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ESIA

FINAL ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT REPORT FOR 300 MW SECI VI JAGALUR WIND POWER PROJECT, KARNATAKA

Location:
Jagalur, Kudligi and Chitradurga Taluka, Davangere, Bellary and Chitradurga District, Karnataka (India)

Client:
Ostro Kannada Power Private Limited

ReNew POWER

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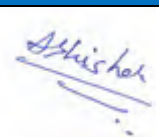
Compiled By:	Abhishek Tomar	01/12/2021	
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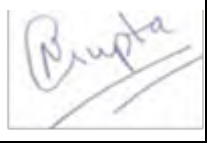
Reviewed By:	Nishtha Gupta	03/12/2021	

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Glossary

AAQM	:	Ambient Air Quality Monitoring
AoI	:	Area of Influence
AAQM	:	Ambient Air Quality Monitoring
ATS / ATL:		Agreement to Sale / Agreement to Lease
ABT	:	Availability Based Tariff
BIS	:	Bureau of Indian Standards
BOD	:	Biochemical Oxygen Demand
CEA	:	Central Electricity Authority
CERC	:	Central Electricity Regulatory Commission
CGWA	:	Central Ground Water Authority
CDM	:	Clean Development Mechanism
CPCB	:	Central Pollution Control Board
CTE	:	Consent to Establish
CTO	:	Consent to Operate
DO	:	Dissolved Oxygen
DPR	:	Detailed Project Report
DG	:	Diesel Generator
E&S	:	Environmental & Social
EHS	:	Environment Health & Safety
EHSS	:	Environment Health Safety and Social
EMS	:	Environmental Management System
ESIA	:	Environmental and Social Impact Assessment
ESAP	:	Environmental and Social Action Plan
ESMS	:	Environmental and Social Management System
ESMP	:	Environmental & Social Management Plan
ERP	:	Emergency Response Plan
ESIA	:	Environmental and Social Impact Assessment
EPC	:	Engineering, Procurement and Construction
EPFI	:	Equator Principles Financial Institutions
EAP	:	Environment Action Plan
FCCC	:	Framework Convention on Climate Change
FI	:	Financial Intermediary
FPIC	:	Free, Prior and Informed Consent
GR	:	Grievance Redressal
GHG	:	Green House Gases
GIIPs	:	Good Industrial International Practices
GRP	:	Grievance Redressal Policy
KSPCB	:	Karnataka State Pollution Control Board
IFC	:	International Finance Corporation
IEGC	:	Indian Electricity Grid Code

IEEE	:	Institute of Electrical and Electronics Engineers
ICAR	:	Indian Council of Agricultural Research
IUCN	:	International Union for Conservation of Nature
ICC	:	Internal Complaint Committee
KPI	:	Key Performance Indicator
LOTO	:	Lock out/ Tag Out
MW	:	Mega Watt
MNRE	:	Ministry of New and Renewable able Energy
MoEF	:	Ministry of Environment & Forest
MBGL	:	Meters Below Ground Level
MCM	:	Million Cubic Meters
NRRP	:	National Rehabilitation and Resettlement Policy 2007
NOC	:	No Objection Certificate
NOx	:	Oxides of Nitrogen
NAAQS:		National Ambient Air Quality Standards
OHS	:	Occupational Health and Safety
OKPPL	:	Ostro Kannada Power Private Limited
OSHA	:	Occupational Safety and Health Administration
O&M	:	Operation and Maintenance
PPEs	:	Personal Protection Equipment
PGCIL	:	Power Grid Corporation of India Limited
PS	:	Performance Standards
REET	:	Rare, Endangered, Endemic and Threatened species
PESO	:	Petroleum and Explosives Safety Organization
QHSE	;	Quality Health Safety and Environment
RAP	:	Resettlement Action Plan
PAP	:	Project Affected People
R&R	:	Resettlement & Rehabilitation
ROW	:	Right of Way
RTO	:	Regional Transportation Officer
SCADA	:	Supervisory Control and Data Acquisition
SDA	:	State Designated Agency
SECI	:	Solar Energy Corporation of India
SERC	:	State Electricity Regulatory Commission
SO2	:	Sulphur Dioxide
SPCB	:	State Pollution Control Board
TUV SUD:		TUV SUD South Asia Pvt. Ltd.
WPA	:	Wild Life Protection Act

EXECUTIVE SUMMARY

ReNew Power is one of the India's largest providers of on-site solar and wind power. The company was established in 2011 and a subsidiary of ReNew Energy Global PLC, is one of India's largest renewable energy IPPs in terms of total energy generation capacity. Since commencing operations with a 25.2 MW wind project in Jasdan, Gujarat, the company has grown exponentially. ReNew Power increased its operational capacity from 545.76 MW as of March 31, 2015 to 986.90 MW as of March 31, 2016 and became the first Indian Renewable Energy Independent Power Producer (IPP) to exceed 1 GW of operational capacity in April 2016. ReNew Power then doubled its operational capacity to 1.99 GW as of March 31, 2017 and again nearly doubled it to 3.92 GW as of March 31, 2018. The company has grown exponentially, and has a current renewable asset base of over 10 GW, including projects under development and in the pipeline.

In October 2019, ReNew Power became the 1st Renewable Energy company in India (and 10th globally) to cross 5 GW of installed capacity. The present commissioned capacity is 6.4 GW and rest 3.8 GW is committed capacity. It has already commissioned 51 wind power projects located in seven different states namely, Rajasthan, Gujarat, Madhya Pradesh, Andhra Pradesh, Maharashtra, Karnataka, Tamil Nadu with a total installed capacity of 3.94 GW in India. The Company has also been recognised among the top 10 Companies globally in Fortune Magazine's 2021 'Change the World' list.

Ostro Kannada Power Private Limited (hereinafter referred to as "OKPPL"), is a special purpose vehicle (SPV) of ReNew Power Limited (henceforth referred to as 'ReNew Power). OKPPL has secured the present project in Jagalur, Kudligi and Chitradurga talukas falling in Davangere, Bellary and Chitradurga districts in Karnataka through Competitive Bidding Process for development, generation, and supply of electricity from proposed 300 MW Wind Power Project to achieve its renewable power purchase obligation requirement. It has signed a 25-year power purchase agreement with SECI for selling power. M/s Ostro Energy Pvt Ltd. (OEPL), has been awarded this project under bid for 'Selection of Wind Power Developers for Setting up of 300 MW ISTS-Connected Wind Power Projects under Global Competitive Bidding for SECI – VI (1200M)'. [RFS No.: SECI/C&P/WPD/1200M/T6/RfS/122018 dated 31.12.2018].

The proposed project is partly operational and divided into two phases (Phase-I and II). Phase-I comprises of 72 WTG's falling in Davangere and Bellary districts which are partly operational. Out of these; 60 land locations are final and 30 WTG's are already operational which were procured from Siemens Gamesa. The land for 12 WTG's is yet to be finalized. The Phase-II comprises of 71 WTG's falling in Davangere and Chitradurga districts out of

which Agreement To Sell (ATS) has been signed for 20 WTG's and land is yet to be finalized for 51 WTG's.

The construction activities were observed in progress at Phase-I during the Site visits undertaken on 7th - 11th October 2021. Around 45 WTGs have been erected till date.

Presently, the land for 80 WTGs has already been procured and ATS is signed with the land sellers in the name of land aggregators which will further transferred in the name of OKPPL. There are 6 land aggregators involved for the land acquisition of the proposed project. Approximately 548 acres of land is being proposed to be acquired for the wind power project in Jagalur, Kudligi & Chitradurga Talukas falling in Davangere, Bellary and Chitradurga districts based on Willing Buyer-Willing Seller transactions. Since the proposed project will be implemented in two phases, therefore, there are two pooling substations of 150 MW capacity each which consists of a land parcel of 7 acres for Phase I & 6 acres for Phase II.

The power output from Pooling Substation (PSS) Phase II shall be evacuated at PSS Phase I located at a distance of 26.47 km. The power generated from PSS Phase-I shall then be transmitted through exernal tranmsmission line to PGCIL 400/220 kV Hiriyur Grid Substation located near village Beerenahalli in Hiriyur at a distance of 78 km. The 300 MW Jagalur Wind Power project is expected to be commissioned by March 2022.

TÜV SÜD South Asia Pvt. Ltd. (TÜV SÜD) has been assigned by OKPPL for undertaking Environmental and Social Impact Assessment (ESIA) of its 300 MW SECI VI Jagalur Wind Power Project in Jagalur, Kudligi & Chitradurga Talukas, Davanagere, Bellary & Chitradurga Districts, Karnataka in India.

This ESIA report has been prepared based on detailed reconnaissance visit carried out at the site, environmental monitoring, analysis and review of available documents and consultations/ discussions with the project proponents and related stakeholders. The report assesses the project for social and environment aspect with respect to the International Finance Corporation (IFC) Performance Standards and Equator Principles 4. It also covers IFC's General EHS Guidelines, published on April 30, 2007; IFC's Environmental, Health and Safety Guidelines for Wind Energy published on 7th August, 2015 and IFC's EHS Guidelines for Electric Power Transmission and Distribution.

Applicability of Performance Standards

PS No.	Performance Standards	Applicability
PS 1	Assessment and Management of Environmental and Social Risks & Impacts	● Yes ○ No

PS 2	Labour and Working Conditions	● Yes ○ No
PS 3	Resource Efficiency and Pollution Prevention	● Yes ○ No
PS 4	Community Health, Safety, and Security	● Yes ○ No
PS 5	Land Acquisition and Involuntary Resettlement	○ Yes ● No
PS 6	Biodiversity Conservation and Sustainable Management of Living Natural Resources	● Yes ○ No
PS 7	Indigenous Peoples	○ Yes ● No
PS 8	Cultural Heritage / PS 8	○ Yes ● No

1. PROJECT CATEGORIZATION

In accordance to the screening criteria of IFC Principles and Equator Principles, TÜV SÜD has categorized Project as ***Category B***, which specifies that the project can cause potential and limited adverse social or environmental impacts which are generally site-specific, largely reversible and readily addressed through mitigation measures. The major observations of the proposed project are as follows.

- The project is a Greenfield project. There are no resettlements and rehabilitation or involuntary resettlement issues related to the project.
- The land procurement for Wind Power Project is being carried out based on 'willing buyer-willing seller' transactions with compensation of around 4-5 times than government rate and more than twice the prevailing market rates. There are no issues observed related to Common Property Resources (CPR) in the land acquired for the proposed project. However; NOC from Gram Panchayat and separately from ST community needs to be obtained for the 3 nos. ST land parcels acquired till date and any further ST land parcels being acquired if any.
- There is no critical habitat with high biodiversity value within project premises, AoI and buffer zone of 15 km radius
- No migratory bird pathway and corridors were observed near the project site and in the Study Area. Also no nesting and breeding grounds of birds were observed in Tranmsission Line Route and in the area earmarked for Wind Power Project;
- There are no biosphere reserves, national parks, tiger reserves, Important Bird Areas (IBA), nesting or breeding grounds for any of the rare species within the study area of 15 km radius.
- Rangayyanadurga Four Horned Antelope Wildlife Sanctuary boundary is located at 1.4 km of project area (WTG SGJA-73) and Eco-sensitive zone of Rangayyanadurga Four Horned Antelope Wildlife Sanctuary falls partially within the project area. 2 WTGs (SGJA-78 and SGJA-73) fall within the ESZ area of Rangayyanadurga Four Horned Antelope Wildlife Sanctuary.

- The peacock corridor is located at a distance of 1.63 km in NE direction from SGJA 06; 1.57 km in NNE direction from SG JA-07; 1.28 km in SW direction from SG JA-70 and at

a distance of 4.68 km in SW direction from PSS Phase I

- NOC from Forest and Wildlife Department is required to be obtained for laying WTG's and associated facilities for the project due to presence of WTGs SGJA-78 & SGJA-73 within the ESZ boundary of the Rangayyanadurga Four Horned Antelope Wildlife Sanctuary.
- The Shadow Flicker assessment conducted reveal that the shadow impacts shall not exceed 30 hours on all permanent receptors thereby avoiding adverse impacts on aesthetics during operation phase of the project
- The Noise Modelling Assessment results further indicate that cumulative noise levels are within permissible limits of 55 dB(A) during day time and 45 dB(A) during night time near permanent receptors in proximity of WTG's except receptors in vicinity of 7 WTG locations therefore it is advised to shift WTG locations namely SGJA 71, SGJA 73, SGJA 74, SGJA 75, SGJA 77, SGJA 78, SGJA 79 due to moderate impact of noise determined during Operation Phase during day as well as night-time.
- The access to the village roads will not be restricted during construction and operation phase of the project and Traffic Management Plan shall be implemented during Construction and Operation & Maintenance Phase of the project. Approach roads from the existing village road or PWD roads shall be constructed to access the WTG locations
- There are no issues related to cultural heritage and archaeological significance near project site

2. PROJECT DESCRIPTION

The proposed wind farm is is spread across 38 nos. villages i.e. Alur, Lokikere, Hullikere, Kenchamalanhalli, Yerrahali, Bangarakkan gudda, Huchavanhalli, Anabur, Mugichukkanhalli, Chikamalanhalli, Hirekumbalakunte, Harlakatte, Hullehal, Nellikatte, Yellagodu, Issamudra, Chennapura, Matadhavvannahalli, Sagalgatte, Guttidurga, Taitoni, Madamuttenhalli, Ajjanppnahalli, Rastamachekere, Kalagere, Gollarahalli, Kotadagudda, Nagathihalli, Adavigollarahalli, Medaginakere, Karinamanahalli, Dibbadahatty, Byranaikanahalli, Rangavvanahalli, Kakabalu villages in Jagalur, Kudligi & Chitradurga Talukas falling in Davanagere, Bellary & Chitradurga Districts in the State of Karnataka, India.

The site boundaries for the wind farm site are given below in **Table 1**.

Table 1 : Boundaries of the Wind Farm

Boundary	WTG Phase I	Geographical Coordinates	WTG Phase II	Geographical Coordinates
Northern Boundary	SGJA - 03	14°38'15.36"N 76°29'18.73"E	SGJA - 73	14°32'5.38"N 76°16'33.01"E

Southern Boundary	SGJA - 31	14°32'36.33"N 76°27'19.63"E	SGJA - 99	14°21'23.84"N 76°14'2.78"E
Eastern Boundary	SGJA - 01	14°35'55.50"N 76°29'50.47"E	SGJA - 77	14°30'51.58"N 76°17'49.15"E
Western Boundary	SGJA - 67	14°35'32.86"N 76°23'46.17"E	SGJA - 88	14°25'24.81"N 76°13'3.06"E

The location map and vicinity of the project site is given in **Figures 1-2**.

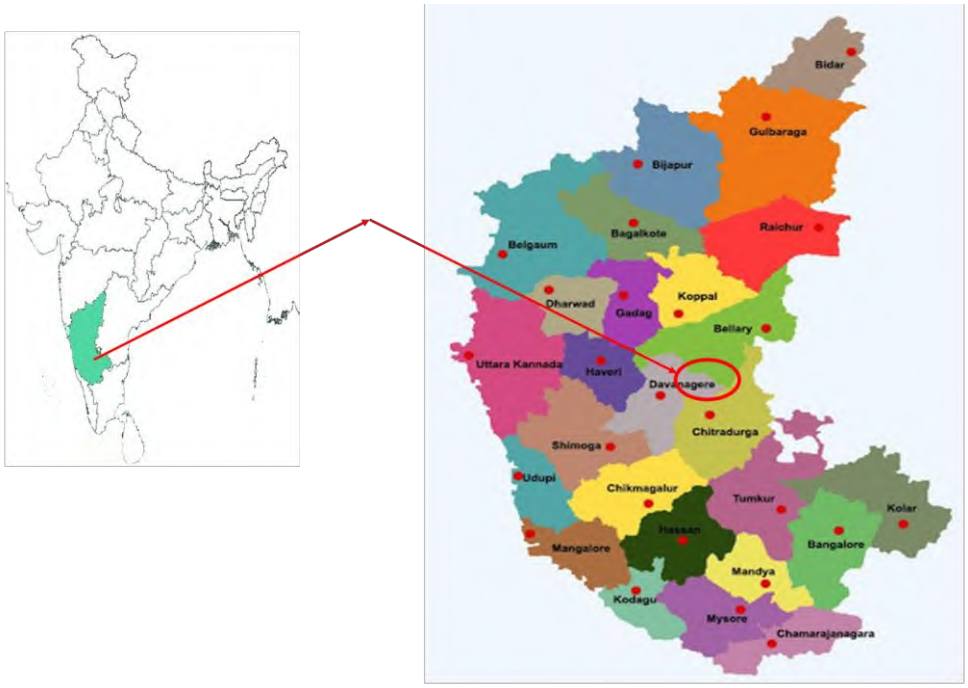

Figure 1: Location Map of Project Site

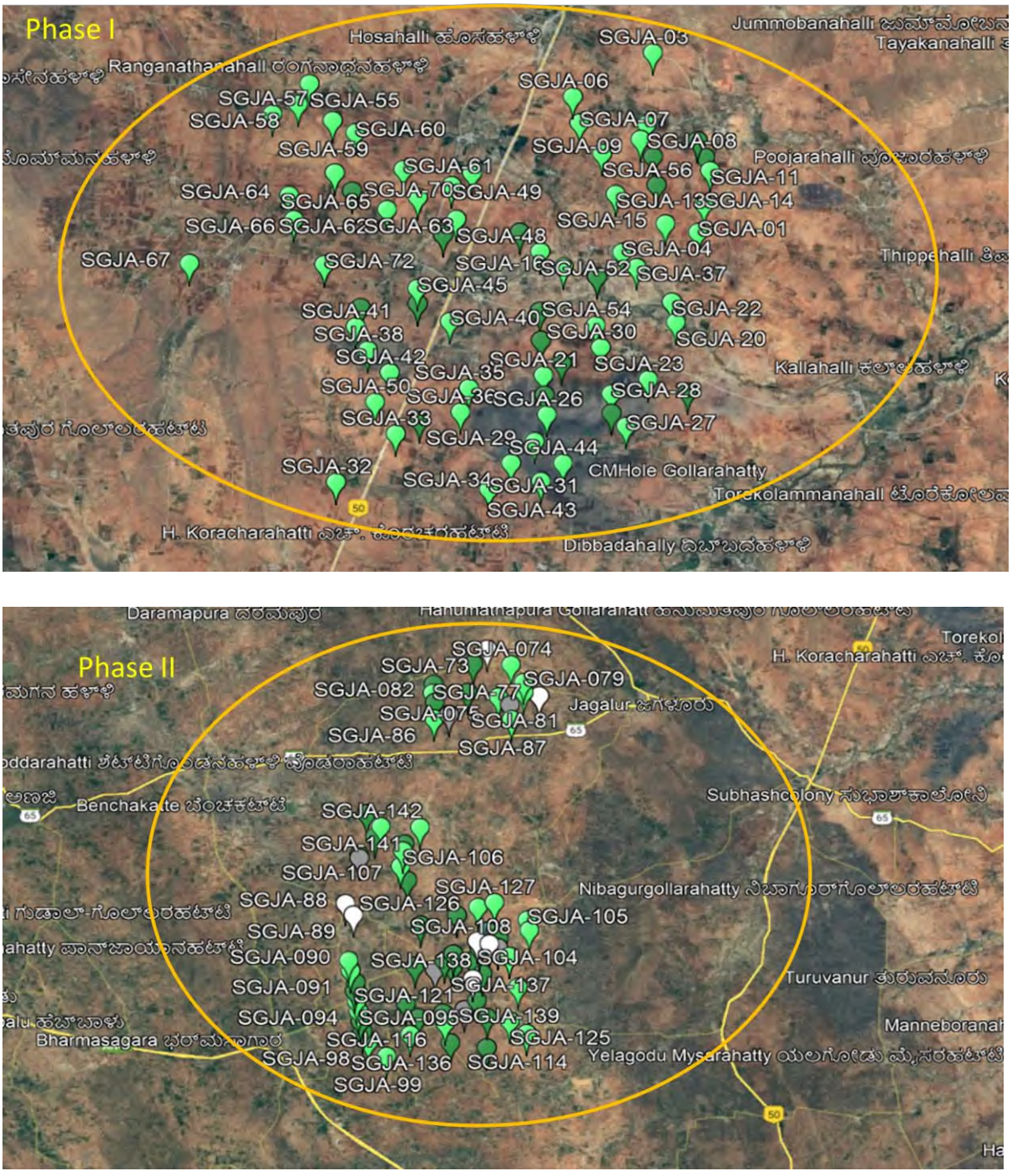

Figure 2: Vicinity Map (Phase I & II) of 300 MW Jagalur Wind Power Project

Around 548 acres of flat rainfed agricultural land and few patches of barren dry land with minor undulation has been procured for Wind power project. The 300 MW wind power plant will have 143 WTGs of 2.1 MW each SG 2.1-114 model). Currently all 143 proposed WTG locations have been finalized out of which land for 80 locations have already been acquired.

