius dorsalis*	Perka	LC
28.	Mola Carplet	*Amblypharyngodon mola*	Alan Chepa	LC
29.	Morari	*Cabdio morar*	Gitsu	LC
30.	Nilgiri Osteobrama	*Osteobrama neilli*		LC
31.	Olive Barb	*Systomus sarana*	Kanugu	LC
32.	Orangefin Labeo	*Labeo calbasu*	Kaki-bocha	LC
33.	Pangusia Labeo	*Labeo pangusia*	Done-chepa	NT
34.	Pool Barb	*Puntius sophore*	Chedu Parigi	LC
35.	Redside Barb	*Puntius bimaculatus*		LC
36.	Roho Labeo	*Labeo rohita*	Routa	LC
37.	Rosy Barb	*Pethia conchonius*	Perka-chepa	LC
38.	Sandkhol Carp	*Thynnichthys sandkhol*	Thalasigadu	EN
39.	Schilbid Catfish	*Silonia children*	Pedda-jella	EN
40.	Silver Carp	*Hypophthalmichthys molitrix*	Vendi chepa	
41.	Silver Hatchet Chela	*Chela cachius*	Getchu	LC
42.	Sind Danio	*Devario devario*	Nooltu	LC
43.	Spotted Snakehead	*Channa punctate*	Matta	LC
44.	Stone Roller	*Tariqilabeo latius*		LC
45.	Striped Snakehead	*Channa striata*	Koramata	LC
46.	Swamp Barb	*Puntius chola*	Pakki	LC
47.	Ticto Barb	*Pethia ticto*	Parigi	LC
48.	Vatani Rohtee	*Rohtee ogilbii*	Aku chepa	LC
49.	Wallago	*Wallago attu*	Valuga	VU
50.	Wynaad Barb	*Puntius melanostigma*	Perka	NE
51.	Zebra Danio	*Danio rerio*	Chintaku-parega	LC

(LC = Least Concern, NT = Near Threatened, VU= Vulnerable, En = Endangered)
Source: Primary field survey and Shiwaram Wildlife Sanctuary, Working Plan

Conservation Plan and mitigation Measures for Crocodile in Godavari River

Crocodilians (crocodiles, alligators, caimans, and gharials) are prominent and widespread occupants of tropical and subtropical aquatic habitats. The group is of great antiquity with hundreds of fossil forms and three major radiations. Crocodilians are implicated in positive effects in their environments as "keystone species" that maintain ecosystem structure and function by their activities. These include selective predation on fish species, recycling nutrients, and maintenance of wet refugia in droughts.

Crocodilians have some unique aspects of natural history that create special challenges for their conservation. They are the largest predators in their habitats and can threatened humans and their livestock. Many species are exploited for their valuable skin, which supports an international trade worth over US$500 million annually. They are also heavily affected by habitat loss and the pollution of aquatic habitats. Loss of any species of crocodilian would represent a significant loss of biodiversity, economic potential and ecosystem stability.

All crocodilians are very effective aquatic predators. At smaller sizes they often eat aquatic insects, small fish and crustaceans and as they grow larger they tend eat more

vertebrates, including fish, turtles, birds and mammals. Crocodiles attempt to maintain their body temperature within narrow limits by basking in the sun when cool and seeking shade when hot. They are metabolically efficient and have fast reflexes and effective loco motor ability on land, where they walk on erect legs, and in the water, where they swim rapidly driven by their powerful tails.

Crocodilians are threatened in India due to indiscriminate killing for commercial purpose and severe habitat loss.

All the three species of crocodiles, namely, **Gharial** (*Gavialis gangeticus*), **Mugger crocodile** (*Crocodylus palustris*) and **Saltwater crocodile** (*Crocodylus porosus*), in the river systems of Telangana state were on the verge of extinction by the seventies. Crocodile population started to decline because of the increasing human activity in the rivers and consequent reduction in the extent of habitable stretches. The survival rate of the crocodile hatchlings was also relatively low because of predation. Efforts were being made save the crocodile after enactment of the Wildlife (Protection) Act, 1972.

FAO Expert, Dr. H.R. Bustard, engaged by UNDP/FAO and Government of India studied the prospects of crocodile rehabilitation, and based on his report and guidance a Crocodile Conservation Projects were launched in 1975 in different States. Since Telangana is recognized for the existence of only of one species of Mugger crocodile (*Crocodylus palustris*), the crocodile conservation programme was initiated. The UNDP/ FAO provided funds and other technical support through the Government of India.