The nearest commercial city, Davanagere is 60 Km away from the Project site location and the nearest major airport to the site is at Bengaluru approximately 200 km away from the site.

The proposed project is partly operational and divided into two phases (Phase-I and II). Phase-I comprises of 72 WTG's falling in Davangere and Bellary districts which are partly operational. Out of these; 60 land locations are final and 30 WTG's are already operational which were procured from Siemens Gamesa. The land for 12 WTG's is yet to be finalized. The Phase-II comprises of 71 WTG's falling in Davangere and Chitradurga districts out of which Agreement To Sell (ATS) has been signed for 20 WTG's and land is yet to be finalized for 51 WTG's.

The site (Phase I) is accessible from the PWD and village road which connects to Solapur-Mangalore National Highway (NH-50) at 280 m from WTG SGJA 33. The proposed project site (Phase II) is connected to Jagalur Taluka via State Highway (SH-65) which further connects to SH-50 located at 9 km in the South-East direction.

The site is approachable by black top PWD road that on north and south side for both Phase I & Phase II. This road in turn leads to the individual WTGs with many kuccha village roads. OKPPL will need to develop access road to individual WTGs from the available village road. In case village road is used for the transportation of construction material it should be done with proper traffic management plan and should be continually repaired in case the road is damaged.

The construction of Pooling substation phase I is completed and commissioning is under process in Anabur village and construction was observed to be ongoing for PSS Phase II in Nallikatte village at the time of site survey conducted. The proposed Wind Turbines of Phase I cluster will be connected to Plant's Internal 33 / 220 kV Pooling Substation PSS I & Phase II near Village Anabur and Nallikatte respectively. The power generated from proposed 300 MW project will be evacuated at the PGCIL 400/220 kV Hiriyur Grid Substation located near village Beerenahalli in Hiriyur.

The Power from Pooling Substation Phase II will be evacuated to PSS Phase I through 26.47 km long 220 kV Single Circuit Transmission Line along with associated bay and metering infrastructure and the overall power from 300 MW wind power project (PSS Phase I) is expected to be evacuated to PGCIL Substation, Hiriyur located at a distance of 78 km through 220 kV Single Circuit Transmission Line along with associated bay and metering infrastructure.

The project area is characterized by rural setup, flat rainfed agricultural land and few

patches of barren dry land with minor undulation. The project area has an elevation in the range of 660 - 666 m above mean sea level for Phase I and elevation in the range of 656-760 m above mean sea level for Phase II. As per the revenue records, the land use of the project area is classified as rainfed agricultural land and few patches of barren dry land with minor undulation. The project area comprises of seasonal crops which includes cotton, groundnut, sunflower, maize depending on the availability of water. The approach roads are mostly kachcha village roads with few stretches of black top road and concrete roads (when it passes through the villages).

The project area of Influence (AoI) does not fall within any sensitive receptors viz. Wildlife Sanctuaries, Biosphere Reserves, National Parks etc. Also, there are no migratory pathways for avian fauna. No forest land is associated with the land taken for the project. However, Rangayyanadurga Four Horned Antelope Wildlife Sanctuary boundary is located at a distance of 1.4 km from WTG-SGJA-73 and SGJA-78. These 2 WTGs further fall within the ESZ area of Rangayyanadurga Four Horned Antelope Wildlife Sanctuary.

The peacock corridor is located at a distance of 1.63 km in NE direction from SGJA 06; 1.57 km in NNE direction from SG JA-07; 1.28 km in SW direction from SG JA-70 and at a distance of 4.68 km in SW direction from PSS Phase I. Rangayyanadurga Four Horned Antelope Wildlife Sanctuary Eco-sensitive zone is located at 11.8 km distance from transmission line.

It was also confirmed that neither of the WTG finalized till date is not located under earmarked Reserved Forest (RF) land. Further, the transmission line from Phase II to Phase I & from Phase I to GSS also does not pass through any sensitive areas. Also, there are no structures of archaeological significance in the Study Area.

The description of the proposed project is provided below:

Parameters	Description
Location	143 WTGs are located across 38 nos. villages i.e. Alur, Lokikere, Hullikere, Kenchamalanhalli, Yerrahali, Bangarakkan gudda, Huchavanhalli, Anabur, Mugichukkanhalli, Chikamalanhalli, Hirekumbalakunte, Harlakatte, Hullehal, Nellikatte, Yellagodu, Issamudra, Chennapura, Matadhavvannahalli, Sagalgatte, Guttidurga, Taitoni, Madamuttenhalli, Ajjanppnahalli, Rastamachekere, Kalagere, Gollarahalli, Kotadagudda, Nagathihalli, Adavigollarahalli, Medaginakere, Karinamanahalli, Dibbadahatty, Byranaikanahalli, Rangavvanahalli, Kakabalu villages in Jagalur, Kudligi & Chitradurga Taluka, Davanagere, Bellary & Chitradurga District in the State of Karnataka, India.
Type of WTGs	143 WTGs with a capacity of 2.1 MW each with a rotor diameter of 114 m and 127 m tower height. (Model: SG114 -2.1 MW)
Power Evacuation	• The project will consist of approximately 78 km of external

	transmission line from PSS Phase I to GSS and 26.47 km from PSS Phase II to PSS Phase I. The power will be evacuated from PSS I as whole of 300 MW consist of output from PSS Phase I & II.
Land Requirement	• 143 WTG are proposed on private land only. • Approximately 3.5 to 4 acres land is required including the access road is required per WTG; • Land parcels for 80 out of the 143 WTG locations have already been finalized consist of private land through Willing buyer – Willing Seller Transaction; • 7 acres of land for PSS Phase I & 6 acres for PSS Phase II has also been procured for the pooling substation.
Project Status	• 30 WTG are already operational which were procured by Siemens Gamesa. • Agreement to sell is signed for 80 WTG locations out of which 45 WTGs are already erected and construction work with piling, foundation and erection of WTG's at few locations is under process • Construction phase is anticipated to be completed in a phased manner by the end of March 2022

3. BASELINE ENVIRONMENT

The area falling within 15 km radius from the 300 MW SECI VI project boundary has been considered as "Study Area" for the purpose of conducting ESIA Study. The WTG zone has been considered as "Core Zone" and Study Area of 15 km radius has been considered as "Buffer Zone". Further, the area falling within 500 m from the proposed project has been considered as Area of Influence (AoI) for evaluation of impact assessment of the project on noise and shadow flicker on the receptors in area falling with 0.5 km from the Wind Turbines for 300 MW SECI VII Wind Power Project.

The baseline data generation includes site visits, ecological surveys, social surveys and interviews, and secondary data review from established sources such as Indian Meteorological Department, Census of India.

Physiography and Topography

The project area is characterized by rural setup and flat rainfed agricultural land with minor undulation. The project area has an elevation in the range of 638- 666 m above mean sea level for Phase I and elevation in the range of 656- 704 m above mean sea level for Phase II. As per the revenue records, the land use of the project area is classified as rainfed agricultural land.

The PSS site and the 143 WTGs are at average elevation ranges from 660 - 666 m above mean sea level for Phase I and elevation in the range of 656- 760 m above mean sea level for Phase II.

Climate

The district enjoys semi arid climate, dryness in the major part of the year and hot summer. In general, southwest monsoon contributes 58 % of total rainfall and northeast monsoon contributes 22 % rainfall. The remaining 20 % rainfall is received as sporadic rains in summer months. It receives low to moderate rainfall. Normal annual rainfall varies between 556 mm in Jagalur and 808 mm in Channagiri taluka.

The district falls under central dry agro-climatic zone of the Karnataka state and is categorized as drought prone. Normal climatic parameters of Davanagere district are increasing temperature from March to May, usually maximum in April month and minimum temperature that is coldest month during month of December.

Proximity to Surface Waterbodies

There are 4 village lakes and chinna hagari stream present within the study area. Chinna Hagari river is located at a distance of 2.4 km from SGJA 43 WTG location, Jagalur lake is 4.1 km from SGJA 77 WTG location, Sangenahalli lake is 9.7 km from SGJA 108 WTG location, Anaji lake is 14.5 km from SGJA 102 WTG location and Katlalu lake is 9.8 km from SGJA 118 WTG location. These water bodies are seasonal and do not retain water for longer duration. Water from these water bodies is extracted by farmers to fulfill their irrigation needs during and after monsoon.

Depth to Groundwater Levels

In Jagalur Taluka, During May 2006 (pre-monsoon season) the minimum and maximum depths to water levels were 14.14 mbgl and 20.77mbgl respectively. During November 2006(Post-monsoon) water level ranged from 12.59 mbgl to 23.04 mbgl.

In Kudligi Taluka, during May 2011 (Pre-monsoon) the minimum and maximum depth to water level was 3.21 mbgl and 7.30 mbgl respectively. During November 2011 (Post-monsoon) water level ranged from 2.82 mbgl to 5.60 mbgl.

In Chitradurga Taluka, during May 2006 (pre-monsoon season) the minimum and maximum depth to water level are 2.43 and 13.13 mbgl respectively. During November 2006 (post-monsoon) water level ranges from 2.75 to 11.75 mbgl.

Seismicity and Wind Speed

The project falling under the Bellary, Davanagere, and Chitradurga District of Karnataka hence lies in seismic zone II (Low Damage Risk Zone (MSK VI).

ECOLOGY

The primary surveys were undertaken to identify the ecological features of the area with particular reference to identify and quantify any sensitive ecological communities in the study area within 15 km radius of the proposed project. Secondary surveys were conducted to identify Rare, Endangered, Endemic and Threatened species (REET) and/or habitats within the study area. The reference has been taken from The Wildlife (Protection) Act, 1972 and Red Data Book. The relevant, observations noted in that assessment have been included in the current assessment and referenced accordingly.

Project Area

The Project area is devoid of wildlife sanctuary, national park or notified ecologically sensitive areas or any other significant area of ecological interest. The project area does not fall in important bird area (IBA) and route of migratory birds. Occurrence of rare threatened and/or endangered (both flora and fauna) species has not been reported in and around the project site, and in AoI.

There is no critical habitat with high biodiversity value within project premises, AoI and buffer zone of 15 km radius. No migratory bird pathway and corridors were observed near the project site and in the Study Area. Also no nesting and breeding grounds of birds were observed in Tranmsission Line Route and in the area earmarked for Wind Power Project.

There are no biosphere reserves, national parks, tiger reserves, Important Bird Areas (IBA), nesting or breeding grounds for any of the rare species within the study area of 15 km radius. Rangayyanadurga Four Horned Antelope Wildlife Sanctuary boundary is located at 1.4 km of project area (WTG SGJA-73) and Eco-sensitive zone of Rangayyanadurga Four Horned Antelope Wildlife Sanctuary falls partially within the project area. 2 WTGs (SGJA-78 and SGJA-73) fall within the ESZ area of Rangayyanadurga Four Horned Antelope Wildlife Sanctuary.

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Habitat Type

There is no critical habitat with high biodiversity value, including (i) habitat of significant importance to Critically Endangered and/or Endangered species; (ii) habitat of significant importance to endemic and/or restricted-range species; (iii) habitat supporting globally significant concentrations of migratory species and/or congregatory species; (iv) highly threatened and/or unique ecosystems; and/or (v) areas associated with key evolutionary processes in the project area.

This type of vegetation is extensively found in non-cultivated lands, particularly revenue lands/grazing land located within the study area.

The project will be developed in a “Modified Habitat” and in this connection dry agricultural lands/ or barren lands have been procured. Typical thorny vegetation grows on its own in the abandoned agricultural lands/patta lands providing a habitat of nesting and perching to some of the resident birds. Small reptiles also find a suitable habitat in those places. It was observed that grazing was common in the area. No Reserved Forest area is present in core zone project site.

The study area comprising of core and buffer zone was assessed for the presence of important wildlife habitats and protected areas, mangroves, breeding and nesting habitats of fauna, coastal habitats, important wetlands, and grassland area from WTG Locations and transmission line of core and buffer zones. These important areas such as Protected areas (National Park, Wildlife Sanctuaries, Conservation Reserves etc.), Wetlands of national importance, Ramsar sites, Important Bird Areas (IBAs), classified by the Birdlife International and Bombay Natural History Society etc. Data collected and information gathered from primary and secondary sources on flora, fauna, protected area, natural habitats, wildlife species etc., were analysed and results are presented below in **Table 2.**

Table 2: Details of protected areas, forests & ecologically sensitive areas in Study Area

Ecological sensitive habitat	Description
National Parks/ Wildlife Sanctuary/ Biosphere reserves/ Elephant Reserve/ Any Other Reserve	Rangayyanadurga Four Horned Antelope Wildlife Sanctuary buffer zone boundary is located at 1.4 km of project area (turbine location-SGJA-78 and SGJA-73) and Eco-sensitive zone of Rangayyanadurga Four Horned Antelope Wildlife Sanctuary falls partially within the project area. Rangayyanadurga Four Horned Antelope Wildlife Sanctuary Eco-sensitive zone is located at 11.8 km distance from transmission line. The Eco sensitive zone notification is attached as **Annexure VI.**

Important Bird Areas (IBAs)	NIL within in 15 km study area Nearest Important Bird Area is Jogimatti Wildlife Sanctuary is located at 21 km distance from the WTG Locations and 7.1 km transmission line
Wetlands / Water bodies	Chinna Hagari Stream 2.2 km Jagalur Lake 4.0 km Sangenahalli Lake 9.7 km Katralu Lake 9.5 km
Reserved Forests	Niruthadi Reserved Forest - 9.3 km Bevinahalli Reserved Forest - 5.5 km Guheswara Gudda Reserved Forest - 3.6 km Jagalur Reserve Forest - 2.4 km Anabur Reserve Forest - 0.3 km Nimbalagiri Reserve Forest - 6.0 km Hosahalli Reserve Forest - 1.0 km Jummobanahalli Reserve Forest - 3.7 km Mallurahalli Reserve Forest - 9.7 km
Ramsar Site	NIL
Wildlife Corridors & Routes	Peafowl Corridor at Hulikere Village
Breeding/nesting areas of endangered species	NIL
Mangroves	NIL

The Shadow Flicker assessment conducted reveal that the shadow impacts shall not exceed 30 hours on all permanent receptors thereby avoiding adverse impacts on aesthetics during operation phase of the project. It is advised to shift WTG locations SGJA 71, SGJA 73, SGJA 74, SGJA 75, SGJA 77, SGJA 78, SGJA 79 due to moderate impact of noise determined during Operation Phase during day as well as night-time.

There are three land parcels which has already been acquired by OKPPL in Kanamadagu (Alur) village for the proposed wind power project. However; all 3 land parcels have been acquired from same family headed by Deputy Sarpanch who has further provided land for the project. The tribals in the area have similar socio-economic status at part with other community in the area. However; NOC from Gram Panchayat and separately from ST community needs to be obtained for the 3 nos. ST land parcels acquired till date and any further ST land parcels being acquired if any.

On the basis of interpretation made above, primary survey (interaction with stakeholders, FGD, community consultation, consultation with government official and discussion with influential person of the study area) and secondary sources, the major outcomes specify the

following need-based gaps in the study area:

- Scarcity of drinking water is a major issue of the study area. Main source of drinking water is piped supply tap water through village panchayat borewell.
- Some villages do not have transport facilities as they are not well connected with the There are fewer opportunities of employment and livelihood in the study area. Youth and people gaining higher education generally migrate for work and job in developing cities like Bengaluru, Hyderabad etc.
- The OKPPS wind power project will hire local people for both direct and indirect employment. During construction phase, labors and security staff are being hired locally. The locals are of the opinion that project will improve the socio-economic status of the study area
- Scarcity of drinking water is a major issue of the study area. Main source of drinking water is piped supply tap water through village panchayat, and borewells
- The area is primarily dependent on rains for cultivation
- There are only few Self Help Groups and NGOs which could further enhance the livelihood potential of the area by encouraging womenfolk to participate in tailoring, handicrafts etc
- There are no chronic or epidemic diseases reported in the study area
- There are no employment opportunities available for the women and this is needs to be done for the villages and study area
- As per the existing condition of the study area, it is recommended that Corporate Social Responsibility (CSR) Plan needs to be formulated for the project
- Vocational training programs and Capacity building and Skill enhancement programs should be organized for locals in the area

4. STAKEHOLDER CONSULTATIONS

A detailed stakeholder interactions were conducted by TUV SUD team with the land sellers and local population in project influenced villages and with the local population residing near project site.