Taxonomy: Mugger (*Crocodylus palustris*)

Kingdom	Phylum	Class	Order	Family
Animalia	Chordata	Reptilia	Crocodylia	Crocodylidae

Common Name(s): Mugger, Broad-snouted Crocodile, Marsh Crocodile, Muggar

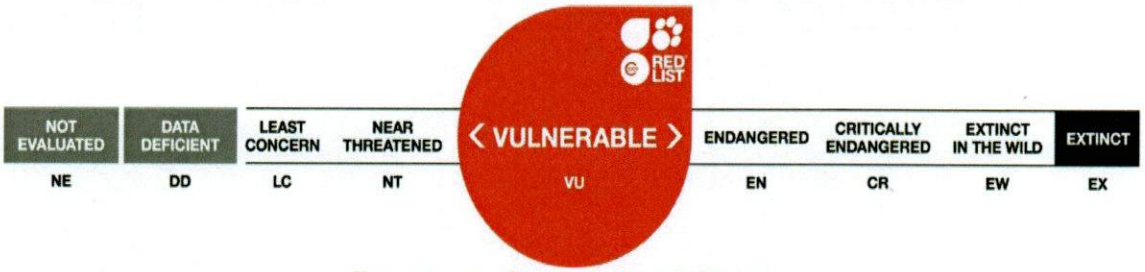

Figure – 3: Conservation Status

Figure – 4: Conservation Status of Crocodile in Asia

Reproduction of Corcodile

Female muggers obtain sexual maturity at a body length of around 1.8–2.2 m (5 ft 11 in–7 ft 3 in) at the age of about 6.5 years, and males at around 2.6 m (8 ft 6 in) body length. The reproduction cycle starts earliest in November at the onset of the cold season with courtship and mating. Between February and June, females dig 35–56 cm (14–22 in) deep holes for nesting between 1 and 2,000 m (3 ft 3 in and 6,561 ft 8 in) away from the waterside. They lay up to two clutches with 8 – 46 eggs each. Eggs weigh 128 g (4.5 oz) on average. Laying of one clutch usually takes less than half an hour. Thereafter, females scrape sand over the nest to close it. Males have been observed to assist females in digging and protecting nest sites. Hatching season is two months later, between April and June in south India, and in Sri Lanka between August and September. Then females

excavate the young, pick them up in their snouts and take them to the water. Both females and males protect the young for up to one year.

Healthy hatchlings of muggers develop at a temperature range of 28–33 °C (82–91 °F). Sex ratio of hatched eggs depends on incubation temperature and exposure of nests to sunshine. Only females develop at constant temperatures of 28–31 °C (82–88 °F), and only males at 32.5 °C (90.5 °F).

Percentage of females in a clutch decreases at constant temperatures between 32.6 and 33 °C (90.7 and 91.4 °F), and of males between 31 and 32.4 °C (87.8 and 90.3 °F). Temperature in natural nests is not constant but varies between nights and days. Foremost females hatch in natural early nests when initial temperature inside nests ranges between 26.4 and 28.9 °C (79.5 and 84.0 °F). The percentage of male hatchlings increases in late nests located in sunny sites. Hatchlings are 26–31 cm (10–12 in) long and weigh 75 g (2.6 oz) on average when one month old. They grow about 4.25 cm (1.67 in) per month and reach a body length of 90–170 cm (35–67 in) when two years old.

Habitat and Ecology

This species is found in freshwater habitats including, rivers, lakes, reservoirs, hill streams, village ponds and manmade tanks. It may also be found in coastal saltwater lagoons. This species is a hole-nesting species.

The Mugger is a hole-nesting species, with egg-laying taking place during the annual dry season. Females become sexually mature at approximately 1.8-2 m, and lay 25-30 eggs). Nests are located in a wide variety of habitats, and females have even been known to nest at the opening of, or inside, their burrow In captivity, some Muggers are known to lay two clutches in a single year (Whitaker and Whitaker 1984), but this has not been observed in the wild. Incubation is relatively short, typically lasting 55-75 days.

Conservation Actions

This species is listed under CITES Appendix I. Management of the species is largely based on the legal protection of wild populations and captive breeding for restocking natural populations. Between 1978 1992 in India, a total of 1,193 captive bred individuals have been used to restock populations in 28 protected areas. However, in 1994 due to overcrowding in captive centers, the production of new offspring was ceased by the Indian Government. Protection is moderately effective in protected areas in India, Sri Lanka, and Iran. Education and public awareness into the importance of crocodiles to their habitats is needed, and continued monitoring of the populations is required.

Threats

This species was threatened by habitat destruction due to agricultural and industrial expansion, entanglement and drowning in fishing equipment, egg predation by humans, illegal poaching for skin and meat and the use of body parts in medicine. Crocodiles were often treated as pests to inland fisheries and killed whenever possible. There are increasing incidents of human conflict with this species and this is due to encroachment by humans into the species natural habitats.

Mitigation measures

1. The egg laying areas and rest areas of crocodile must be restricted for any kind of human movement and activities

2. Sign board in crocodile movement area must be displayed in local languages to avoid to any disturbance to the crocodile and to avoid Human- crocodile conflicts.
3. Provisions for economic assistance in EMP for the program for the conservation under "Project Crocodile" of Govt. Of India.
4. Number of piers in bridge must be minimized for the crossing of River Godavari.
5. Public awareness program or conservation of wildlife will be conducted.
6. There is also provision to spread awareness on importance of conservation of crocodile and its importance particularly at school, college and village level.

Budgetary provision for the conservation of Crocodile

A total budget provision of **Rs. 1.08 Crores** have been kept for the conservation of Crocodile in the proposed project. (Table-18)

Table – 18: Budget Provisions for the Conservation of Crocodile

S.No.	Activity	Cost (Rs.)
1	Community awareness programme for conservation of Crocodile & its movement in the nearby villages where the alignment passing near to ESZ of the Sanctuary	2,00,000
2	Provision of Sign boards from Ch.25+000 to Ch. 26+000 where the alignment passes close to the Wildlife Sanctuary	1,00,000
3	Fencing from Ch.25+000 to Ch. 26+000 to avoid the human interference in the Crocodile area	5,00,000
4	Noise Barrier on both sides of the proposed bridge from Ch.25+000 to Ch. 26+000	50,00,000
5	Contribution to the Conservation Crocodile Programs, research and monitoring in the nearby villages run by the forest department	50,00,000
Total		**1,08,00,000**

References:

1. **Gaztte Notification of Shiwaram Wildlife LS (2018) published by GOI.**
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3. **Prasad, K. K., Bagari, R, Srinivasulu, C. and Bhargavi, S. (2014):** Avifaunal diversity of Manjeera Wildlife Sanctuary, Andhra Pradesh, India, *Journal of Threatened Taxa*, 6(2): 5464–5477
4. **Working Plan for the forest of Mancherial Division,** Adilabad District, Vol – II, from 2012 – 13 to 2022- 2023.
5. www.iucnredlist.org/

CHAPTER - 5: ANALYSIS OF ALTERNATIVES

5.1 INTRODUCTION

This chapter presents a comparative analysis of various alternatives considered to avoid, prevent or minimize impacts that would be inevitable if technically (based on design speed and geometrics) best-fit alignment is followed. The consideration of alternatives to a proposal is a requirement of the EIA report. During the scoping process, alternatives to a proposal can be generated or refined, either directly or by reference to the key issues identified. A comparative analysis of alternatives will help to determine the best method of achieving project objectives while minimizing environmental impacts. Various alternatives have been selected for analysis which usually includes the 'no project' or 'no action' alternative. The relative impact of each alternative is compared against the baseline environment to select a preferred alternative.

The proposed highway of 4 lane from Narva village in Mancherial district to Oorugonda village in Warangal rural (Warangal) district in the state of Telangana from Ch. 3+834 to Ch. 112+240 were considered after finalization of various option studies such as realignments and other alternative alignment options and different construction material options keeping in view objectives of the project, traffic condition, obligatory points, geometric designs, congestions and socioeconomic viability and environmental safety aspects. The discussion in this chapter includes the project with alternatives. The objective of this chapter is to highlight some of the salient issues considered for exercising options.

5.2 SELECTION OF ALTERNATIVE

The NHAI had carried out preliminary desk studies using satellite imageries and as such an alignment for the proposed highway from Narva village in Mancherial district to Oorugonda village in Warangal rural (Warangal) district in the state of Telangana from Ch. 3+834 to Ch. 112+240 was finalized. The detail of this selected alignment was handed over by the NHAI and the Consultant has been assigned the task of preparing the Feasibility and Preliminary Design Report for the proposed Highway. The initial site visit and detailed ground reconnaissance by the consultants revealed that by and large this selected alignment is acceptable.

Three alternative alignments have been considered:

i) **Option -1 (Proposed Green field alignment):** The alignment crosses through major villages/town such as Mancherial, Manthani, Mutharam, Chityala, Parkal and Warangal. The total alignment passes through 54 villages/towns. The option -1 has been recommended since

it involves minimum nos. of felling of trees and the project cost is less as compared with the other two options.

ii) **Option -2 (Brown field alignment):** The alignment follows major villages/towns such as Mancherial, Manthani, Mutharam, Chityala, Parkal and Warangal. The total alignment passes through Singareni Collieries Company Boundary's. The option-2 is not feasible to acquire SCCL lands. Also submergence of lands due to upstream side of Sundilla barrage (Parvati Barrage).

iii) **Option -3 (Green field alignment):** The alignment follows Mancherial, Ramagundam, Velampalli, Chityala, Kamalapur, Parkal & Warangal. The total alignment passes through major impact on flora as more number of trees is falling under the alignment and more impact on structure and families as number affected families are high. The option-3 has not been recommended since the project cost and the acquisition of land is more as compared with the other two options.

Consultant submitted three alignment options to NHAI at the time of alignment approval, considering the Merits and Demerits option-1 is approved by NHAI. The option suggested by MOEFF already included in Alignment options report submitted to NHAI, as (Option-2) however which is passing through Singareni Colleries land, upstream of Sundilla barriage under Kaleshwaram irrigation project of TS, is more prone submergence and more R&R requirement. Considering the merits and de-merits of three options current option-1 is agreed for implementation.