OKPPL is in the process of procuring private land on willing seller/ and willing buyer basis private for the proposed project. Around 548 acres of land for installation of WTGs including access roads from Jagalur, Kudligi & Chitradurga Taluka villages will be acquired for the project out of which 280 acres of private land on Willing Buyer-Willing Seller transactions has been acquired for the project till date. However, since land acquisition is in progress for the proposed project project and remaining 268acres of land are yet to be acquired for the project therefore OKPPL should ensure adherence w.r.t. Willing Buyer-Willing Sellor approach adopted in the project for the proposed project and avoidance of Physical and Economic displacement issues, if any.

Procedure of Land Acquisition:

The procured land is mostly dependent on rain-fed agriculture pattern on seasonal crops and barren land. The compensation for the purchased land is reportedly above the existing government circle and market rate. No physical displacement happened due to the project and private land has purchased through good faith negotiations based on willing sellers and willing buyer basis, which was confirmed on the basis of following;

- Evalution of Agreement to Sell
- Primary consultation with landowners
- Consultation with land aggregator
- Discussions with Revenue Department related to prevailing rates
- Analysis of market value of land to verify compensation provided to landowners are higher than the circle rate.
- Evaution of Land Acquisition procedure and assessment that all land was purchased from one seller, and
- Interactions with land sellors and Sarpanch to ensure that nobody was pursued for selling who did not want to sell his land for any reasons known to him.

There are six land aggregators involves fot the land acquisition of the proposed project namely:

- Revana
- Virtuz
- Aqua Reality Solutions
- RPR
- Lawrence Deltekar
- Venakatesh Kulkarni

The procedure in land acquisition involves purchasing land on the basis of General Power of Attorney (GPA) in the name of six different land aggregators from individual farmers on payment of market value/fixed between the both parties which will further transferred in the name of OKPPL i.e. six land aggregators. OKPPL has signed Land Aggregation Agreement which stipulate various conditions for acquiring the land. The land sellers willing to sell land provide documents related to land and then a thorough due diligence is carried out by Land aggregators and OKPPL land team. The mutually agreed compensation is paid to the land sellers after executing GPA in form of a cheque. The GPA holders will then give the Agreement to Sell (ATS) to land aggregators. As per Section 109 and after sec 109 approval land aggregators on behalf of OKPPL can purchase the lands from GPA holders.

The procedure for land acquition for the project is as follows:

- OKPPL appoints six land aggregators as provided above.
- OKPPL provide the coordinates to each land aggreagator for identifiifcation of land for 143 WTGs
- Land aggregators approaches land owners for purchase of land
- Willing land owners provide documents related to land
- Due Diligence is carried out by Land Aggregators and OKPPL Land Team
- Clearance for purchase is received
- Land aggregator consults and negotiates with land owners regarding compensation for land purchase
- Pre-Agreement to Sell (ATS) is signed by the individual land seller in the name of land aggregators by providing some token money through land aggregators
- ATS is signed by the individual land seller in the name of land aggregators by providing agreed compensation is paid in the form of cheque
- Non - agricultural report is obtained
- Land Sale deed is signed by the individual land seller in the name of land aggregators
- Land Aggregators will transfer the sale deed in the name of “Ostro Kannada Power Private Limited”.

This project property does not involve any resettlement and rehabilitation in terms of physical and economical aspects hence do not attract Resettlement and Rehabilitation plan as per applicable national / state legislation. The rates offered to PAP have been considered based on market rates determined by Department of Stamps and Registration, Karnataka. The land is acquired on willing buyer-willing seller (WBWS) considering that

- Land markets or other opportunities for the productive investment of the sales income exist;
- The transaction took place with the seller’s informed consent; and
- The seller was provided with fair compensation based on prevailing market values. These principles should apply to land consolidators, aggregators, or land developers in order to ensure fair property transactions.

3 land parcels have been acquired from the persons belong to Schedule tribes community from same family in Kanamadagu (Alur) village. However, no assigned land and land for Common Property Resources like grazing land has been acquired for the project till date. The land acquisition has already taken place for 280 acres on “Willing Buyer-Willing Seller basis” and the land sellers have been compensated with the mutually agreed sale price which minimum 3-4 times higher than the government circle rate and 2-2.5 times higher than the open market private rate for Wind Power Project.

During stakeholder consultations, it was inferred that land sellers have voluntarily given land

parcels to the project and were observed to be contented. As there was not much income earlier generated from the rainfed agricultural sinle crop land given for the project. No physical displacement has been taken place in the transaction. Further, no issues related to landlessness were observed. The land sellers have alternative land parcels apart from land provided for the project.

The land was purchased on willing buyer-willing seller (WBWS) mode following the the guidance based on IFC PSs:

I. Land markets or other opportunities for the productive investment of the sales income exist and on basis of discussions with land sellers; it was inferred that the land sellers will utilize amount received from selling off rainfed land parcels given for the Project to OKPPL for purchase of agricultural land in the nearby áreas and for adoption of mechanized agricultural practices
II. The transaction took place with the seller's informed consent; and
III. The seller was provided with fair compensation based on prevailing market values as described below.

Villagers and land providers expressed positive perception about the wind power project as it will increase economy in the area. Some of them had taken medical expenditure loan which they will repay and few land sellors will use for marriage of children.

The government rates for the dry land is Rs. 1,00,000 to 2,00,000 per acre, for wet land is Rs. 1,25,000 to 3,00,000 per acre **(Annexure IV)**. The open market rate varies between 2.5-3.0 lakhs. The land sellers have been provided a fixed rate per acre for wind power has been given fixed rate which is 2-2.5 times of the market rate.

OKPPL has also followed the norms:

(i) seller's informed consent; and
(ii) the seller was provided with fair compensation based on prevailing market values.

In addition, following criteria's were ascertained during selection and acqusition of land for the project that:

- No land sellers had structures on the land;
- No revenue land, Gauchar land (common land for grazing), reserved forest land has been acquired;
- No land owner took land for land or cash or became landless;
- The transaction took place with the seller's informed consent;
- The seller was provided with fair compensation based on prevailing market values;
- All acquired land for the project is private land; and
- No revenue land has been acquired for the project.

Reportedly, there is no requirement for acquiring land for the transmission line. The RoW permission will be required for transmission line connectivity to the 400/220 kV grid substation at Hiriyur taluka, Chitradurga district. The adequate compensation shall be paid as per Ministry of Power "Guidelines for payment of Compensation towards damages in regard to Right of Way for Transmission Lines". As per this guidelines, Compensation towards diminution of land value in the width of Right of Way (RoW) Corridor due to laying of transmission line and imposing certain restriction would be decided by the States as per categorization/type of land in different places of States, subject to a maximum of 15% of land value as determined based on Circle rate / Guideline value / Stamp Act rates.

The approach route identified for the transmission line is based on a criterion to reduce the environmental and socioeconomic footprint of the transmission line. The shortest feasible route after considering following factors has been selected for the transmission line:

- Transmission line route does not fall under any habitations and thick vegetation
- No households or community structures are in the route of the transmission line
- All environmentally sensitive sites, archaeologically significant sites, areas of ecological and cultural significance have been avoided while selecting the route

5. IMPACT ASSESMENT AND MANAGEMENT PLAN

The Project is a renewable energy project which uses wind energy for power generation. Renewable energy projects are considered to be cleaner compared to fossil fuel based energy projects. In accordance to the screening criteria of IFC, TÜV SÜD has categorized Project as ***Category B***, which specifies that the project can cause potential and limited adverse social or environmental impacts which are generally site-specific, largely reversible and readily addressed through mitigation measures.

The impacts of the project were thoroughly envisaged for construction, operation and decommissioning phases. The anticipated impacts and mitigation measures shall be as follows:

Impact Identified	Impact Significance without mitigation	Suggested Mitigation	Impact Significance with mitigation
CONSTRUCTION PHASE			
Soil Resources and Quality			
Erosion and compaction Contamination of soil Construction/	Minor	• Use of existing roads for transport of man and material to the extent possible • Loose soil to be protected from	Negligible

strengthening of access roads; Vehicular movement; and		wind and runoff • All construction material to be kept within the footprint of the area acquired. • Stripping of top soil will be conducted only when required and if conducted then will not be carried out in monsoon season or during heavy winds to minimize erosion and runoff. • Loose construction material to be covered to avoid being carried into adjoining areas by wind. • Switchyard structures to be undertaken after covering the land beneath with a sheet of impervious material. • Fuel storage for DG sets to be done on paved surfaces • Soil should be ploughed in compacted areas after completion of construction work; and • Site should be restored at the end of the Project life cycle to pre-Project levels.	
Visual Amenities			
Construction activities viz. materials lay down, excavation, backfilling, and spoil create a visual intrusion and disruption	Minor	During construction phase, the project would include a temporary barricading to avoid disruption to aesthetics. The construction period will be limited to 6-7 months and the workers will be restricted to work during 8 to 10 hours. The labor camps will be designed to be located to avoid direct shadows of the wind turbine.	Minor
Land Use			
Construction and strengthening of access road;	Minor	OKPPL has considered all aspects of siting and design prior to selection of the sites. Construction activities will be	Minor

Site clearance and preparation for WTGs, PSS and EHV line Establishment and operation of batching plant; and Transient storage of WTG components		restricted to within the allotted land and immediate surroundings only. Existing roads will be used for access to the wind farm components with the exception of a small connection from the main village road to the foundation of each individual WTG.	
Topography and Drainage			
Changes in Topography and Drainage	Minor	• Waterbodies and hilly terrain should be particularly avoided when constructing access roads or planning the transmission line pathway. • Levelling and grading operations should be undertaken with minimal disturbance to the existing contour thereby maintaining the general slope of the site; and • Disruption/alteration of micro-watershed drainage pattern should be minimized to the extent possible. • Appropriate number of cross drainage channels should be provided during access road construction to maintain flow in existing natural channels, if required.	Minor
Waste Generation, Storage and Disposal			
Accumulation of construction waste Runoff into rain water channels Unhygienic condition for labours Monitoring of waste management plan	Minor	• Disposal of sewage shall be made through a septic tank – soak pit arrangement. Arrangements for collection of garbage in dustbins and daily disposal to the nearest dumpsite shall be made • Other wastes like wood packaging material, metal jute etc. will be sold to scrap dealers. • Provision of segregated toilets	Negligible

		for male and female workers in the ratio of 1:15 and 1:10 (toilet to workers) respectively; • Waste/ Used oil shall be stored on paved surfaces • Empty paint containers shall be stored in earmarked area and sold to authorised vendors by CPCB/KSPCB • Specific containers for rubbish collection should be provided and emptied on a regular basis. • Adequate number of rubbish containers to providing leak proof, non-absorbent, rust and corrosion-resistant containers protected from insects and rodents needs to be provided • Low lying areas prone to accumulation of water should be sprayed with mosquito repellents on regular basis to prevent health hazards to workers and community. • The garbage/rubbish containers should be 30 metres from each shelter on a wooden, metal, or concrete stand. Such containers must be emptied at regular intervals (to be determined based on temperatures and volumes generated) to avoid unpleasant odours associated with decaying organic materials. • Construction debris and excavated material will be stored in a confined area to prevent spread by wind, rain, storms, etc and away from natural drainage channels and will be used for backfilling of excavated areas and for foundation works at site and excess soil will be given to the local villagers for filling up of	

		low lying areas in the vicinity. • Pest extermination, vector control and disinfection should be carried out throughout the living facilities in compliance with local requirements and/or good practice. Where warranted, pest and vector monitoring should be performed on a regular basis.	
Water Resource and Quality			
Ground water extraction Runoff into rain water channels Wastage of water	Moderate	• Water for construction to be arranged by the construction contractors through authorised private tanker water suppliers • Domestic water requirement of the workers at site to be met through borewell and for drinking purpose packaged 20 litre water cans will be provided. • The approval from Gram Panchayat is required in case water will be obtained from water tankers drawn from villages having authorized borewells • NOC needs to be obtained from Karnataka Ground Water Authority for abstraction of water from borewell at PSS Phase-I and water meter needs to be installed for monitoring water consumption. • Adequate arrangement for storm water management during construction period to be made to avoid sediment runoff from the site. • Optimal utilization of water to be ensured throughout the construction phase • Storm water flow during monsoons to be directed to the existing channels with silt traps to avoid sedimentation of the	Minor

		channels or the receiving water body. • Proper drainage needs to be provided near Canteen at project site and labour camp and near bathing areas at Labour Camp, if any to avoid deterioration of groundwater quality and runoff in adjoining land parcels. • Water conservation to be practiced to reduce water requirement.	
Ecology			
Clearing of vegetation Cutting of trees Disturbance to avifauna	Minor	• Tree cutting will be limited to those directly affecting the WTGs placement. • Workforce to be instructed to avoid any other activity likely to affect the local flora & fauna. • The construction activities will not be carried out in night. The use of artificial lighting at night shall also not be carried out to avoid impacts if any on fauna due to illumination. • Transportation to be undertaken along identified paths • Limit construction activities within the wind farm site; • Existing roads are utilize for access to the project site therefore clearance of vegetation limited for road construction; • Store the natural soil at special sites and reuse it when back-fill activities are needed; • Shift natural vegetation and nutrient rich soil of the construction sites to nearby areas. • Replant natural vegetation and transfer rich soil of the construction sites to nearby	Minor

		areas • No blasting should be carried out within 1 km from the boundary of protected area during the work. • There should be no high mast / beam / search lights high sounds within 1 km from the boundary of protected area	
Impacts on avifauna associated with general construction activities including Transmission Lines along the WTG footprint		• Wind turbine blades shall be made visible to birds by painting their tips with orange or red colour to isolate from the sky and mitigates risk of bird collisions • Power lines shall be made visible by placing bird reflectors/red sphere balls on power lines passing close to water bodies (Halekallahalli and Lingavarahatti etc.). • Spike guards should be installed on poles/channels to avoid any bird sitting on them and reduce the chances of electrical shocks • Construction work and anthropogenic movement should be restricted in proximity of water bodies and forest areas near WTG locations and transmission line to reduce the impact on flora and fauna. • During construction of SGJA-78 and SGJA-73 WTG in order to minimize impacts on Rangayyanadurga Four Horned Antelope Wildlife Sanctuary the project staff shall be instructed to take care so that they do not blow horns, do not park their vehicles inside the Eco Sensitive Zone of Rangayyanadurga Four Horned Antelope Wildlife Sanctuary and shall not disturb any flora and fauna etc.	

		• NOC from Forest and Wildlife Department is required to be obtained for laying WTG's and associated facilities for the project due to presence of WTGs SGJA-78 & SGJA-73 within the ESZ boundary of the Rangayyanadurga Four Horned Antelope Wildlife Sanctuary. • Construction work and anthropogenic movement should be restricted at Indian Peafowl corridor at a distance of 1.63 km in NE direction from SGJA 06; 1.57 km in NNE direction from SG JA-07; 1.28 km in SW direction from SG JA-70 Bat roosting trees identified near the Kanamadagu village (Nearest WTG SGJA-47) and Muddapura village (Nearest WTG SGJA-114) should not be felled down and Avoid laying internal roads near the roosing habitats. • The transportation should be avoided during peak ecological activity i.e. dawn (5:30 am to 7:30 am) and dusk (5:00 pm to 7:00 pm). Night time activities should be kept to a minimum. • Excavated areas should be adequately fenced and security should be deployed to prevent wildlife intrusion into these areas. • All out door electrical equipments shall be kept in compact sub-station (which is a cubical, metal box, consisting of CT, PT, VCB and meter) which can reduce chances of electric shock to wildlife which can accidently enter fenced yard..	
Hazards associated with		• Inter-turbine distance should be	

turbine blade. Movement Bird collisions, increased energy expenditure and barrier effects		large enough that birds can avoid turbine blades and utilize minimal energy while doing so • Construction work and anthropogenic movement should be restricted at water bodies and forest areas near WTG locations and transmission line to reduce the impact on flora and fauna. • WTGs should be sited in areas that are visible from a manoeuvrable distance for flying species and shouldn't be located near sudden changes of elevation, large trees or be blocked by any manmade/natural structures. • Flash lamps on the WTGs will prevent bird collisions at night • Waste generated from the wind farm and transmission line during construction should be stored in covered containers within the site premises. Uncovered waste may attract fauna to the wind farm and transmission line. • Hazardous materials and waste should not be stored any drainage channels or cliff-sides to prevent contamination of the surrounding environment and impact on local flora/fauna	
Temporary increase in dust, odor, from construction vehicle emissions indirectly affect avifauna		Dust will be controlled by watering where necessary All combustion engine equipment should be appropriately maintained to meet emission standards	
Traffic and Transport			
Arbitrary movement of vehicles leading to congestion and accidents Improper parking of	Moderate	Only trained drivers are to be recruited. Training programs for all the drivers	Minor

vehicles used by workers and for movement of material can lead to discomfort to other users. Monitoring of traffic management plan		for raising awareness about road safety and adopting best transport and traffic safety procedures once in every six months. Vehicle movement and parking within the Project premises shall be manned properly to avoid accidents Routes for use by construction traffic to be planned to minimize impact on adjoining activities. Dedicated path within the site for exclusive entry and exit of the construction vehicles to be provided. Regular maintenance of vehicles to be taken up. All the kaccha access road to the site will be made paved, widened and strengthened for heavy movement of trailers and cranes. OKPPL will need to develop access road to individual WTGs from the available village road. In case village road is used for the transportation of construction material it should be done with proper traffic management plan and should be continually repaired in case the road is damaged. The speed limit should not excced 20 km/hr and 10 km/hr in proximity of settlements and habitation in villages. Records of vehicles viz. PUC, registration certificate, driving license and fitness certificate needs to be maintained at site.	