Keeping in view of having less/minor effect on environmental and social components, alignment **Option 1** has been fixed and it seems more feasible as compared to the other option. It also provides better route from Mancherial to Warangal . In this minimum felling of trees as compared with other two options. It will lead to less impact on Environment & Social components than other two options. The details of the three alternatives studied have been described in **Table 5.1.**

The map showing the three alignments have been shown in **Figure 5.1.**

Project Director
National Highways Authority of India,
Project Inplementation Unit, Warangal

Table 5.1: Details of alternatives studied

Sl. No.	Parameters/Issues	Option 1 Proposed Alignment	Option 2 Brownfield Alignment	Option 3 Greenfield alignment
1	Length (km)	112.240	104.500 km	120.790
2	Total land requirement (ha)	595.686	537.254	641.064
	Govt. land (ha)	41.459	40.294	112.186
	Pvt. Land (ha)	541.670	484.402	502.552
	Forest land (ha)*	Nil	33.879	26.325
3	Area under protected/ important or sensitive species of flora or fauna/Wildlife Sanctuary	The alignment pass through wild life sanctuary, protected area and its eco sensitive zone.	From Km 26.250 to 29.380 = 3.13 km Total length 3.13 km is passing through Shivaram Wildlife Sanctuary	• From Km 9.900 to 20.900 = 11.00 km • From Km 22.300 to 24.200 =1.90 km • From Km 30.600 to 33.100 =2.50 km Total length 15.40 km length Proposed option passing through Singareni Collieries Company Boundary's"
4	No. of trees	14,689	15,157	17,786
5	Area under water bodies (ha)*	19.44	20.98	23.84
6	No. of structure to be impacted due to proposed alignment	35 nos	40 nos.	101 nos.
7	No. of families	5796 nos.	6154 nos.	14,248 nos.

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Sl. No.	Parameters/Issues	Option 1 Proposed Alignment	Option 2 Brownfield Alignment	Option 3 Greenfield alignment
8	No. of structure to be constructed	MJB – 05 nos. MNB – 45 nos. Box Culverts – 146 nos. Pipe Culverts – 38 nos. VUP – 24 nos. PUP – 35 nos. LVUP – 04. SVUP – 09 nos ROB- 1 Flyovers – 05 Nos Intersection – 1 Nos	MJB - 5 MNB - 36 Box Culverts - 136 Pipe Culverts - 35 VUP - 24 LVUP - 04 PUP – 35 SVUP-09 ROB – 01 Flyovers – 05 Nos. Intersection – 1 Nos	MJB – 06 nos. MNB – 26 nos. Box Culverts – 157 nos. Pipe Culverts – 41 nos. VUP – 23 nos. PUP – 40 nos. LVUP – 16 SVUP – 10 nos ROB-1 (Retained) Flyovers – 6 Nos. Intersection – 2 Nos.
9	Connectivity	Mancherial, Manthani, Mutharam, Chityala, Parkal and Warangal	Mancherial, Manthani, Mutharam, Chityala, Parkal and Warangal	Mancherial, Ramagundam, Velampalli, Chityala, Kamalapur, Parkal & Warangal
10	Project cost (cr.)	2,795.05 (Civil Cost)	2,697.54 (Civil Cost)	2,841.96 (Civil Cost)

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NATIONAL HIGHWAYS AUTHORITY OF INDIA
(Ministry of Road Transport & Highways Government of India)

Natural Environment							
Attributes	Scoring Criteria		Score	Total Weight of Attribute	Option-1 Score	Option-2 Score	Option-3 Score
Topography	Plains	-	0	10	0	0	0
	Rolling terrain	-	5				
	Flood plains/coastal belt	-	10				
	Hilly/mountainous terrain	Upto 100% of Project Length	10	10	0	10	0
		Upto 50% of Project Length	5				
		Upto 25% of Project Length	1				
		Nil	0				
	CRZ Area	CRZ -I	10	10	0	0	0
		CRZ -III	5				
		CRZ -III/IV	1				
		Nil	0				
Vulnerability to natural hazards (as earthquakes, floods, landslides, Tropical cyclone winds, storm surges, tsunami or volcanic eruptions and climate changes etc.)	Not prone to any Hazard	-	0	5	1	1	1
	Rare occurrence	-	1				
	Prone to natural disasters/risks	-	3				
	Highly prone to natural disasters (regular occurrence)	-	5				

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Natural Environment							
Attributes	Scoring Criteria		Score	Total Weight of Attribute	Option-1 Score	Option-2 Score	Option-3 Score
Surface water resources	Number (average) of water bodies per km (rivers, canals, reservoirs, lakes and ponds) – Crossings as well as water bodies within RoW.	5 or less	1	5	4	5	5
		6 to 10	2				
		11 to 15	3				
		16 to 20	4				
		21 or more	5				
Affected Surface Area of Water bodies	Reservoir/Lake/Pomd	>1 ha.	10	10	0	5	5
		Upto 0.5 ha.	5				
		Upto 0.1 ha.	1				
		if No	0				
	Canal/River/Stream	>3 ha.	10	10	10	5	10
		Upto 1.5 ha.	5				
		Upto 0.3 ha.	1				
		if No	0				
Drainage Conditions	Over-topping and/or water logging within RoW (average number of such instances per km)	2 or less	1	5	1	5	5
		3 to 4	2				
		5 to 6	3				
		6 to 7	4				
		7 or more	5				
Ground water resources	Availablity/Grey/Black	Available	1	5	3	3	3

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Natural Environment							
Attributes	Scoring Criteria		Score	Total Weight of Attribute	Option-1 Score	Option-2 Score	Option-3 Score
		Grey	3				
		Black	5				
Materials Availability	Availability of Boulder/Sand/Earth	Within 50 km	1	5	1	1	1
		50 to 100 km	2				
		100 to 200 km	3				
		More than 200 km	5				
Soil Erosion	Is soil erosion an issue in/along the sub-project road?	No Errosion	0	5	1	1	1
		To some extent	1				
		Critical	3				
		Very critical	5				
Total		-		80	21	36	31

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Biological Environment							
Attributes	Scoring Criteria		Score	Total Weight of Attribute	Option-1 Score	Option-2 Score	Option-3 Score
Protected Areas (PA) under Wildlife Conservation Act	National Park	-	10	10	0	0	0
	Tiger Habitat	-	10				
	Wildlife Sanctuary/Marine Sanctuary	-	8				
	Conservation Reserve/Biosphere, Wetland	-	6				
	Projects Falls within 10Km Boundary of PA/ Wildlife Corridor in other type of Forests Area	-	2				
	None	-	0				
Forests Area	Reserved Forest	upto 20 ha	1	10	0	1	1
		upto 40ha	2				
		upto 50 ha	4				
		upto 60 ha	6				
		upt0100 ha	8				
		More than 100 ha	10				
	Protected Forest	upto 20 ha	1	10	0	1	1

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Biological Environment							
Attributes	Scoring Criteria		Score	Total Weight of Attribute	Option-1	Option-2	Option-3
					Score	Score	Score
		upto 40ha	2				
		upto 50 ha	4				
		upto 60 ha	6				
		upto 100 ha	8				
		More than 100 ha	10				
	Forest Type Area (FCA Applicable), Forest Type Area (FCA Applicable), Goverrtment Land Notified under FCA Act as Protected Forest for Management Purpose	upto 20 ha	1	10	1	1	1
		upto 40ha	2				
		upto 50 ha	4				
		upto 60 ha	6				
		upt0100 ha	8				
		More than 100 ha	10				
Trees	Felling of trees from forest area	Upto 100 Trees/Km	1	10	1	1	1
		Upto 200 Trees/Km	2				
		Upto 300 Trees/Km	4				

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Biological Environment							
Attributes	Scoring Criteria		Score	Total Weight of Attribute	Option-1	Option-2	Option-3
					Score	Score	Score
		Upto 400 Trees/Km	6				
		More than 500 Trees/Km	8				
		More than 1000 Trees/Km	10				
	Local Law applicable for felling of trees Non Forest Land	50 Trees/Km	1	10	1	1	1
		100 Trees/Km	2				
		200 Trees/Km	4				
		Upto 300 Trees/ Km	6				
		Upto 400 Trees/ Km	8				
		More than 500 Trees/Km	10				
Mangroves	Area	No CRZ	0	10	0	0	0
		upto 2 ha.	2				
		upto 5ha	5				
		More than 10 ha	10				
	No of Mangroves	upto 50 ha	2	10	0	0	0

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Biological Environment							
Attributes	Scoring Criteria		Score	Total Weight of Attribute	Option-1	Option-2	Option-3
					Score	Score	Score
		Upto 100 ha	5				
		More than 200 ha	10				
Total	-	-	-	80	3	5	5

Physical Environment							
Attributes	Scoring Criteria		Score	Total Weight of Attribute	Option-1	Option-2	Option-3
					Score	Score	Score
Air Quality	Respirable PM10	More than Permissible limit i.e. 100 µg/m3	5	5	-	-	-
		Upto 50 µg/m3	2				
		Upto 20 µg/m3	0				
	Respirable PM 2.5	More than Permissible limit i.e. 60 µg/m3	5	5	-	-	-
		Upto 30 µg/m3	2				
		Upto 10 µg/m3	0				

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Physical Environment							
Attributes	Scoring Criteria		Score	Total Weight of Attribute	Option-1	Option-2	Option-3
					Score	Score	Score
	SO2/Nox	More than Permissible limit i.e. 80 µg/m3	5	5	-	-	-
		Upto 40 µg/m3	2				
		Upto 20 µg/m3	0				
	CO (1 Hr. Monitoring)	More than Permissible limit i.e. 4000 µg/m3	5	5	-	-	-
		Upto 2000 µg/m3	2				
		Upto 1000 µµ/m3	0				
	CO (8 Hr. Monitoring)	More than Permissible limit i.e. 2000 µg/m3	5	5	-	-	-
		Upto 1000 µg/m3	2				
		Upto 250 µ+C43/m3	0				
Ground Water	Limit as per IS 10500:2012	If 4 Parameters are above desirable limit	5	5	-	-	-
		If 2 Parameters are above desirable limit	2				
		All within Permissible Limit	0				
Surface Water	Limits as per IS:2296 Class C	If 4 Parameters are above desirable	5	5	-	-	-