Atmospheric Emissions			
Fugitive dust Emissions from diesel engines and DG sets	Minor	• Dust generating activities to be avoided in conditions of very high wind and covers to be provided for loose construction material at construction site. • Stock piling and storage of construction material will be oriented after considering the prominent wind direction. • It is to be ensured that construction equipments are properly maintained to minimise smoke in the exhaust emissions. • Machinery to be turned off when not in use. • Housekeeping of the area to be maintained and open burning of solid waste or packaging material will be strictly prohibited in the vicinity of project area • The impact of emissions from vehicles bringing construction material to be minimised by proper upkeep of maintenance of vehicles, sprinkling of water on unpaved roads at the construction site and planned movement of such vehicles. • Vehicle speed to be restricted to 10km/hour at site to minimize potential for dust generation in the surroundings • Trucks /dumpers to be covered by tarpaulin sheets during off site transportation of friable construction materials and spoil • All the vehicles entering the site to be asked to have updated PUC (Pollution under control) certificate. • Generator to be optimally used with proper orientation and adequate stack height	Negligible

		• All the kaccha access road will be made paved prior construction for smooth movement of vehicles which lead to less gaseous and dust emissions around the site. • During construction, temporary barricading should be provided around the construction site to restrict the emissions. • Also, temporary greenbelt which are dust absorbents should be proposed at the site to minimize the dust emissions.	
Noise and Vibration			
Disturbance to habitations Disturbance to fauna Occupational Hazard	Minor	• Use of inherently quiet plant and equipment as far as reasonably practicable and regular maintenance to ensure noise emissions are maintained at design levels. • Mobile noise sources such as cranes, earth moving equipment and HGVs shall be routed in such a way that there is minimum disturbance to receptors. • Integral noise shielding to be used where practicable and fixed noise sources to be acoustically treated, for example with silencers, acoustic louvres and enclosures. • All loud and sudden noises will be avoided wherever possible and fixed noise sources to be located at least 50m away from the site boundary. • Provision of rubber paddings/noise isolators at equipment/machinery used for construction • Construction vehicles to be well maintained and not idling equipment or vehicles when not in use.	Minor

		• Provision of make shift noise barriers near high noise generating equipment to minimise horizontal propagation of noise • Noise prone activities will be restricted to the extent possible during night time 2200 to 0600 hours to reduce the noise impact. • Site workers working near high noise equipment use personal protective devices to minimise their exposure to high noise levels • All the kaccha access road to the site will be made paved for the smooth movement of vehicles which will minimize the noise and vibration in the area.	
Health and Safety Hazards			
Accidents leading to injuries fatalities Occupational health hazards	Moderate	• All the required safety measures based on individual job profile to be provided (as per working guidelines, use of personal protective equipments like gloves, helmets, ear muffs, safety belts etc.) for construction worker through the contractors. • Ensure effective work permit system for hot work, electrical work, working at height, working in confined space etc. • Ensure personal protective equipment for all personnel present at site are made available. • Arrangement for fire control measures • Display of phone numbers of the city/local fire services, etc. at site. • Ensure good housekeeping at the construction site to avoid slips and falls. • Dropping/lowering of construction	Minor

		material or tool to be restricted and undertaken only under strict supervision, if required. • Provision of proper sanitation at the labour camp. • A Job Hazard Analysis (JHA) has been maintained at Site comprising of risks/job hazards along with its severity, probability, control measures and preventive action measures • The construction work will be carried out in adherence w.r.t. COVID mitigation strategies suggested by the State labor department guidelines, Karnataka State for the migrant workers and for construction workers. • OKPPL is further required to ensure maintaining HSE documentation for all workforce engaged at Site along with COVID-19 Precaution training records at Site. • OKPPL should ensure undertaking adequate measures while overlaying internal transmission lines as at few WTG locations, existing WTGs are located in visual range of proposed WTGs. • The project proponent for laying transmission lines, preventive action measures in case of blade throws from existing WTGs and avoid of construction works during maintenance works of existing WTGs in the area needs to be considered. • An up to date first aid box should be provided at all construction sites and a trained person should be appointed to manage it.	

		• Security should be deputed at potential accident sites to restrict entry and prevent near miss or fatal incidents;	
Socio Economic Impacts			
Land Acquisition Loss of land Loss of livelihood Loss of grazing land	Minor	• Employment opportunities should be given to locals and family members of land losers • OKPPL can simultaneously take up CSR activities in the project area through livelihood improvement schemes and training programs that will improve the skills of the local population and increase their employability or make them self employed. • Stakeholder engagement needs to be carried out and community consultations should be ensured prior to land acquisition and records need to be maintained • Proper fencing and adequate lightning arrangements needs to be provided for community safety and security. • Although the community expressed satisfaction over the compensation of land and functioning of the project there is a need for implementation of Grievance Redressal Mechanism for addressing their concerns associated with the project, if any • The land acquisition for ST land parcels should be avoided and alternative locations should be considered for procurement • In case ST land acquisition is the last option and is being carried out for remaining land parces to be acquired; a separate consultation with ST	Negligible

		community should be carried out in presence of Sarpanch • NOC from Gram Panchayat and separately from ST community needs to be obtained • In case of land being acquired from members of the Scheduled Tribes, at least one-third of the compensation amount due shall be paid to the affected families at the outset as first installment and the rest shall precede the taking over of the possession of the land • Additional compensation should be paid to PAP's from ST community • Employment opportunities should further be provided to locals including members of ST community from whom land has been acquired	
Access to Common Property Resources Access to grazing lands; Common village approach road to the site; Access to fuelwood sourcing areas.	Minor	The project shall avoid using community /village roads for project activities. Alternative access roads will be constructed and used;	Negligible
Increased Community Expectations Heightened community expectations for employment and other local benefits	Negligible	The project will initiate an early dialogue with the local community to understand their concerns as well as expectations from the project; The project will communicate and discuss with the community in a transparent manner about employment/contract and other opportunities on a regular basis and demonstrate the efforts being made to accommodate as many people as possible. The projects will ensure	Negligible

		that there is a transparent process of giving jobs/contracts and other benefits.	
Influx of Migrant Workers Social Impacts; Health Impact; Economic Impacts.	Moderate	• The Contractor needs to ensure construction of labour camp as per IFC Guidelines in case of hiring migrant labour for the ptroject. The following measures shall be ensured: • Accommodation: It shall be ensured that a minimum space of 4-4.5 m^2 is allocated per person. • Common latrines and bathing facilities duly segregated for male and female labour - Number of toilets and sanitary fittings shall be considered as 1 toilet, 1 urinal and 1 bathroom per 15 male workers. Arrangement for female workers shall be 1 toilet and 1 bathroom per 10 female workers. • Water supply through borewells and tankers sourced from authorized borewells- Adequate provisions of water with about 150 litres per capita per day shall be made. • Disposal of sewage through a septic tank – soak pit arrangement. • Arrangements for collection of garbage in dustbins and disposal through daily collection. • Provisions of food – it shall be ensured that the food provided to workers contains an appropriate level of nutritional value and shall take into account the different religious/cultural backgrounds; • Supply of fuel wood and LPG cylinders in order to avoid encroachment in adjoining areas • IFC Labor guidelines need to be followed	Minor

		• The construction work will be carried out in adherence w.r.t. COVID mitigation strategies suggested by State labor department guidelines, Karnataka State for the migrant workers and for construction workers. OKPPL is further required to ensure maintaining HSE documentation for all workforce engaged at Site along with COVID-19 Precaution training records at Site.	
Community Health Safety and Security Common approach road to the site; Nuisance from air emissions and noise due to transportation; Traffic impacts like accidents.	Minor	• Ensure proper training of drivers and planning for transport of construction machinery, material and manpower. • All workers whether local or migrants will be instructed to follow strict code of conduct • Local security personnel shall preferably be engaged at site. • To the extent possible, labour to be housed in camps, with good living conditions and access to amenities. • Health and safety training of the labour, raising awareness about STDs, and HIV, and maintaining behaviour standards while moving in the community should be a priority; • Any complaints or concerns with respect to labour should be addressed without delay. • OKPPL will ensure maintaining HSE documentation for all workforce engaged at Site along with COVID-19 Precaution training records at Site. • Proper fencing and adequate lightning arrangements needs to be provided for community safety and security.	Negligible

Impact on adjacent lands Crop loss during construction; Encroachment.	Minor	• Ensure that all the project activities are restricted to the existing site boundary. The use of land outside the boundary for purposes like parking of vehicles, storage of material during construction etc warrants prior consent of the owner of that land as well as adequate compensation for such a use; • The project should proactively discourage any encroachment around the project area and involve the local panchayat authorities in the same; • Any structures which are constructed outside the boundary should be dismantled after use.	Negligible
OPERATION PHASE			
Soil Impact			
Defunct/damaged WTGs parts disposal on unpaved ground repair and maintenance of underground cables and associated utilities will lead to generation of hazardous wastes such as used transformer oil	Minor	OKPPL will ensure proper restoration of soil. OKPPL shall explore the option of buyback agreements for defunct rotor, blades and for replacement and disposal of transformer oil by the supplier, otherwise will make arrangements for disposal of defunct rotors/blades and waste oil by KSPCB/CPCB authorized recyclers. Fuel and used oil will be stored in demarcated storage areas with adequate secondary containment and appropriate capacity. Spill control and prevention mechanism will be developed, and all the staff will be trained.	Negligible
Waste Disposal			
Domestic waste from staff quarters Waste transformer oil	Moderate	Transformer oil to be replaced and retained by the supplier of transformers	Negligible

		Buyback agreements for defunct rotor, blades and for replacement and disposal of transformer oil by the supplier Proper segregation of different kind of waste and disposal of hazardous waste through KSPCB/ CPCB authorised vendors	
Aesthetics and Visual Impact			
Visual intrusion Glare	Moderate	During shadow flicker modelling, it was found that all the residential permanent structures have shadow flicker below 30 h/year The turbines will be arranging in a systematic manner which will give an aesthetic sense to it.	Minor
Noise Impact			
Noise from a wind turbine	Moderate	• Shifting WTG SGJA 71, SGJA 73, SGJA 74, SGJA 75, SGJA 77, SGJA 78, SGJA 79 to other locations due to moderate impact of noise determined during Operation Phase during day as well as night-time; • Regular maintenance of WTGs; • Periodic monitoring of noise near to the sources of generation to ensure compliance with design specification; and • Quarterly monitoring of ambient noise levels (during day and night time) at identified residential receptors for determination of actual impact due to operation of WTGs (during day and night time) at identified residential receptors for determination of actual impact due to operation of WTGs.	Minor
Water Resource and Quality			
Water requirement for cleaning	Moderate	Alternate arrangement of water through authorised tanker water	Minor

Waterlogging		suppliers to be made Agreement with vendor and water consumption records need to be maintained in case of water requirement being met from tankers The plant site will be provided with adequate drainage facility to drain off wash wastewater and prevent any water-logging at site or in the surroundings. Adequate storm water drainage OKPPL should adopt 200% groundwater recharge initiatives as part of CSR initiatives. This is due to secondary impacts that the project development would cause on the water resources in the district which is categorised as semi critical.	
Ecology			
Distraction to avifauna Routine clearance	Minor	Clearing of vegetation to be limited to removal of undergrowth or shrubs at the plant site Waste materials especially food waste, if any should not be left lying around the WTG's and if any waste is found it should be cleared immediately so that it does not attract birds near the WTG blades	Negligible
Bird & bat collisions with Operational turbines		• Annual monitoring study for birds and bats in the Core Zone should be developed and implemented to understand the effects of potential bird collisions with the rotors during the operational phase. Annual Bird and Bat Monitoring Study in operational phase need to be carried out for two continuous years for determining the scale of impacts on birds and bats. Upon finding significant bird & bat	

		mortality mitigation measures could be suggested including that of curtailment or cut off the generation during certain identified period identified when maximum impact occurs. • The WTG blade tips should be painted with orange or red colour as per International Standards measure to isolate from the sky and mitigates risk of bird collisions. • Daytime visual markers shall be provided on transmission lines and Blades to enhance visibility for bird. Visibility enhancement objects such as marker balls, bird deterrents, or diverters shall also be installed along the transmission line to avoid avian collision • Use of reflectors and bird flappers to be used at suitable intervals to avoid easy visibility of transmission wires and the risk of electrocution • Any dead animals/carcass shall be removed in time from the site so that it does not attract movement of raptors near to the WTGs • Power lines should be made visible by placing bird reflectors/red sphere balls on power lines passing close to water bodies (Halekallahalli and Lingavarahatti etc.). • Spike guards should be installed on transmission line poles to avoid any bird sitting on them thereby reducing the chances of electrical shocks • Jumpers on the electric poles should be covered by HDPE	

		pipes to insulate conductors which would prevent electrocution of birds. • Maximum distance should be maintained between conductors on overhead lines up to 200 cms so that it would enable passage of small and medium birds through them and also avoid fatalities of long tailed birds like Peafowl. • Switching off the lights below the turbines whenever not required at night to avoid attracting the insects and associated nocturnal birds and bats to the turbines. • Clearing of the weeds or grasses underneath each WTG needs to be carried out to prevent raptors flying in close vicinity of wind farm to prey on rodents. Herbaceous/grass layers may offer protection to rodents which will make burrows near them for breeding and resting purpose. • Any dead animals/carcass should be removed in time from the site so that it does not attract movement of raptors near to the WTGs. • Towers should regularly checked to avoid any nesting in any suitable gaps or platforms. • Measures need to be taken to create awareness among the villages in and around turbine site for careful burial of the cattle carcasses to avoid the attraction of scavenging birds such as vultures into the turbine area. • A participatory approach towards advocating and popularizing various measures	

		in the human habitations located in and around the wind farm areas mainly for discouraging the feeding of pigeons and other human associated avifaunal species may be adopted. This can help minimize bird collision risk directly at the turbines, and also indirectly through avoiding the raptors getting attracted to the area. • Vehicle movements in the turbine sites may be reduced and appropriately managed to minimize disturbances and road mortalities. • The installation of turbines may be avoided in the area within 500 m radius of water bodies to further minimize the collision risk especially for migratory avifauna. • Plantation of fruit bearing trees (such as guava, mango, banana, fig) and flowering plants, which may attract bird and bat near project area need to be avoided. • Waste materials especially food waste, if any should not be left lying around the WTG's and if any waste is found it should be cleared immediately so that it does not attract birds near the WTG blades • For minimizing impacts on bats, a random survey should be conducted for carcass bat searches at a representative sample of turbines to determine the level of bat mortality around wind turbines. This is especially important during the periods March to May and September to December when bats are	

		migrating between summer and winter roosts. • Carcass searches should be made early in the morning to minimize the effect of scavengers (which remove carcasses). • Plantation of fruit bearing trees (such as guava, mango, banana, fig) and flowering plants, which may attract bird and bat near project area need to be avoided. • Towers are regularly checked to avoid any nesting in any suitable gaps or platforms • Switching off the lights below the turbines whenever not required at night to avoid attracting the insects and associated nocturnal birds and bats to the turbines. • Jumpers on the electric poles should be covered by HDPE pipes to insulate conductors which would prevent electrocution of birds.	
Bird Collision with Powerlines		• Align power lines as far as possible. • Monitor power lines passing near by the water bodies for collisions. If found frequent mortality more efforts to increase visibility of power line could be suggested • The impacts of over-ground transmission systems could be mitigated by use of visual markers on cables to render them relatively more visible. • Daytime visual markers shall be provided on transmission lines and Blades to enhance visibility for bird. Visibility enhancement objects such as marker balls, bird deterrents, or diverters shall also be installed along the transmission line to avoid avian	

		collision • Use of reflectors and bird flappers to be used at suitable intervals to avoid easy visibility of transmission wires and the risk of electrocution • Any dead animals/carcass shall be removed in time from the site so that it does not attract movement of raptors near to the WTGs	
Habitat destruction of birds and animals		Collect all wastes in sealed containers to be disposed in proper disposal sites; Prohibit leaving the roads and crane pads with vehicles unless major maintenance works will have to be performed; Prohibit workers from hunting and produce awareness materials such as: • Signs • Training manuals and material. • Posters. • Brochures. • Reduce vehicle movements to a minimum; Reduce footprint as much as possible; Minimize intervention as much as possible;	
Electrocution of birds on Poles and Powerlines		Cables & electric wires originating from wind turbine should be either made underground or under concealed pipes when sent to DP Yard adjoining to turbine. This DP Yard must be protected by animal proof walls/fence on all four sides.	

		The poles in DP yard shall be kept at the height of 10m above ground. Use coiled barbed fencing (concertina coil) to avoid any animal jumping above the wall as an extra protection measure All out door electrical equipments shall be kept in compact sub-station (which is a cubical, metal box, consisting of CT, PT, VCB and meter) which can reduce chances of electric shock to wildlife which can accidently enter fenced yard.	
Environmental Monitoring			
Ambient Air Quality and Noise	Moderate	The Ambient Air Quality Monitoring (PM2.5, PM10, SO2, NOX, CO) and Ambient Noise Monitoring should be carried out on annual basius for atleast 2 years during O&M Phase of the project	Negligible
Health & Safety			
Electromagnetic field Accidents leading to injury/fatality	Moderate	EMF generated to be of weak in intensity Personal protective equipment to be provided for all personnel at road construction and transmission line. The transformer yard should be provided with fire extinguishers and sand buckets at all strategic locations to deal with any incident of fire; Employees involved in electrical works shall be trained in and familiar with the safety-related work practices, safety procedures and other safety requirements that pertain to their respective job assignments;	Minor
Social			
Impacts on Local Economy	Moderate (beneficial)	In case of development of local enterprise in the vicinity of the	Insignificant (beneficial)

		project, these should be encouraged through sourcing opportunities.	
Upgrades to Local Infrastructure	Minor	Collaborate with local govt. and industry for any community development programs to share the resources and cut cost; Avoid duplicating existing infrastructure and emphasize on improving or upgrading the quality and quantity of the same.	Negligible
DECOMMISSIONING PHASE			
Health and Safety			
Fugitive dust generation during construction and decommissioning phase	Moderate	• Decommissioning activities will be done in a manner which minimises dust generation; • Dampening (using water or some other environmentally benign dust suppressant material) may be undertaken to prevent dust re-suspension during hot, dry weather conditions with relatively high wind speeds; • Lorries will be sheeted during transportation of friable construction materials and wheel wash facilities made available during adverse conditions; • Drop heights will be minimised during material transfer activities, such as unloading of friable materials.	Minor
Combustion and decommissioning emissions	Moderate	Diesel powered construction equipment and vehicles will be well maintained to minimise exhaust emissions; and, Idling reduction awareness activities for onsite diesel-powered equipment and mobile vehicles.	Minor
Generation of GHG emissions associated with transport movements.		Development of management plans and procedures to ensure traffic flow is minimised as far as possible and that all transportation vehicles used throughout the project are fit	

		for purpose and adequately maintained High-efficiency low emission vehicles to be preferentially used where possible.	
Generation of noise by construction vehicle movements	Moderate	Scheduling of road traffic movements to avoid noise sensitive periods (e.g. nighttime). Route traffic away from noise sensitive receptors.	Minor
Waste Disposal			
Potential to harm human health and environment through uncontrolled disposal of wastes.	Moderate	Permanent segregation facilities will be provided (e.g. separate receptacles for food wastes, plastics, metals). The receptacles will be clearly marked and suitable to hold the Permanent segregation facilities will be provided (e.g. separate receptacles for food wastes, plastics, metals). The receptacles will be clearly marked and suitable to hold the type of waste they will contain. There will be frequent emptying of waste receptacles and transfer to appropriate storage facilities on site and/ or transfer and disposal by suitable waste disposal contractors. Waste storage will be within designated areas located on hard surfacing and covered where appropriate to ensure containment and prevent ingress of rain. There will be special provisions for the storage of any hazardous wastes and these will be segregated from non-hazardous wastes. Staff will be fully trained in the handling and suitable disposal of waste streams and provided with PPE where appropriate	Minor
Traffic and Transport			
Risk of accidents and congestion	Moderate	Training of drivers about road safety to be organized;	Minor

		Vehicle movement and parking within the Project premises shall be manned properly to avoid accidents Routes for use by construction traffic to be planned to minimize impact on adjoining activities. Dedicated path within the site for exclusive entry and exit of the construction vehicles to be provided. Regular maintenance of vehicles to be taken up.	
Water Resource and Quality			
Protection of local watercourses	Moderate	Decommissioning phase impacts on the local water environment will largely be controlled through the management of construction site drainage and appropriate sediment segregation / run off controls and appropriate control and storage of potential pollutants such as fuels or cement material used in the construction process.	Minor
Contamination of groundwater and surface waters following spillages.	Moderate	All workers will be trained in the handling, storing, and disposal of hazardous materials. Emergency procedures will be in place so that in the event of an accidental release the spill can be contained, and effects mitigated. Emergency spill containment material and clean-up equipment will be distributed and stored in appropriate places so that any spill can be cleared up as quickly as possible to minimize any adverse effects.	Minor
Ecology			
Impact on land environment	Moderate	Sealing and / or re-vegetation of completed earthworks will be undertaken as soon as reasonably practicable;	Minor
Landscape and Visual			
Visual aesthetics	Moderate	Landscaping of the site to be done	Minor

		to achieve close to prior to project condition. Soils excavated during decommissioning could be used for landscaping if suitable.	