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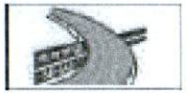

Physical Environment							
Attributes	Scoring Criteria		Score	Total Weight of Attribute	Option-1	Option-2	Option-3
					Score	Score	Score
	Limits	limit					
		If 2 Parameters are above desirable limit	2				
		All within Permissible Limit	0				
Noise	Day Time (Ambient Noise) in Residential/Commercial/Silent (*Noise Level in dB (A) for continuous 24 hours at 1 hour interval)*	More than Permissible Limit i.e.65dB	5	5	-	-	-
		Upto 50% of Permissible Limit i.e.32dB	2				
		Upto less than 50 % of Permissible Limit	0				
	Night Time (Ambient Noise) in Residential/Commercial/Silent (*Noise Level in dB (A) for continuous 24 hours at 1 hour interval)*	More than Permissible Limit i.e.55dB	5	5	-	-	-
		Upto 50% of Permissible Limit i.e.27dB	2				
		Upto less than 50 % of Permissible Limit	0				
Soil		Saline/Highly Alkaline/Highly Acidic	5	5	-	-	-
		Moderate	2				
		Within 50% of Permissible Limit	0				

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Physical Environment							
Attributes	Scoring Criteria		Score	Total Weight of Attribute	Option-1	Option-2	Option-3
					Score	Score	Score
Total	-	-		50	-	-	-

Social Environment							
Attributes	Scoring Criteria		Score	Total Weight of Attribute	Option-1	Option-2	Option-3
					Score	Score	Score
People	No of Families Affected/Km	>25	5	5	4	5	5
		Upto 20	4				
		Upto 10	2				
		<5	1				
Agriculture	Affectected Area/Km	>2 ha.	10	10	10	10	10
		Upto 1 ha.	5				
		Upto 0.2 ha.	1				
		if No	0				
Settlements	Total length of settlement sections (both towns and villages) abutting the road corridor	10 km or less	2	10	2	4	4
		10 to 20 km	4				
		20 to 30 km	6				
		30 to 40 km	8				

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Social Environment							
Attributes	Scoring Criteria		Score	Total Weight of Attribute	Option-1 Score	Option-2 Score	Option-3 Score
		40 km or more	10				
Sensitive Receptors	Number (total) of sensitive receptors within RoW (such as educational and health facilities) per km	10 or less	1	5	1	2	2
		11 to 20	2				
		21 to 30	3				
		31 to 40	4				
		41 or more	5				
Drinking water sources	Total number of drinking water sources (wells, hand pumps, community water points/taps etc.) with in RoW per km	10 or less	1	5	1	3	3
		11 to 20	2				
		21 to 30	3				
		31 to 40	4				
		41 or more	5				
Religious Structures	Number (total) of religious structures (temples, shrines, mosque, church, gurudwara) with in RoW	10 or less	1	5	1	2	2
		11 to 20	2				
		21 to 30	3				
		31 to 40	4				
		41 or more	5				
Cultural Heritage Site	Number (total) of cultural properties (protected/ unprotected archeological monuments) within RoW.	2 or less	1	5	0	0	0
		3 to 5	2				
		6 to 8	3				
		8 to 10	4				
		More than 10	5				

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Social Environment							
Attributes	Scoring Criteria		Score	Total Weight of Attribute	Option-1	Option-2	Option-3
					Score	Score	Score
Market Places	Number (total) of weekly market places/*haats*; grain/fruit/ vegetable/ fish market; cattle market	5 or less	1	5	1	2	2
		6 to 10	2				
		11 to 15	3				
		16 to 20	4				
		21 or more	5				
Common Property Resources	Number (total) of CPRs (such as pastures/gauchar lands; seating areas of the community; cremation/burial grounds etc.) within/along the RoW	5 or less	2	10	2	2	2
		6 to 10	4				
		11 to 15	6				
		16 to 20	8				
		21 or more	10				
Total	-	-	-	60	22	30	30

Engineering Aspect							
Attributes	Scoring Criteria		Score	Total Weight of Attribute	Option-1	Option-2	Option-3
					Score	Score	Score
Road Length, (Km)	Total length of the Road	10 km or less	3	15	15	15	15
		10 to 20 km	6				

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Engineering Aspect							
Attributes	Scoring Criteria		Score	Total Weight of Attribute	Option-1	Option-2	Option-3
					Score	Score	Score
		20 to 30 km	9				
		30 to 40 km	12				
		40 km or more	15				
Geometrical Elements	Horizontal and Vertical (Curvature)	Nil	0	15	12	15	15
		5 or less	3				
		6 to 10	6				
		11 to 15	9				
		16 to 20	12				
		21 or more	15				
Road Safety		High	5	15	5	10	10
		Moderate	10				
		Low	15				
Operational	Connectivity / Access	Better	5	10	5	7	7
		Moderate	7				
		Low	10				
Construction Time		<30 Months	5	10	7	10	10
		up to 36	7				
		>36 Months	10				
Muck/blasting/ disposal	Cutting/ drilling/ blasting /	Low	1	5	1	1	1