6. ANALYSIS OF ALTERNATIVES

The project being a nonconventional source of power generation intends to contribute towards surplus power generation. The proposed project use Suzlon SG 114 – 2.1 MW wind turbine generator system. The wind power technology ranking depends on the meteorology, wind speed, efficiency of rotor & nacelle etc., there is no standard criterion for WTGs installation.

The other favourable technical parameters considered for site selection were easy access, wind speed, minimum shadow, climate, topography conditions, water availability, location at distance from settlements, ecologically sensitive areas.

7. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

The ESMP describes the mitigation measures for all the identified potential impacts associated with the project during its construction and operation phases. ReNew Power has already developed a Health, Safety and Environmental and Social Management System Manual applicable for both Solar and Wind Power Projects. This ESMP in integration with ReNew Power's ESMS will bridge the gaps on environment and social aspects of solar power projects. The environment and social management plan (ESMP) delineates the monitoring and management measures to avoid and/or minimize such impacts by allocating management responsibility and suggesting skill requirement for implementation of these measures. Also the ESMP shall ensure a continuous communication process between ReNew Power, their workers (including sub-contractors), local community and other stakeholders.

OKPPL has an obligation to ensure compliance to all the commitments towards Environment, Social, Health and Safety Standards while executing all the project related activities for the project. OKPPL is committed to implement an effective Environmental and Social Management System (hereinafter referred as ESMS) to continuously manage and communicate the potential social and environmental impacts and risks imposed on the project employees (direct and indirect) and the local communities residing in the immediate vicinity of the project area. Also, OKPPL shall ensure that all the contractors of this project are brought under the umbrella of the ESMS and it shall implement the provisions of this

Environment and Social Management Plan.

OKPPL shall ensure that the job specific training and EHS Induction Training needs are identified based on the specific requirements of ESMP and existing capacity of site and project personnel (including the Contractors and Sub-contractors) to undertake the required actions and monitoring activities. Special emphasis will be placed on traffic management and operation of Cranes.

In order to implement the ESMP, the on-site team will develop a time-bound and action-oriented Environmental and Social Action Plan to implement the mitigation measures provided for each of the identified environmental and social impacts. This ESMP will have to be monitored on a regular basis, quarterly or half-yearly and all outcomes would need to be audited in accordance with existing HSE commitments in ESMP and in ESMS. Through the process of inspection, audit, and monitoring, OKPPL shall ensure that all the contractors comply with the requirements of conditions for all applicable permits including suggested action plans. The inspections and audits shall be done by OKPPL HSE team and external agencies/ experts. The entire process of inspections and audits will be documented.

1 INTRODUCTION

ReNew Power is one of the India's largest providers of on-site solar and wind power. The company was established in 2011 and a subsidiary of ReNew Energy Global PLC, is one of India's largest renewable energy IPPs in terms of total energy generation capacity. Since commencing operations with a 25.2 MW wind project in Jasdan, Gujarat, the company has grown exponentially. ReNew Power increased its operational capacity from 545.76 MW as of March 31, 2015 to 986.90 MW as of March 31, 2016 and became the first Indian Renewable Energy Independent Power Producer (IPP) to exceed 1 GW of operational capacity in April 2016. ReNew Power then doubled its operational capacity to 1.99 GW as of March 31, 2017 and again nearly doubled it to 3.92 GW as of March 31, 2018. The company has grown exponentially, and has a current renewable asset base of over 10 GW, including projects under development and in the pipeline.

In October 2019, ReNew Power became the 1st Renewable Energy company in India (and 10th globally) to cross 5 GW of installed capacity. The present commissioned capacity is 6.4 GW and rest 3.8 GW is committed capacity. It has already commissioned 51 wind power projects located in seven different states namely, Rajasthan, Gujarat, Madhya Pradesh, Andhra Pradesh, Maharashtra, Karnataka, Tamil Nadu with a total installed capacity of 3.94 GW in India. The Company has also been recognised among the top 10 Companies globally in Fortune Magazine's 2021 'Change the World' list.

Ostro Kannada Power Private Limited (hereinafter referred to as "OKPPL"), is a special purpose vehicle (SPV) of ReNew Power Limited (henceforth referred to as 'ReNew Power). OKPPL has secured the present project in Jagalur, Kudligi and Chitradurga talukas falling in Davangere, Bellary and Chitradurga districts in Karnataka through Competitive Bidding Process for development, generation, and supply of electricity from proposed 300 MW Wind Power Project to achieve its renewable power purchase obligation requirement. It has signed a 25-year power purchase agreement with SECI for selling power. M/s Ostro Energy Pvt Ltd. (OEPL), has been awarded this project under bid for 'Selection of Wind Power Developers for Setting up of 300 MW ISTS-Connected Wind Power Projects under Global Competitive Bidding for SECI – VI (1200M)'. [RFS No.: SECI/C&P/WPD/1200M/T6/RfS/122018 dated 31.12.2018].

The proposed project is partly operational and divided into two phases (Phase-I and II). Phase-I comprises of 72 WTG's falling in Davangere and Bellary districts which are partly operational. Out of these; 60 land locations are final and 30 WTG's are already operational which were procured from Siemens Gamesa. The land for 12 WTG's is yet to be finalized. The Phase-II comprises of 71 WTG's falling in Davangere and Chitradurga districts out of

which Agreement To Sell (ATS) has been signed for 20 WTG's and land is yet to be finalized for 51 WTG's.

The construction activities were observed in progress at Phase-I during the Site visits undertaken on 7th - 11th October 2021. Around 45 WTGs have been erected till date.

Presently, the land for 80 WTGs has already been procured and ATS is signed with the land sellers in the name of land aggregators which will further transferred in the name of OKPPL. There are 6 land aggregators involved for the land acquisition of the proposed project. Approximately 548 acres of land is being proposed to be acquired for the wind power project in Jagalur, Kudligi & Chitradurga Talukas falling in Davangere, Bellary and Chitradurga districts based on Willing Buyer-Willing Seller transactions. Since the proposed project will be implemented in two phases, therefore, there are two pooling substations of 150 MW capacity each which consists of a land parcel of 7 acres for Phase I & 6 acres for Phase II.

The power output from Pooling Substation (PSS) Phase II shall be evacuated at PSS Phase I located at a distance of 26.47 km. The power generated from PSS Phase-I shall then be transmitted through exernal tranmsmission line to PGCIL 400/220 kV Hiriyur Grid Substation located near village Beerenahalli in Hiriyur at a distance of 78 km. The 300 MW Jagalur Wind Power project is expected to be commissioned by March 2022.

TÜV SÜD South Asia Pvt. Ltd. (TÜV SÜD) has been assigned by OKPPL for undertaking Environmental and Social Impact Assessment (ESIA) of its 300 MW SECI VI Jagalur Wind Power Project in Jagalur, Kudligi & Chitradurga Talukas, Davanagere, Bellary & Chitradurga Districts, Karnataka in India.

This ESIA report has been prepared based on detailed reconnaissance visit carried out at the site, environmental monitoring, analysis and review of available documents and consultations/ discussions with the project proponents and related stakeholders. The report assesses the project for social and environment aspect with respect to the International Finance Corporation (IFC) Performance Standards and Equator Principles 4. It also covers IFC's General EHS Guidelines, published on April 30, 2007; IFC's Environmental, Health and Safety Guidelines for Wind Energy published on 7th August, 2015 and IFC's EHS Guidelines for Electric Power Transmission and Distribution.

1.1 OBJECTIVES OF THE STUDY

The objective of the ESIA study is to evaluate the environmental and social impacts of the proposed Wind Power project and design an Environmental, Health, Safety and Social

Management Plan to avoid adverse impacts during the project in compliance with the IFC Performance standards and Equator Principles. The specific objectives are to:

- Determination of Environmental and Social settings near the proposed project site and in the vicinity
- Assess the Social and Environmental Impacts from the project on the environment and social setting; and
- Prepare mitigation measures and environmental and social management plan (ESMP) for the project; and
- Determination of the requirements for additional studies, such as a detailed bird and bat monitoring study.

1.2 SCOPE OF WORK

The scope of work for the study shall be as follows:

- Reconnaissance survey and primary site assessment to collect and review baseline environmental and social conditions;
- Ground-truthing the environmental features identified by desk study;
- Identification of environmental and social sensitivities based on survey and interaction with local communities;
- Social consultation with the relevant government agencies, gram panchayat members, and other relevant individuals or agencies to understand the land uptake process, current and previous use of the project site, dependence of local people on the land, and the concerns and expectations of the community from the project.
- Primary survey for determination of baseline for the ecology of the area which includes forestry conditions, flora and fauna, natural habitat of species of special conservations, migratory bird paths and habitats, if any, etc.
    - Assessment of ecology, flora and faunal biodiversity of the project area
    - Delineation of measures for abatement/reduction of biological stress (if any)
    - Assessment of ecology, flora and faunal biodiversity of the project area
    - Assessment of ecology, flora and faunal biodiversity of the project area
    - Delineation of measures for abatement/reduction of biological stress (if any)
    - Secondary data collection from published academic papers and government records with respect to species checklist, species sighting, species inventory, critical habitats, congregation sites, roosting sites, protected areas, IBAs etc.
    - To identify the principal habitats and their classification, vegetation types (Trees, Shrubs, Herbs and Climbers) and fauna in the study area including avifauna. The floral assessment separately carried out shall further help in drawing significant

conclusions about important habitats of Critically Endangered Bird species if any in the area and impact of upcoming project on breeding/nesting grounds of the endangered bird species

- Identification of critical habitats in the study area and buffer area; also, study of critical habitat/ecologically sensitive zone closest to the study area boundary
- To identify fauna associated (based on visual encounter studies) with the vegetation types and habitats in the study area
- List of fauna with their RET status and conservation status as per IUCN 3.1 and Wildlife Act, 1972 (Schedule of species); also migratory and congregatory species.
- To make an inventory of all available biodiversity information (floral and faunal species) in the study area.
- To identify the native species, endemic species, invasive species in the study area.
- To calculate phytosociology indicators for flora (Abundance, Frequency and Density)
- To calculate the indices; Simpson's, Shannon's for avifauna and flora
- To study aquatic biodiversity (Phytoplankton, Benthos and Zooplankton), if any water body is located in the study area
- Providing photographic evidence of the study with auto-stamp of date and location
- Study impacts of construction and operation on local ecology and biodiversity
- Conducting a critical habitat assessment and suggesting mitigation strategies to minimize impacts on these two critically endangered species in case of adverse impacts envisaged from project and associated facilities, if any
- Updating the biological baseline and preparing a critical habitat assessment and identifying mitigation strategies:
- Suggest mitigation measures to reduce the construction and operational impacts, if any
- Determination of ecologically sensitive areas, if any
- Bird and bat baseline, based on field quantitative field observations, i.e. standardized surveys of resident or migratory birds and bats over a grid of fixed observation sites in the project area, covering the relative importance of the site to birds, proximity of caves, forests, wetlands or other routes, likely feeding areas. Should include proximity to Important Bird Areas and known bird migration routes.

- Socio-economic survey of local community/ project study area

- Assessment of impacts on places of historical/archaeological importance and aesthetic impairment, if any
- Study of population, aesthetics, economic pattern and occupational structure around project site
- Socio-economic profile of nearby settlements: demographics, land use in the project area, main sources of income, poverty levels, culture, religion, skills and education levels, social service provision, business environment.
- Land, access requirements, land use, and involuntary resettlement

- Details on land acquisition/ transfer (loss of lands, houses, livelihood, etc.), and resultant involuntary resettlement extent;
- Review of the land take/lease process to assess any legacy or current/existing issues (like informal settlers, livelihood dependence, other usage etc) on the allotted land.
- Proximity to other existing or planned/permitted wind power sites.
- Impact of the project on local infrastructure of the area such as road network and whether any additional infrastructure would need to be constructed.
- Sample social perception survey based on questionnaire and formal interview of people within study area.
- Determination of Socio-economic Profile including Transmission Line Route while undertaking SIA.
- Identify the communities directly impacted by the project construction and operation.
- Study of PAPs/PAFs in the study area
- Prepare a PAP profile through suitable survey using acceptable tool/s, as per the applicability
- Focused Group discussion and Women Group discussions to identify the needs, problems, if applicable
- Interactions with Government Agencies, Institutional Stakeholders, Vulnerable Groups
- Socio economic survey by need base assessment study on the basis of secondary / primary information
- Determination of Socio-economic Profile and identification of the communities directly impacted by the project construction and operation.
- Enumeration of all households and household members in the communities directly impacted by the project construction and operation by socio-economic strata, including disadvantaged and vulnerable households.
- Identification of those households/individuals from whom the project is leasing/purchasing land for the project.
- Describe any interdependencies linking community members with the households/individuals from whom the project is leasing land for the project.
- Prediction and Assessment of Social Impacts and identification of mitigation measures
- Review Community Engagement Procedures in place and describing process for public disclosure of project information, consultation with affected communities, and the grievance mechanism put in place
- Identify and summarize the key issues raised by all stakeholders with regards to the project
- Describing the actions necessary to implement the various sets of mitigation measures – including potential socio-economic development inputs supported

Corporate Social Responsibility initiatives – or corrective actions to be undertaken; (ii) prioritizes these actions; (iii) includes the time-line for their implementation; and (iv) describes the schedule for communicating with affected communities when on-going disclosure or consultation is expected.

- Collection of additional secondary environmental, social and demographic information;
- Identification and review of the applicable standards and identification of key issues;
- Prepare a PAP profile through suitable survey using acceptable tool/s, as per the applicability;
- Focused Group discussion to identify the needs, problems, if applicable
- Socio economic survey by need base assessment study on the basis of secondary / primary information;
- To integrate the environmental and Social issues in the project planning and design; and
- Preparation of Environmental and Social Action Plan (ESAP) based on the ESIA and suggest procedures for mitigation and monitoring of environment and social impacts on an ongoing basis as well as to identify any requirements that may occur subsequent to the completion of the ESIA.

1.3 TUV SUD's APPROACH AND METHODOLOGY FOR THE STUDY

The broad approach and methodology adopted for the project is described below:

a) Identified and reviewed applicable local, state, national and international environmental and social regulatory and institutional frameworks;
b) Assessment of the proposed project for social and environment aspect with respect to the International Finance Corporation (IFC) Performance Standards and Equator Principles. It covers IFC's Environmental, Health and Safety Guidelines for Wind Energy published on 7th August, 2015; IFC's General EHS Guidelines, published on April 30, 2007 and IFC's EHS Guidelines for Electric Power Transmission and Distribution (for construction and operation of transmission lines).
c) Established environmental baseline conditions of the site and surrounding area through the following:

- Detailed surveys to observe environmental and social characteristics of the project area (WTG footprint and Study Area);
- Discussions with the local community, project affected people, panchayats and identification key issues during planning, construction and operation phase of the project;
- Primary baseline data collection of the site and study area with respect to water and soil quality, ambient air and noise quality and ecology mainly terrestrial flora & fauna and Avifauna in particular;

d) Assessed the socio-economic environment through collation of secondary information of the site, supplemented by personal and group consultations with the local communities to understand community perception with regard to the project and its activities. The approach included:

- Stakeholder identification;
- Focussed group consultations with land owners, general community, SC community and other impacted groups;
- Discussions with the local community, project affected people, panchayats and identification key issues during planning, construction and operation phase of the project;
- Interactions with Government Agencies, Institutional Stakeholders, Vulnerable Groups, Youth Groups, and Tribals,
- Group/Community Consultations: Group meetings and consultations with local and community representatives; Women;
- Field surveys and data compilation;
- Cumulative Impact Assessment due to upcoming of the project
- Group/Community Consultations: Group meetings and consultations with local and community representatives; and

e) Reviewed the land related records, land procurement process, current HR, Social, Environmental, Occupational Health and Safety Management System to understand its adequacy and efficacy with respect to the PS requirements

f) Identification of any probability of significant shadow flicker and noise impact that would potentially affect human settlements in the vicinity of the project (500m from a WTG) and if identified, to assess the potential shadow flicker/ noise impact and to develop mitigation measures to reduce the impacts;

g) Identification, prediction and evaluation of potential aspects and impacts on various environmental and social sensitivities due to the project activities envisaged during land acquisition, construction, operation and decommissioning stages;

h) Ascertain whether project footprint or its immediate environment is considered to be ecologically sensitive regarding endangered or protected species, as well as whether the location is a high risk zone for bird and bat activity (migratory routes, foraging and breeding areas);

i) Recommendation of appropriate mitigation/enhancement measures for identified environmental, ecological and social impacts;

j) Comparison and analysis of alternatives considered for the project with respect to location and technology; and

k) Formulation of an Environmental and Social Management Plan (ESMP) in accordance with IFC's Performance Standards 2 through 8 and Equator Princple 4 with management tools and techniques including monitoring and reporting requirements for effective implementation

The present Report has been prepared based upon the reconnaissance survey carried out from 7th October -11th October, 2021 by TUV SUD team for preliminary assessment of the project site. The ground truthing for Environmental; Social and Ecological conditions near WTG locations, Area of Influence (AoI) and in Study Area were carried out during Site Assessment. This study included verification of location and site condition viz terrain & topography, soil & geology, vegetation cover in the project area and conducting Environmental Monitoring for analysis of Ambient Air Quality, Noise levels, Surface water and groundwater, soil in study area of 15 km radius. Further, Stakeholder Consultations with PAP and community were also carried out.