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Engineering Aspect							
Attributes	Scoring Criteria		Score	Total Weight of Attribute	Option-1	Option-2	Option-3
					Score	Score	Score
	Disposal	Moderate	3				
		High	5				
Underpass (No.)	VUP/LVUP/SVUP	10 or less	4	10	10	10	10
		11 to 20	6				
		21 to 30	8				
		31 or more	10				
Interchange	Number (total) of Road Junctions	10 or less	4	10	2	2	2
		11 to 20	6				
		21 to 30	8				
		31 or more	10				
Railway Crossing	Number (total) of RUB/ROB/At Grade	Nil	0	10	4	0	0
		2 or less	4				
		3 to 4	6				
		5 to 7	8				
		8 or more	10				
Major Bridge	Number (total) of Bridges incl. bridges on Water Bodies	2 or less	4	10	10	10	10
		3 to 5	6				
		6 to 8	8				
		More than 8	10				

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Engineering Aspect							
Attributes	Scoring Criteria		Score	Total Weight of Attribute	Option-1	Option-2	Option-3
					Score	Score	Score
Minor Bridge	Number (total) of Bridges incl. bridges on Water Bodies	5 or less	4	10	10	10	10
		6 to 10	6				
		11 to 15	8				
		15 or more	10				
Total Cost of Structures	Civil Cost (Crores)	Upto 300	2	5	5	5	5
		300 to 600	3				
		600 to 1000	4				
		1000 or more	5				
Total Construction Cost	Civil Cost (Crores)	Upto 500	2	5	5	5	5
		500 to 1000	3				
		1000 to 1500	4				
		1500 or more	5				
Total	-	-	-	130	91	100	100

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Scoring Criteria	Total Weightage	Option-1	Option-2	Option-3
		Score	Score	Score
Natural Environment	80	21	36	31
Biological Environment	80	3	5	5
Physical Environment	50	25	38	25
Social Environment	60	22	30	30
Engineering	130	91	100	100
Total	400	162	209	191
		Recommended		

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Based on the above studies the following observations are there:

1. Option 2 and 3 are passing through Singareni Collieries Company Boundary's".
2. Option 2 and 3 leads to major impact on flora as more number of trees is falling under the alignment.
3. Option 2 and 3 leads to more impact on structure and families as number affected families are high as compared to option 1.

Option 1 is found to have less impact on environmental and social component, hence it is followed.

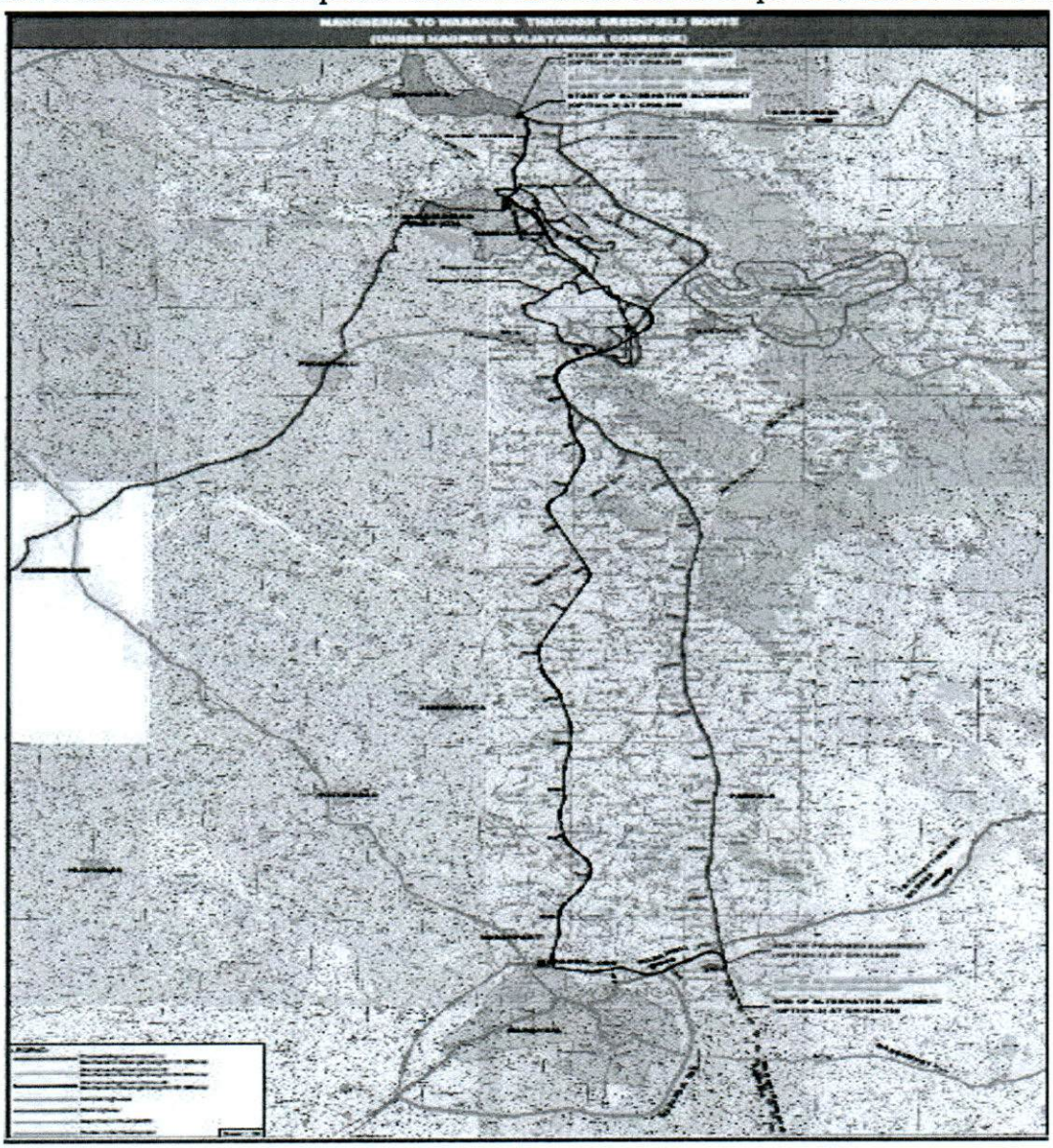

Figure 5.1: Details of alternative alignments

5.3 WITH AND WITHOUT PROJECT SCENARIO

The proposed project will not only develop the surrounding area but will also provide smooth movement of traffic and linking with other roads of the country. Keeping in view, the site conditions and the scope of development of the area, the 'With' and 'Without' project scenarios has been studied. The details of the "With" and "Without" Project has been presented in **Table 5.2.**

Table 5.2: 'With' and 'Without' Project Scenario

With Project		Without Project	
Positive Impacts	**Negative Impacts**	**Positive Impacts**	**Negative Impacts**
• The construction of new highway will reduce the traffic congestion and wastage of fuel. • Flourish in trade and Commerce. • Providing better level of service in terms of improved riding quality and smooth traffic flow. • Reduction in accident rate. • Access to new Employment Opportunities. • Employment of local workers for the execution of project. • Better access to health care and other social services. • Improved quality of life of the local people. • Better way side. amenities and other facilities like bus bays/shelters, truck	• Approx. 595.686 ha of land shall be acquired • Around 14,689 trees will be cut down due to development of green field alignment. • Increase of traffic will lead to air and noise pollution. • Removal of trees and vegetation due to construction of proposed project • Changes in land use pattern along the new green field alignment. • Increase in dust pollution and noise Pollution during Construction period. However, this will be for short term.	• No acquisition of land or properties and hence no displacement of families. • No felling of existing trees and vegetation	• Travel time and fuel consumption level will be more due to bottlenecks • Increased air pollution in the close proximity of the existing roads due to slow moving traffic and congestion • Rise in noise levels due to more traffic congestion on the existing roads • Chances of accidents on existing transport infrastructure will be more in absence of the planned Highway. • Further deterioration of project road.

With Project		Without Project	
Positive Impacts	Negative Impacts	Positive Impacts	Negative Impacts
lay byes and service roads. • Adequate underpasses flyovers for cross over	• Displacement of families		

Therefore, 'with' project scenario, with its insignificant adverse impacts is more acceptable than the 'without' project scenario, which would mean an aggravation of the existing problems. The potential benefits of the planned highway are substantial and far reaching both in terms of the geographical spread and time. Hence, it is clear that the implementation of the project will be a definite advantage to Telangana especially in Mancherial, Peddapalli, Jayashankar Bhupalpally and Warangal rural (Warangal) districts, and its neighboring states and in order to achieve all-round development of their economy and progress for their people.

The potential impacts on different environmental components would be avoided through good engineering design practices. Appropriate mitigation measures have been suggested where avoidances are not possible in various sections of the environmental assessment report.

MANCHERIAL TO WARANGAL THROUGH GREENFIELD ROUTE
(UNDER NAGPUR TO VIJAYAWADA CORRIDOR)

START OF PROJECT AT CH:0.000

TS/MH BORDER

MANCHERIAL

Armoor-Ramagundam GFA

Godavari River

RAILWAY CROSSING

Previous Alignment

Singareni dumping yard

Recommended Option

RAMAGUNDAM POWER STN.

RAMAGUNDAM

Singareni open cast

Singareni boundaries

Sivaram Wildlife Sanctuary

MANTHANI

MDR

Peddapalli-Manthani Road

PEDDAPALLI

Maner River

KARIMNAGAR

JAMMIKUNTA

HUZURABAD

PARKALA

HUSNABAD

TS/CHHATTISGARH BORDER

HASANPARTI

WARANGAL ORR

WARANGAL

END OF PROJECT AT CH:111.762

NARSAMPET >>>

LEGEND:

- Proposed Greenfield Alignment from Mancherial to Warangal (Length=111.762 kms)
- Greenfield Alignment Old option from Mancherial to Warangal (Length=104.000 kms)
- National Highways
- State Highway
- Major District Road (MDR)
- Routes Under Development

Date: 28-March-2019

Scale= 1:100