The report assesses the proposed project for social and environment aspect with respect to the International Finance Corporation (IFC) Performance Standards and Equator Principles. It also covers IFC's Environmental, Health and Safety Guidelines for Wind Energy published on 7th August, 2015; IFC's General EHS Guidelines, published on April 30, 2007 and IFC's EHS Guidelines for Electric Power Transmission and Distribution.

The identified project activities that might have significant environmental, health, safety and social impacts and the scoped out activities are given below in Table 1-1 and Table 1-2.

Table 1-1: Identified Project related activities with potential significant impacts

S.No.	Interaction (between project activity and Resource/Receptor	Justification for Expectation of Potentially Significant Impacts
1.	Changes in Land Use	• Construction of temporary structures during the construction phase, such as stockyard, labour camp etc., would lead to changes in the land use albeit for a short period; • Setting up the project would require clearing of vegetation for Project related activities; • Installation of WTGs and other components, paving and widening of access roads, setting up site office will lead to permanent change in land use; and • Restoration site after Project cycle will reverse the land use to the original one.
2.	Alteration of Topography and drainage	Analysis of the Project site as well as its surrounding area exhibits primarily flat terrain with slight undulation. Project activities (e.g., site development, construction of access

		roads) are likely to result in alteration in the topography and drainage of this area.
3.	Impact on Soil/Land	• Vegetation clearance and construction can change the soil properties and negatively affect soil stability in the area; • Vehicle movement can compact or erode soil further; • Improper waste disposal can contaminate soil and groundwater; • Storage and handling of hazardous waste (e.g. fuel and lubricant) and accidents/negligence leading to leaks and soil contamination; • Generation of hazardous waste during operation of the Project e.g. small amounts of waste oil; and • Restoration of site after project life cycle.
4.	Impact on Air Quality	Operation of D.G. sets, vehicular movement and construction activities can cause fugitive and point source emission
5.	Increased Ambient Noise Levels	Operation of construction equipment, machinery, piling, D.G. sets, vehicular movement and maintenance activities would increase the ambient noise levels;
6.	Ecology	Impact on habitats and species may result from vegetation clearance, construction of site and access roads. Impact to avifauna may also occur due to electrocution with the transmission lines.
7.	Local Economy and Employment	• Local community might choose to work during the construction phase as security guards for the plant. There is also a likelihood of reduced dependence on agriculture for income. • If the project hires migrant labourers, contractors and subcontractors they might stay in local villages and could provide an influx of money into local businesses. However, inadequate accommodation facilities provided to the migrant workers in the vicinity of local inhabitation can also result into unsafe and unhygienic conditions in the local areas.

8.	Community Health and Safety	• Community health and safety hazards include noise pollution, increased traffic, dust pollution and any effects due to structural damage. In the case of spills/leaks, there is a potential for fire hazards and soil/water contamination. • In addition, if migrant labourers are hired the level of interface that locals have with the migrant workers of the project may determine spread of communicable diseases.
9.	Labour and Human Rights	• The internal policies of ReNew Power, contractors and subcontractors will largely determine the labour and working conditions practiced in the project throughout its lifecycle. • However, the scale of impacts either positive or negative will be observed mainly during the construction stage when the number of workers engaged is the highest compared to other stages of the project.
10.	Cumulative Impacts	• The impact on avifauna is an area of concer due to electrocution and mortality risks from transmission lines from upcoming projects. • Land rates in the area will increase due to multiple solar and wind projects being developed in the area. Also there will be further loss of agricultural land. • Also, construction phase of current and upcoming projects in the area may cause increased air emissions and noise levels.

Table 1-2: Scoped out Interactions

S.No.	Interaction (between project activity and Resource/Receptor	Justification for Expectation of Potentially Significant Impacts
1.	Impact on ambient air quality during operation phase	• The power generation process will not have any air emissions; • The site activities will be mainly scheduled maintenance work
2.	Indigenous People	According to the Census records and consultations with the local community, the study areas is having presence of few Scheduled Tribe population within the study area. However; the area does not fall under Schedule V areas.

3.	Impact on cultural resources and heritage structures	• No structures bearing cultural, historical, religious or spiritual significance are located within the vicinity of the project; • Community consultations and discussions with the site team of OKPPL also confirmed that the project would not impact any such structure.
4.	Common Property Resources (CPR)	• Common property resources either due to traditional use or recognizable rights (legal) include animal grazing land, pathways of commute, meeting/gathering areas etc. Such areas may be belonging to a private owner or government but used by the community at large; • Based on the consultation with local community, it was understood that villagers have their animal grazing land, community hall etc. within the village and no such common property has been procured by the project.

1.3.1 AGENCIES CONTACTED

The following stakeholders were contacted during the ESIA study:

- Project Proponents:
  - Representatives from OKPPL
- Land Aggregator
- Local Community:
  - Residents – Jagalur, Kudligi and Chitradurga Taluka villages
  - PAP- Jagalur, Kudligi and Chitradurga Taluka villages
  - Women's group
  - Youth group
  - Vulnerable group
- Local Regulatory Bodies:
  - Members of Gram Panchayat
  - Revenue department (Sub-Registrar Office), Jagalur, Kudligi and Chitradurga
  - Water Supply Department, Jagalur, Kudligi and Chitradurga
  - Deputy Conservator of Forest – Davanagere, Bellary and Chitradurga
- Institutional Stakeholders
  - Primary School
  - Health Care center
  - Anganwadi

1.4 PROJECT BACKGROUND

The purpose of the assignment is to evaluate the environmental and social impacts of the proposed project in line with the project and to implement mitigation measures and design an Environmental, Health, Safety and Social Management Plan to avoid adverse impacts during the project. The aim of the study is to assess whether the project to comply with the requirements of the above mentioned guidelines as necessitated by financial investors.

In accordance to the screening criteria of IFC Principles and Equator Principles, TÜV SÜD has categorized Project as ***Category B***, which specifies that the project can cause potential and limited adverse social or environmental impacts which are generally site-specific, largely reversible and readily addressed through mitigation measures. The major observations of the proposed project are as follows.

- The project is a Greenfield project. There are no resettlements and rehabilitation or involuntary resettlement issues related to the project.
- The land procurement for Wind Power Project is being carried out based on 'willing buyer-willing seller' transactions with compensation of around 4-5 times than government rate and more than twice the prevailing market rates. There are no issues observed related to Common Property Resources (CPR) in the land acquired for the proposed project. However; NOC from Gram Panchayat and separately from ST community needs to be obtained for the 3 nos. ST land parcels acquired till date and any further ST land parcels being acquired if any.
- There is no critical habitat with high biodiversity value within project premises, AoI and buffer zone of 15 km radius
- No migratory bird pathway and corridors were observed near the project site and in the Study Area. Also no nesting and breeding grounds of birds were observed in Tranmsission Line Route and in the area earmarked for Wind Power Project;
- There are no biosphere reserves, national parks, tiger reserves, Important Bird Areas (IBA), nesting or breeding grounds for any of the rare species within the study area of 15 km radius.
- Rangayyanadurga Four Horned Antelope Wildlife Sanctuary boundary is located at 1.4 km of project area (WTG SGJA-73) and Eco-sensitive zone of Rangayyanadurga Four Horned Antelope Wildlife Sanctuary falls partially within the project area. 2 WTGs (SGJA-78 and SGJA-73) fall within the ESZ area of Rangayyanadurga Four Horned Antelope Wildlife Sanctuary.
- The peacock corridor is located at a distance of 1.63 km in NE direction from SGJA 06; 1.57 km in NNE direction from SG JA-07; 1.28 km in SW direction from SG JA-70 and at a distance of 4.68 km in SW direction from PSS Phase I
- NOC from Forest and Wildlife Department is required to be obtained for laying WTG's and associated facilities for the project due to presence of WTGs SGJA-78 & SGJA-73

within the ESZ boundary of the Rangayyanadurga Four Horned Antelope Wildlife Sanctuary.

- The Shadow Flicker assessment conducted reveal that the shadow impacts shall not exceed 30 hours on all permanent receptors thereby avoiding adverse impacts on aesthetics during operation phase of the project
- The Noise Modelling Assessment results further indicate that cumulative noise levels are within permissible limits of 55 dB(A) during day time and 45 dB(A) during night time near permanent receptors in proximity of WTG's except receptors in vicinity of 7 WTG locations therefore it is advised to shift WTG locations namely SGJA 71, SGJA 73, SGJA 74, SGJA 75, SGJA 77, SGJA 78, SGJA 79 due to moderate impact of noise determined during Operation Phase during day as well as night-time.
- The access to the village roads will not be restricted during construction and operation phase of the project and Traffic Management Plan shall be implemented during Construction and Operation & Maintenance Phase of the project. Approach roads from the existing village road or PWD roads shall be constructed to access the WTG locations
- There are no issues related to cultural heritage and archaeological significance near project site

1.5 LIMITATIONS OF THE STUDY

The ESIA report has been prepared based on the professional judgement to certain facts with resultant subjective interpretations. Professional judgments expressed herein are based on the facts which were available within the limits of the scope of work, information provided by OKPPL or its representative, prevailing secondary data, budget and schedule.

The consultation undertaken during the site visit was based on the present understanding of the project and the project footprint. This assessment may slightly change in case of a change in the plant location as finalized at the time of study. The documents like SOPs, policy and procedures for EHS&S management were limited for review at the time of visit.

Also, the consultations undertaken as part of the impact assessment were restricted to the stakeholders who were available during the site visit. Also, due to the large number of the villages within the study area and the limited time in which the assessment had to be completed, the ESIA team undertook consultation in a sample of the villages with a focus for coverage of maximum number of stakeholder groups. Due to ongoing COVID-19 pandemic situations; the stakeholder consultations were limited to PAPs which were available during Site Visits.

1.6 STRUCTURE OF THE REPORT / CHAPTERISATION

The ESIA Report will be chapterised under following heads:

Chapter	Title	Description
Chapter 1	Introduction:	Project background, objectives and scope of work and approach & brief methodology for the study.
Chapter 2	Legal, Policy and Administrative Framework	Assess applicable laws and legislations and institutional framework for its implementation
Chapter 3	Project Description	Describes the proposed project and its geographic, ecological, social, health and temporal context, including any related facilities that may be required.
Chapter 4	Environmental and Social Baseline Conditions:	Assess existing social and environmental baseline conditions of the study area which describe relevant physical, biological, socioeconomic, health and labour conditions in the project area of influence;
Chapter 5	Public Consultations and Stakeholders Analysis	Perception and views of the affected villagers, Panchayat personal and other stakeholders like officials, other people of the community indirectly and directly affected by the upcoming project have been discussed in this chapter.
Chapter 6	Environmental and Social Impact Assessment	Impact Assessment and Mitigation Measures for environmental and social components for pre-construction/construction and operation phases. To minimize the adverse impacts of mitigation measures have been suggested.
Chapter 7	Analysis of Alternatives	Analysis of Alternatives comparing reasonable alternatives to the proposed project site, technology, design, and operation in terms of their potential environmental impacts
Chapter 8	Environmental and Social Management Plan (ESMP):	It includes formulation of ESMP and preparation of Environmental and Social System (ESMS) that include the following: • Mitigations for adverse environmental and social impacts and associated risks • Institutional arrangement - management tools and techniques for the implementation of environmental impacts and risk mitigations • Monitoring and reporting of requirements and

		mechanisms for the effective implementation of the suggested mitigations • Monitoring arrangements for effective implementation of suggested mitigations for the proposed project and • Reporting requirement to the regulatory agencies and funding institutes Preparation of ESMS: Corporate level Environmental and Social Management System (ESMS) based on the current profile of activities of technology provider with respect to the Wind power Project, and the findings of ESIA. The ESMS will be prepared in accordance with the directives and guidelines of Performance Standards of IFC and Equator Principles.
Chapter 9	Conclusion and Recommendations	The overall results drawn from a detailed Environmentalk and Social Impact Assessment (ESIA) Studies and suggestive measures

2 LEGAL, POLICY AND ADMINISTRATIVE FRAMEWORK

The emerging environmental scenario calls for attention on conservation and judicious use of natural resources. There is a need to integrate the environmental consequences of the development activities and for planning suitable measures in order to ensure sustainable development of a region. The environmental and social considerations in any developmental process have become necessary for achieving sustainable development. To achieve such goals, the basic principles to be adopted are:

- To enhance the quality of environment in and around the project area by adopting proper measures for conservation of natural resources;
- Prevention of adverse environmental and social impact to the maximum possible extent; and
- To mitigate the possible adverse environmental and socio-economic impact on the project-affected areas.

This section provides legal and regulatory framework along with Institutional framework for the Project, covering national requirements as well as applicable international treaties and conventions, guidelines and standards. The intent of this section is to lay out the regulatory and non-regulatory performance requirements for all stages of the proposed wind power project. The section broadly focuses on the institutional framework, applicable environment, health and safety and social legislative, IFC's Performance Standards; IFC's sector-specific guidelines and Equator Principles' requirements relevant to the proposed project.

The approvals from various regulatory agencies authorized by the Central and State Governments, in the form of Licenses, Permits, or Authorizations, are required for the establishment and operation of proposed Project are discussed in below sections.

2.1 INSTITUTIONAL FRAMEWORK – ENFORCEMENT ACTIVITIES

A brief description of the relevant enforcement agencies with respect to the institutional framework is described in the following **Table 2-1.**

Table 2-1: Enforcement agencies relevant to the Project

Sr. No.	Agency	Functions	Relevance and Applicability to the Project
Central Level			
1	Ministry of New and renewable Energy (MNRE)	The Ministry of New and renewable Energy (MNRE) is the nodal Ministry of the Government of India for all matters relating to renewable energy. The Ministry facilitates research, design, development, manufacture and deployment of new and renewable energy systems/devices for transportation, portable and stationary applications in rural, urban, industrial and commercial sectors.	Project will be developed based on MNRE guidelines
2	National Green Tribunal	The tribunal will have jurisdiction over all civil cases relating to implementation of the following regulations: • The Water Act, 1974; • The Forest Conservation Act, 1980; • The Air Act, 1981; • The Environmental Protection Act, 1986; • The Public Liability Insurance Act,1991; and • The Biological Diversity Act, 2002. The Act provides compensation on account of following: • Relief and compensation to the victims of pollution and other environmental damage arising under enactment of the above acts; • Restitution of property damaged; and • Restitution of the environment.	U / s 17, any person responsible for any untoward incidents (defined in Schedule II of the Act) is liable to pay relief or compensation as determined by the tribunal, failing which a penalty (u/s 26 and 27) is imposable which may lead to imprisonment of up to 3 years or fine up to Rs. 10 crores or both and an additional fine of Rs. 25,000 per day for any delay which may be further increased to one lac per day.
3	Central Electrical Authority (CEA)	The Central Electricity Authority (CEA) is a statutory organization constituted under Section 3 of the repealed Electricity (Supply) Act, 1948, herein after replaced by the Electricity Act, 2003. Some of the functions performed by CEA include the following: • Advise the Central Government on the matters relating to the national electricity policy, formulate short-term and perspective plans for development	Project will be developed based on technical standards for CEA for electrical lines and grid connectivity.

		• of the electricity system and coordinate activities of the planning agencies for the optimal utilization of resources to sub-serve the interests of the national economy and to provide reliable and affordable electricity to all consumers; Specify the technical and safety standards for construction of electrical plants, electric lines and connectivity to the grid; • Specify the safety requirements for construction, operation and maintenance of electrical plants and lines; • Advise any State Government licenses or the generating companies on such matters which shall enable them to operate and maintain the electricity system under their ownership or control in an improved manner and where necessary, in coordination with any other Government license or the generating company owning or having the control of another electricity system etc.	
4.	Petroleum and Explosives Safety Organization (PESO)	The PESO is under the Department of Industrial Policy & Promotion, Ministry of Commerce and Industry, Government of India. The Chief Controller of explosives is responsible to deal with provisions of: • The Explosive Act 1884 and Rules, 1983, • The Petroleum Act 1934 and the Rules 2002, • The Static and Mobile pressure vessels {Unfired} Rules, 1981 and amendment 2000,2004, • Manufacture, Storage and Import of Hazardous Chemical Rules, 1989 and amendment, 2000 • Hazardous and Other Wastes (Management and Trans boundary Movement) Amendment Rules, 2019 • Environment (Protection) Act, 1986	Project to comply with PESO requirements.
5.	Centre for Wind Energy Technology (C-WET)	Centre for Wind Energy Technology (C-WET) has been established in Chennai in the year 1998, as an autonomous R&D institution by the Ministry of New and renewable Energy (MNRE), Government of India. It functions with the following structure. • **Research & Development unit:** Its main focus towards novelty in developments of components as well as in sub-systems of wind turbines. • **Wind Resource Assessment Unit:** The unit identifies resource rich regions in the	Project will be developed based on technical standards described herein

		country by conducting wind resource micro survey and offers its services to the wind farm developers. • **Standards and Certification Unit:** The unit carries out Provisional Type Certification of Wind Turbines as per the Indian Certification Scheme for Wind Turbines viz. Type Approval - Provisional Scheme - TAPS – 2000 (amended). Standards on Wind Energy are being developed by the unit. • **Information, Training & Commercial Service Unit**: To establish and update the data bank and serve as finest information centre in wind energy by collecting, collating and analyzing the related information.	
State level			
1	Karnataka Renewable Energy Development Limited (KREDL)	The Karnataka Renewable Energy Development Limited (KREDL) is an organization working under the purview of Energy Department, Government of Karnataka. The objectives of the KREDL are to promote renewable energy in the State and to initiate all necessary actions for Energy Conservation in the State. The KREDL works through various Governmental Agencies, Private Organizations, NGO's and Accredited Energy Auditors The Karnataka Renewable Energy Development Ltd. (KREDL) is an organization devoted entirely to the promotion of non-conventional energy sources in Karnataka. Its aim is to promote projects for harnessing energy from wind, small-hydro, biomass, solar energy and energy recovery from wastes through private investment. The company advises the Government of Karnataka on policies to be adopted for ensuring a systematic and balanced growth of projects for harnessing Renewable energy sources. KREDL create synergies between industry, finance, government, and technical experts to evaluate challenges and opportunities arising from law and policy; make politically feasible recommendations to promote clean energy. KREDL also catalogues "best practices" in	Project to comply with Karnataka Renewable Energy Policy 2016-2022 and its amendments.

		Renewable energy regulation at national and regional levels. Disseminate findings through Renewable energy networks and global partnerships, targeted events, and at international negotiating fora; and Act as a catalyst for change to promote policy and legal instruments that will enhance the market position for Renewable energy.	
2	Karnataka Power Transmission Corporation Limited (KPTCL)	KPTCL is mainly vested with the functions of Transmission of power in the entire State of Karnataka and also Construction of Stations & Transmission Lines and maintenance of 400/220/110/66 KV Sub-Stations. Many new lines and Sub-Stations were added & existing stations were modified in the Transmission network. It operates under a license issued by Karnataka Electricity Regulatory Commission.	Project to comply with KPTCL requirements
3	Karnataka State Pollution Control Board (KSPCB)	The KSPCB is a statutory authority entrusted to implement environmental laws and regulations within the state of Karnataka, India. The board ensures proper implementation of statuses, judicial and legislative procurements related to environmental protection within Karnataka State	The Project would generate used oil from DG sets and WTG maintenance. The authorization is not required to be obtained under Hazardous and Other Wastes (Management and Transboundary Movement) Amendment Rules, 2019 however a tie up arrangements with CPCB/KSPCB authorized vendor for handling hazardous waste needs to be carried out as per the norms. Hazardous waste not to be stored for a period more than ninety days. As per Central Pollution

			Control Board's (CPCB) recent notification dated March 7th, 2016 vide No. B-29012/ESS (CPA)/2015-16 for modified directions under Section 18 (1) (b) of the Water (Prevention & Control of Pollution) Act, 1974 and Air (Prevention & Control of Pollution) Act, 1981, regarding harmonization of classification of industrial sectors under red/orange/green/white categories. Industrial sectors having Pollution Index scores inclusive and up to 20, will fall under the White Category projects. Wind projects have been categorized as White Category. It has been mentioned in the notification that there shall be no necessity of obtaining CTO for White Category industries. Karnataka State Pollution Control Board has accepted the new notification as part of their consent management process (1) and do not require CTE and CTO for white category industries. NOC is therefore not required to be obtained

			however an Intimation Letter needs to be submitted.
4	Gram Panchayats	The local Panchayats are empowered with management of local resources like forests, groundwater, common land and infrastructure like roads, buildings etc.	Panchayats are empowered to levy and collect local taxes on land, property and provisioning of facilities. The State of Karnataka does not require solar or wind power projects to take a NoC (No Objection Certificate) from the Gram Panchayat of the impacted villages prior to initiation of construction activities. *However; OKPPL is planning to obtain No-Objection Certificate (NOC) from the Grampanchayats for setting up project in 38 villages of Jagalur, Kudligi and Chitradurga Tehsil falling in Davangere, Bellary and Chitradurga districts. It has already obtained NOC from Gram Panchayat Hiremallanahole Gram Panchayat as on date* ***(Annexure- V).***
5	State Labour Department	The Department of Labour is responsible for formulation, implementation and enforcement of the labour laws in Karnataka state. It also undertakes prevention and settlement of industrial disputes, Industrial safety, and health and promotes welfare of workers in the undertakings within the sphere of the State.	Workmen to be involved during the construction phase and a few in the operation should be provided with wages and other facilities with state as well as local labour

			laws and acts.
6	Directorate Industrial Safety and Health Department (DISH).	The Directorate of Industrial Safety and Health Department enforces the provisions of Factories Act 1948 and Karnataka Factories Rules, 1969 and the rules made there under to ensure safety health and welfare of the workers. It also plays a significant role in regularizing working hours, and working conditions and reducing the accident and dangerous occurrences in the factories, redressal of the grievances of the workers in respect of Safety Health and Welfare through a set of policies developed by both the Central and State Govt. Some of the functions of DISH are: • Elimination inequality and discrimination in the work place; • Enhancing occupational health and safety awareness and compliance in the workplace; • Workforce and community participation, to employers, employees, workplaces, communities, businesses and unions; and • Providing policy advice and analysis to government on labour and employment related matters.	Projects needs to comply with different rules under jurisdiction of DISH.
Other institutions			
1	National institute of wind energy (NIWE)	NIWE has been established in Chennai in the year 1998, as an autonomous R&D institution by the Ministry of New and Renewable Energy (MNRE), Government of India. The Centre provides services such as: • R & D for wind turbine technologies; • Identification of wind resource rich regions in the country; • Testing of complete Wind Turbine Generator Systems (WTGS) according to international standards (IEC) and Type Approval Scheme (TAPS-2000); and • Provisional Type Certification of Wind Turbines as per the Indian Certification Scheme.	Project will be developed based on technical standards of WTGs specified by NIWE.

2.2 APPLICABLE REGULATORY/POLICY FRAMEWORK

The above table summarizes the key regulations that are relevant to the Project across its lifecycle. This document should be used to update/develop a comprehensive legal register

for the Project which can be regularly monitored for compliance as well as updated to reflect changes/non-applicability of regulations, policies and standards.

2.3 APPLICABLE ENVIRONMENTAL STANDARDS

2.3.1 NATIONAL LEVEL STANDARDS

Taking provision of EPA, 1986, the Central Pollution Control Board (CPCB) has stipulated different environmental standards w.r.t ambient air quality, noise quality, water and waste water for the country as a whole. Following standards are applicable for the Projects and need to be complied with during the Project life cycle.

- National Ambient Air Quality Standards (NAAQ Standards), as prescribed by MoEFCC vide, *Gazette Notification dated 16th November, 2009;*
- Drinking water quality – Indian Drinking Water Standard (IS 10500: 2012);
- General standards for discharge as prescribed under the Environment Protection Rules, 1986 and amendments (G.S.R 422 (E) dated 19.05.1993 and G.S.R 801 (E) dated 31.12.1993 issued under the provisions of E (P) Act 1986);
- Noise standards specified by the MoEF vide gazette notification dated 14th February, 2000 (Noise Pollution (Regulation and control) Rules, 2000); and
- Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 and Hazardous and Other Wastes (Management & Transboundary Movement) Amendment Rules, 2019

2.3.2 IFC/WB STANDARDS

The General EHS Guidelines (30th April 2007) of IFC/WB have outlined following environmental standards which needs to be compiled for the Project.

- IFC/WB Air Emissions and Ambient Air Quality Standards;
- IFC/WB Guidelines for treated sanitary sewage discharges;
- IFC/WB Noise Standards.
- Environmental, Health, and Safety General Guidelines
- Environmental, Health, and Safety Guidelines for Wind Energy.

The key requirements stated in the EHS guidelines have been discussed in **Table 2-2.**

Table 2-2: Key Requirements as per EHS Guidelines of IFC

S.No.	Requirements	Description
1.	Noise and Vibrations	a. Planning activities in consultation with local communities to minimise disturbance.

		b. Avoiding or minimizing project transportation through community areas. c. Proper siting of wind farms to avoid locations in close proximity to sensitive noise receptors Adherence to national or international acoustic design standards
2.	Soil Erosion	i. *Sediment mobilization and transport* a. Scheduling to avoid heavy rainfall periods (i.e., during the dry season) to the extent practical. b. Contouring and minimizing length and steepness of slopes c. Re-vegetating areas promptly
		ii. Clean runoff management a. Segregating or diverting clean water runoff to prevent it mixing with water containing high solids content, to minimize the volume of water to be treated prior to release.
		iii. Road design a. Limiting access road gradients to reduce runoff-induced erosion b. Providing adequate road drainage based on road width, surface material, compaction, and maintenance.
3.	Air Quality	a. Implementing dust suppression techniques such as applying water or non-toxic chemicals to minimize dust from vehicle movements. b. Avoiding open burning of solid waste *i. Mobile Sources* a. Implementation of manufacturer recommended engine maintenance programs by vehicle operators. b. Instructions to drivers on safe and efficient driving practices.
4.	Solid Waste	a. Avoiding or minimizing the generation waste materials, as far as practicable.
5.	Hazardous Materials	a. Providing adequate secondary containment for fuel storage tanks and for the temporary storage of other fluids such as lubricating oils and hydraulic fluids.
6.	Wastewater Discharges	a. Water use efficiency to reduce the amount of wastewater generation. b. Compliance with national or local standards for sanitary wastewater discharges.

7.	Occupational Health and Safety	*i. Over-exertion* a. Training of workers in lifting and materials handling techniques including the placement of weight limits. b. Planning work site layout to minimize the need for manual transfer of heavy loads. c. Implementing administrative controls into work processes, such as job rotations and rest or stretch breaks
		ii. Slips and Falls a. Implementing good house-keeping practices, such as the sorting and placing loose construction materials or demolition debris in established areas away from foot paths. b. Cleaning up excessive waste debris and liquid spills regularly.
		iii. Work in Heights a. Training and use of temporary fall prevention devices b. Training and use of personal fall arrest systems c. Prior to undertaking work, test structure for integrity; d. Implementation of a fall protection program that includes training in climbing techniques and use of fall protection measures; inspection, maintenance, and replacement of fall protection equipment; and rescue of fall-arrested workers; e. Install fixtures on tower components to facilitate the use of fall protection systems; f. Avoid conducting tower installation or maintenance work during poor weather conditions and especially where there is a risk lightning strikes;
		iv. *Stuck by Objects* a. Maintaining clear traffic ways to avoid driving of heavy equipment over loose scrap. b. Wearing appropriate PPE, such as safety glasses with side shields, face shields, hard hats, and safety shoes.
		v. Moving Machinery a. Planning and segregating the location of vehicle traffic, machine operation, and walking areas, and controlling vehicle traffic through the use of one-way traffic routes, establishment of speed limits, and on-site trained flag-people wearing high-visibility vests or outer clothing covering to direct traffic. b. Using inspected and well-maintained lifting devices that are appropriate for the load, such as cranes, and securing loads when lifting them to higher job-site elevations.

		vi. Dust a. Implementation of Dust suppression techniques such as applying water
8.	Community Health and Safety	*i. Disease Prevention* a. Providing surveillance and active screening and treatment of workers.
		ii. Traffic Safety a. Adoption of safety measures that are protective of project workers and of road users, including those who are most vulnerable to road traffic accidents. b. Regular maintenance of vehicles and use of manufacturer approved parts.
		iii. Public Access a. Fence the wind farm site, or individual turbines, to prohibit public access close to the turbine; b. Prevent access to turbine tower ladders;
9.	Visual Impacts	a. Consider the landscape character during turbine siting; b. Consider the visual impacts of the turbines from all relevant viewing angles when considering locations c. Maintain uniform size and design of turbines (e.g. direction of rotation, type of turbine and tower, and height); d. Paint the turbines a uniform colour, typically matching the sky (light gray or pale blue), while observing marine and air navigational marking regulations;
10.	Species Mortality or Injury and Disturbance	a. Implement appropriate storm water management measures to avoid creating attractions such as small ponds which can attract birds and bats for feeding or nesting near the wind farm.
11.	Shadow Flicker and Blade Glint	a. Site and orient wind turbines so as to avoid residences located within the narrow bands, generally southwest and southeast of the turbines, where shadow flicker has a high frequency

Table 2-3: Applicable Environmental and Social Legislative framework for SECI VI Jagalur Wind Power Project (300 MW)

Sr. No.	Applicable Indian Legislation/Guidelines	Pre-construction	Construction	Operation	Decommissioning	Agency responsible	Remark/status
Land Purchase							
1.	Karnataka Land Revenue Act 1964	Y	Y	N	N	District Collector	Land procurement is under process for the Project and it is understood that only

						and Revenue Department	Private Land will be acquired for the project. Few WTG's on procured private land parcels are already operational. Land procurement details have been provided in Section 3.6. The applicability of these regulations has been covered in the process.
Environment Protection							
2.	Environment Protection Act, 1986 as amended	Y	N	N	N	KSPCB CPCB MoEFCC	Permissible limits for ambient air quality, water quality, noise limits have been laid down by CPCB under EP Act, 1986 which required to be compiled with.
3.	The Water (Prevention and Control of Pollution) Act, 1974, as amended.	N	Y	Y	N	KSPCB	CPCB has introduced a new category of Industries (White Category) in their March 7th, 2016 notification. The list of industries that falls under this category, including wind power projects, no longer requires a CTO. In such a case, intimation to SPCB shall suffice. Karnataka State Pollution Control Board has accepted the new notification as part of their consent management process (1) and do not require CTE and CTO for white category industries. NOC is therefore not required to be obtained however an Intimation Letter needs to be submitted.
4.	The Air (Prevention and Control of Pollution) Act, 1981, as amended.	N	Y	Y	N	KSPCB	CPCB has introduced a new category of Industries (White Category) in their March 7th, 2016 notification. The list of industries that falls under this category, including wind power projects, no longer requires a CTO. In such a case, intimation to SPCB shall suffice. Karnataka State Pollution Control Board has accepted the new notification as part of their consent management process (1) and do not require CTE and CTO for white category industries. NOC is therefore not required to be obtained however an Intimation Letter needs to be submitted.
5.	The Noise (Regulation and Control) Rules, 2000	N	Y	Y	Y	KSPCB	Ambient noise levels are to be maintained as stipulated in the rules for different categories of areas – residential, commercial, and industrial and silence zones. OKPPL will need to abide by the

							limits prescribed for residential zones.
Storage of hazardous chemicals							
6.	Manufacture, storage and import of hazardous chemicals (MSIHC) Rules, 1989 and as amended	N	Y	Y	N	KSPCB	Rules will be applicable during construction and operation stages if chemicals stored at site satisfy the criteria laid down in the Rules
Handling of Hazardous Waste							
7.	Hazardous and Other Wastes (Management and Trans boundary Movement) Amendment Rules, 2019 and Amendment	N	Y	Y	Y	KSPCB	Generation of waste oil and transformer oil at site attracts the provisions of Hazardous and Other Wastes Amendment Rules, 2019. There is no authorization required from KSPCB. However, tie up with CPCB/KSPCB authorized vendor needs to be carried out for disposal and handling of hazardous wastes viz. Used Oil, cotton soaked cloth, and empty oil barrels
Labour and Working Conditions							
8.	• The Factories Act, 1948 and the Karnataka Factories Rules, 1969: • Building and Other • Construction Workers • (Regulation of • Employment and • Conditions of Service), • Act, 1996; • Inter-state Migrant • Workmen (Regulation of • Employment and • Condition of Service) Act, • 1979; • Contract Labour Act, • 1970; • Child Labour • (Prohibition and • Regulation) Act, 1986; • Bonded Labour Systems • (Abolition) Act, 1976; • Minimum Wages Act, 1948;	N	Y	Y	Y	Deputy Chief Inspector of Factories	Project proponent will need to comply to all requirements of factories rules and participate in periodic inspection during the Operations Phase.

	• Equal Remuneration Act, 1976; • Workmen's Compensation Act, 1923; and • Maternity Benefit Act, 1961.						
9.	Companies Act, 2013.	N	N	Y	N	OKPPL	According to Schedule 135 sub-section 1, the companies meeting the threshold criteria specified should spend in every financial year, at least 2% of the average net profits of the company made during the three immediately preceding financial years, in pursuance of CSR Policy. The Project will need to comply with the requirements as stated in the law, if it attracts provision under the above mentioned schedule.
Applicable International Conventions							
10.	Conventions on the Conservation of Migratory Species of Wild Animals and Migratory Species.	Y	Y	Y	Y	State Forest Department	Migratory birds in the Project area bear protection from killing under Convention of Migratory Species (CMS) to which India is a signatory. Wetlands being utilized by these species are also protected under this convention.
11.	Kyoto Protocol: The 3rd Conference of the Parties to the Framework Convention on Climate Change (FCCC) in Kyoto in December 1997 introduced the Clean Development Mechanism (CDM) as a new concept for voluntary green-house gas emission reduction agreements.	Y	Y	Y	Y	NATCOM	The proposed Project being a wind power generation Project becomes the basis for qualifying for the Clean Development Mechanism
IFC/World Bank Guidelines							
12.	IFC Performance Standards	Y	Y	Y	Y	IFC	The ESIA report has to be prepared on lines of the IFC Performance Standards (2012).
13.	Equator Principles	Y	Y	Y	Y	IFC	The ESIA report has to be prepared on lines of the Equator Principles (2020).
14.	IFC/WB General EHS Guidelines	N	Y	Y	Y	IFC	During the construction, operation and decommissioning of the site, these

15.	IFC Guidelines for Power Transmission and Distribution	N	Y	Y	Y		guidelines will need to be followed
16.	IFC Guidelines for Wind Energy Project	N	Y	Y	Y		
17.	IFC Guidelines on Worker Accommodation	N	Y	Y	Y		During the construction stage of the Project, these guidelines will need to be followed.

2.4 EQUATOR PRINCIPLES

The Equator Principles, based on the IFC Performance Standards on social and environmental sustainability and on the World Bank Group Environmental, Health, and Safety Guidelines (EHS Guidelines), are intended to serve as a common baseline and framework for financial institutions to identify, assess and manage environmental and social risks when financing Projects. The Equator Principles comprise of a group of ten principles adopted by the Equator Principle Financial Institutions (EPFIs) in order to ensure that the projects funded by them are developed in a manner that is socially responsible and reflect sound environmental management practices. Since July, 2020, the Equator Principles (EP) IV[1] is effective, replacing the previous EP III. These 10 Equator Principles are as follows:

- Principle 1: Review and Categorisation;
- Principle 2: Environmental and Social Assessment;
- Principle 3: Applicable Environmental and Social Standards;
- Principle 4: Environmental and Social Management System and Equator Principle Action Plan;
- Principle 5: Stakeholder Engagement;
- Principle 6: Grievance Mechanism;
- Principle 7: Independent Review; and
- Principle 8: Covenants.
- Principle 9: Independent Monitoring and Reporting
- Principle 10: Reporting and Transparency

The applicability of Equator Principles to the project has been outlined in **Table 2.4** below.

Table 2-4: Application of Equator Principles to the Project

Equator Principles	Requirements	Project Information/ Application
Principle 1: Review	Project seeking financing from EPFIs, the	Based on the IFC environmental and social screening criteria the

[1] https://equator-principles.com/wp-content/uploads/2021/02/The-Equator-Principles-July-2020.pdf

Equator Principles	Requirements	Project Information/ Application
and Categorization	project has to be categorized based on the magnitude of its potential impacts and risks in accordance with the environmental and social screening criteria of IFC.	proposed wind power project is identified as a "Category B" project with potential limited adverse social or environmental impacts that are few in number, generally site-specific, largely reversible and can be readily addressed through mitigation measures
Principle 2: Environmental and Social Assessment	For each project assessed as being either Category A or Category B, the EPFI will require the borrower need to conduct an Environmental and Social Assessment process to address, to the EPFI's satisfaction, the relevant environmental and social risks and impacts of the proposed Project. The assessment should also propose measures to minimize, mitigate, and offset adverse impacts in a manner relevant and appropriate to the nature and scale of the proposed Project.	OKPPL has appointed TÜV SÜD for undertaking environment and social impact assessment study for the proposed 300 MW SECI VI wind project, Davanagere, Bellary & Chitradurga. OKPPL has also developed a ESMS and HSE manual for its Solar and Wind Power projects at corporate level incorporating the following elements: EHS&S aspects; Risk Assessment and Management Procedures for Construction, Operation & Decommissioning Phase; Institutional Framework for ESMS implementation; Legal Compliance Management; Grievance Redressal Mechanism for handling Internal and External Grievances, Reporting and Monitoring Procedures, Stakeholder Engagement Plan, Occupational Health and Safety Plan; Training and Capacity Building Plan, HSE Management System and Procedures; Monitoring, Evaluation and Review procedures. The ESMP proposed in this ESIA along with ESMS shall be adhered for addressing impacts from the proposed project
Principle 3: Applicable	The principle requires the Environment and Social Assessment to refer to the	The ESIA report has been prepared including the

Equator Principles	Requirements	Project Information/ Application
Environmental and Social Standards	applicable IFC performance standards and then applicable industry specific EHS guideline including the project's overall compliance with or justified deviation from, the respective Performance Standards and EHS Guidelines. The assessment process also needs to address compliance with relevant host country laws, regulation and permits that pertain to social and environmental matters.	requirements of IFC Performance Standards, Equator Principles, IFC's General EHS Guidelines and EHS Guidelines for Transmission Lines and all applicable laws and legislations at National level to assess the Environmental and Social Impacts of the project.
Principle 4: Environmental and Social Management System and Equator Principle Action Plan	For all Category A and B projects, an Action Plan (AP) need to be prepared which addresses relevant findings, and draws on the conclusions of the Assessment. The AP will describe and prioritize actions needed to implement mitigation measures, corrective actions and monitoring measures necessary to manage the impacts and risks identified in the Assessment. In this regard, the borrower /proponent needs to maintain or establish a Social and Environmental Management System that addresses the management of these impacts, risks and corrective actions required to comply with applicable host country social and environmental laws and regulations, and requirements of the applicable Performance Standards and EHS Guidelines, as defined in the AP.	ReNew Power has an established Environmental & Social Management System (ESMS) for its wind and solar power projects which defines a set of policies, procedures, tools and internal capability to identify and manage its exposure to the environmental and social risks and aligning its approach to mitigate any impact on People, environment & communities. Further, in accordance with the provision of this Principle, an Environmental and Social Management Plan has been drawn up as part of the ESIA study for the proposed project specifying appropriate plans and procedures which requires to be implemented during various phases in order to prevent, control and mitigate any potential environmental and social risks.
Principle 5: Stakeholder Engagement	According to this Principle, for all Category A and (as appropriate), Category B projects, the Government, borrower or third party expert to consult with project affected communities in a structured and culturally appropriate manner. For projects with significant adverse impacts on affected communities, the process will ensure their free, prior and informed consultation and facilitate their informed participation as a means to judge, vide EPFI norms, whether a project has adequately addressed the concerns of	Consultation with the stakeholders is a regular practice at the project site. OKPPL shall keep regular interaction with all the stakeholders. The consultation was undertaken during land identification and purchase directly and indirectly through Land Aggregator. It shall further be ensured for the remaining land parcels yet to be acquired. Chapter 5 of the report details the stakeholder identification and

Equator Principles	Requirements	Project Information/ Application
	the affected communities.	engagement related to the project. Details of consultations undertaken during ESIA study is also be presented in Chapter 5 of the ESIA report. A stakeholder's engagement plan is also formulated as a part of ESIA report in order to correct any gaps and ensure adequate stakeholder engagement going forward.
Principle 6: Grievance Mechanism	For all Category A and (as appropriate), Category B projects, it needs to be ensured by the proponent that consultation, disclosure and community engagement continues throughout construction and operation of the project and community concerns/grievances addressed through establishing a 'Grievance Redressal Mechanism'. In this regard, the proponent of the proposed Wind Power project need to develop and implement a 'Grievance Redressal Mechanism (GRM)' to receive and facilitate resolution of any concern and grievance that may be raised by land loser groups and/or nearby village communities during both construction and operational phase of the project. As part of this Principle, it is also imperative that the proponent maintains regular dialogue with communities through implementation of focused CSR programmes / initiatives.	Grievance Redressal Mechanism has been developed by ReNew Power for internal and external grievances and the same needs to be implemented at project level by OKPPL. Grievance Register should be maintained onsite and all the grievances should be properly recorded and records for handling and closure of grievances in a timely manner should be maintained at Site during both construction and operation phase. OKPPL will ensure to resolve grievances at the community level. It is also to be ensured that a designated person will be trained and available to receive grievances and coordinate efforts to redress those grievances through the appropriate channels, taking into consideration any customary and traditional methods of dispute resolution within the Affected Communities. In providing a grievance mechanism through which workers may raise workplace concerns, OKPPL should ensure that matters are brought to management's attention and addressed expeditiously. OKPPL needs to document all grievances and follow up on any corrective actions.
Principle 7: Independent Review	For all Category A projects and, as appropriate for Category B projects, an independent social or environmental	As part of the loan approval for the project the respective EPFI may appoint an independent social or

Equator Principles	Requirements	Project Information/ Application
	expert not directly associated with the proponent will review the assessment, action plan and consultation process documentation in order to assist EPFI's due diligence, and assess Equator Principle Compliance.	environmental expert for review of ESIA report and its implementation.
Principle 8: Covenants	For Category A and B projects, the proponent will covenants in financing documentation: a) to comply with all relevant host country social and environmental laws, regulations and permits in all material respects; b) to comply with the action plans (where applicable) during the construction and operation of the project in all material respects; c) to provide periodic reports in a format agreed with EPFIs (with the frequency of these reports proportionate to the severity of impacts, or as required by law, but not less than annually), prepared by in-house staff or third party experts, that i) document compliance with the action plans (where applicable), and ii) provide representation of compliance with relevant local, State and host country social and environmental laws, regulations and permits (where applicable) d) to decommission the facilities, where applicable and appropriate, in accordance with an agreed decommissioning plan.	E&S Covenants shall be embedded within the contracts drawn between proponent and the contractors hired for construction activities; laying transmission line works, technology providers, Security Agencies and waste handling agencies in line with all applicable environmental and social laws, regulations and permits at local and national level. Periodic reporting to the project developers will have to be carried out by the contractors.
Principle 9: Independent Monitoring and Reporting	To ensure on-going monitoring and reporting over the life of loan, EPFIs will, for all Category A projects and, as appropriate for Category B projects, require appointment of an independent environmental and/or social expert, or require that the proponent retain qualified and experienced external experts to verify its monitoring information which would be shared with EPFIs.	Independent monitoring and reporting for adherence w.r.t. ESMP Compliance needs to be carried out annually for assessment of compliance w.r.t. project specific measures and providing representation of compliance with relevant local, state and host country environmental and social laws, regulations and permits
Principle 10: Reporting and Transparency	At a minimum, a summary of the ESIA is accessible	OKPPL needs to ensure that a summary of the ESIA should be readily available at all times. It should be provided to all concerned stakeholders as and when required.

As a part of Implementation requirement of EP4 2020, the evaluation of technically and financially feasible and cost-effective options available to reduce project-related GHG emissions during the design, construction and operation of the project has to be done by OKPPL.

2.5 IFC PERFORMANCE STANDARDS

The Performance Standards (PS) established stipulates that the project shall meet the following throughout the life of an investment by IFC or other relevant financial institution:

- Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts;
- Performance Standard 2: Labour and Working Conditions;
- Performance Standard 3: Resource Efficiency and Pollution Prevention;
- Performance Standard 4: Community Health, Safety and Security;
- Performance Standard 5: Land Acquisition and Involuntary Resettlement;
- Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources
- Performance Standard 7: Indigenous Peoples; and
- Performance Standard 8: Cultural Heritage.

These performance standards and guidelines provide ways and means to identify impacts and affected stakeholders and lay down processes for management and mitigation of adverse impacts. A brief on the requirements as laid down in the performance standards is described below.

Applicable performance Standards

PS No.	Performance Standards	Applicability
PS 1	Assessment and Management of Environmental and Social Risks & Impacts	● Yes ○ No
PS 2	Labour and Working Conditions	● Yes ○ No
PS 3	Resource Efficiency and Pollution Prevention	● Yes ○ No
PS 4	Community Health, Safety, and Security	● Yes ○ No
PS 5	Land Acquisition and Involuntary Resettlement	○ Yes ● No
PS 6	Biodiversity Conservation and Sustainable Management of Living Natural Resources	● Yes ○ No
PS 7	Indigenous Peoples	○ Yes ● No
PS 8	Cultural Heritage / PS 8	○ Yes ● No

The details of Applicability of IFC Performance Standards for 300 MW MW SECI VI project of OKPPL are given below

Table 2-5 : Applicability of IFC Performance Standards for 300 MW SECI VI project

Performance Standard	Performance Standard (PS) requirements in brief	Applicability to project	Actions Taken/Requirements
Assessment and Management of Environmental and Social Risks & Impacts	PS 1 establishes the importance of integrated assessment to identify the environmental and social impacts, risks, and opportunities of projects; effective community engagement through disclosure of project-related information and consultation with local communities on matters that directly affect them; OKPPL's management of environmental and social performance throughout the life of the project.	The proposed project is a wind power project and will have environmental and social impacts such as generation of waste, noise, air emission during construction activities and transportation, etc. Further, the project shall be constructed on private land. The PS 1 is therefore applicable to projects and requires a detailed Environmental and Social Impact Assessment (ESIA) Study to be conducted for the project. Therefore, the present ESIA Study being carried out by OKPPL shall cover all environmental, health, safety and social impacts and mitigation measures and management plan for addressing impacts in construction as well as operation phase of the project.	OKPPL in coordination with other responsible government agencies and third parties as appropriate, will conduct a process of environmental and social assessment, and establish and maintain an ESMP appropriate to the nature and scale of the project. OKPPL needs to adhere to Environmental and Social Management System (ESMS) developed by ReNew Power Ventures Private Limited in January, 2017 which is applicable for both Solar and Wind Power Projects. It comprises of policies and procedures for handling EHS&S aspects; Risk Assessment and Management Procedures for Construction, Operation & Decommissioning Phase; Institutional Framework for ESMS implementation; Legal Compliance Management; Grievance Redressal Mechanism for handling Internal and External Grievances, Reporting and Monitoring Procedures, Stakeholder Engagement Plan, Occupational Health and Safety Plan; Training and Capacity Building Plan, HSE Management System and Procedures; Monitoring, Evaluation and Review procedures.

Performance Standard	Performance Standard (PS) requirements in brief	Applicability to project	Actions Taken/Requirements
			Further, OKPPL needs to adhere w.r.t. ReNew Power EHS Manual and measures suggested in ESMP of this Report to manage the risks associated with its operations like Stakeholder engagement, emergency response plan, contractor management plan, grievance redressal etc. during construction, operation and decommissioning phase of the project OKPPL will draw project specific ESMS & HSE plan and other management plans like Shadow Flicker and Noise Management; Ecological and Biodiversity management; water management, waste management, labour management, site security etc. ReNew Power is having an established corporate level ESMS & HSE plan and would draw project specific plans from them. ReNew Power establishes its commitment to establish an adequate HSE and social management protocol for managing risk arising from project activities and carry out business in most sustainable way which is in conformation to broader objective established in QEHS policy (enclosed in Annexure-1). Also, ReNew Power is having COVID Safety protocol which shall be implemented at Site level by OKPPL.

Performance Standard	Performance Standard (PS) requirements in brief	Applicability to project	Actions Taken/Requirements
			Requirements: Identification of Risks and Impacts and Management Programs OKPPL will establish and maintain a process for identifying the environmental and social risks and impacts of the project. Management Programs to be developed depending upon the nature and scale of the project. The project specific Risks/Impacts as identified during construction and operation phase of the project have been detailed in Chapter 6 of ESIA report separately. Chapter 8 defines framework for environment and social management plan for the project
			Requirements: Organizational Capacity and Competency OKPPL in collaboration with appropriate and relevant third parties, will establish, maintain, and strengthen as necessary an organizational structure that defines roles, responsibilities in association with the project. Organization structure for implementation of environment and social management plan has been detailed in Section 8.2 of the Report. It reflects the role of Corporate and Site level EHS team in managing EHS

Performance Standard	Performance Standard (PS) requirements in brief	Applicability to project	Actions Taken/Requirements
			aspects at Site and outlines a clear responsibility of the EHS team in management of EHS w.r.t. ESMP. Training needs shall be devised for effective implementation of ESMS at Site. Some of the specific trainings that will be carried out on routine basis are as follows: • ESMS Checklists and procedural guidance • Occupational Health & Safety • Fire Safety and Prevention • Emergency Response Preparedness • Operational Training • HR Induction Training • PPE Training • Driver Safety • Implementation of Environmental and Social Management/Action plans The above mentioned trainings are the preliminary trainings which will be undertaken at the inception stage once the employee/worker joins the company and/or project. Post that monthly refresher training can be taken especially for the workers.

Performance Standard	Performance Standard (PS) requirements in brief	Applicability to project	Actions Taken/Requirements
			Requirements: Emergency Preparedness and Response OKPPL will establish emergency preparedness and response system to respond to accidental and emergency situations associated with the project in a manner appropriate to prevent and mitigate any harm to people and/or the environment. OKPPL is required to design emergency preparedness and response plans based on the risks to community health and safety identified during the risks and impacts identification process during construction and operation phase of the project for e.g. devising a Traffic Management Plan, Waste Management Plan to avoid impacts on community health and safety. The level of planning and communication should be commensurate with the potential impacts.
			Requirements: Monitoring and Review OKPPL will establish procedures to monitor and measure the effectiveness of the management program, as well as compliance with any related legal and/or contractual obligations and regulatory requirements. To implement the ESMP, on-site team will develop a

Performance Standard	Performance Standard (PS) requirements in brief	Applicability to project	Actions Taken/Requirements
			time-bound and action-oriented Environmental and Social Action Plan (ESAP) to implement the mitigation measures provided for each of the identified environmental and social impacts. This ESMP will have to be monitored on a regular basis, quarterly or half-yearly and all outcomes would need to be audited in accordance with existing EHS commitments. The monitoring process will cover all stakeholders including contractors, labourers, suppliers and the local community impacted by the project activities and associated facilities. Inspection and monitoring of the environmental and social impacts of construction and operation phase activities will increase the effectiveness of suggested mitigations. Through the process of inspection, audit, and monitoring OKPPL will ensure that all the contractors comply with the requirements of conditions for all applicable permits including suggested action plans. The inspections and audits will be done by OKPPL's trained team and external agencies/experts. The entire process of inspections and audits will be documented. The inspection and audit findings will be implemented by the contractors in their respective areas.

Performance Standard	Performance Standard (PS) requirements in brief	Applicability to project	Actions Taken/Requirements
			Requirements: Stakeholder Engagement, Disclosure of Information and Consultations OKPPL should identify the range of stakeholders that may be interested in their actions and consider how external communications might facilitate a dialog with all stakeholders. OKPPL will develop and implement a Stakeholder Engagement Plan that is scaled to the project risks and impacts and development stage, and be tailored to the characteristics and interests of the Affected Communities. OKPPL will provide Affected Communities with access to relevant information on: (i) the purpose, nature, and scale of the project; (ii) the duration of project activities; (iii) any risks to and potential impacts on such communities and relevant mitigation measures; (iv) the envisaged stakeholder engagement process; and (v) the grievance mechanism. When Affected Communities are subject to identified risks and adverse impacts from a project, OKPPL will undertake a process of consultation in a manner that provides the Affected Communities with opportunities to

Performance Standard	Performance Standard (PS) requirements in brief	Applicability to project	Actions Taken/Requirements
			express their views on project risks, impacts and mitigation measures, and allows OKPPL to consider and respond to them. A Stakeholder Engagement Plan (SEP) has been formulated as a part of ESIA report in order to correct any gaps and ensure adequate community/stakeholder engagement going forward. The two important elements of community engagement will be disclosure and consultation. This implies that as a first step, the findings of the ESIA, especially the ESMP will have to be disclosed to the community. The ESMP should be finalized through consultation with the community and an action plan shall be developed. Further, the community should be regularly updated about the implementation of the ESMP and all other relevant information pertaining to the construction phase, activities, health and safety risks etc. The community shall also be made aware of the available job opportunities from time to time. The Grievance Redressal Mechanism (GRM) procedure shall also be briefed during SEP. The GRM will also outline the process and steps to be taken and the time limit within which the issue would need to be resolved to the

Performance Standard	Performance Standard (PS) requirements in brief	Applicability to project	Actions Taken/Requirements
			satisfaction of the complainant
Labour and Working Conditions	Performance Standard 2 recognizes that the pursuit of economic growth through employment creation and income generation should be accompanied by protection of the fundamental rights of workers. The objectives of PS2 are: • To promote the fair treatment, non-discrimination, and equal opportunity of workers. • To establish, maintain, and improve the worker-management relationship. • To promote compliance with national employment and labour laws. • To protect workers,	The proposed project will involve employment of direct and contracted workers during construction and operation phases. OKPPL will engage direct workers, workers engaged through third parties (contracted workers), as well as workers engaged by OKPPL's primary suppliers (supply chain workers).	***Requirements: Working Conditions and Management of Worker Relationship*** OKPPL will provide workers with documented information that is clear and understandable, regarding their rights under national labour and employment law. The proponent shall ensure measures to • Prevent child labour, forced labour, and discrimination. • Freedom of association and collective bargaining shall be provided. • Wages, work hours and other benefits shall be as per the national labour and employment laws. OKPPL will ensure that reasonable working conditions and terms of employment for both direct and contracted workers through contractor agreements are to be provided. Construction Contractor engaged by OKPPL for various activities should ensure that terms of employment include wages and benefits, wage deductions, hours of work, breaks, rest days, overtime

Performance Standard	Performance Standard (PS) requirements in brief	Applicability to project	Actions Taken/Requirements
	including vulnerable categories of workers such as children, migrant workers, workers engaged by third parties, and workers in OKPPL's supply chain. • To promote safe and healthy working conditions, and the health of workers. • To avoid the use of forced labour.		arrangements, and overtime compensation, medical insurance, pension, and leave for illness, vacation, maternity, or holiday are to be communicated to workers clearly. Migrant workers, if employed shall also be provided same working conditions equivalent to those of non-migrant workers performing the same type of work. It will be the responsibility of all the construction contractors, engaged by OKPPL for this project, to provide accommodation, transportation, and basic services including water, sanitation, and medical care for the workers working on that project in compliance with requirements of IFC PS2. In case of hiring labour from nearby States, a labour camp will be set up during construction phase. The construction work will be carried out in adherence w.r.t. COVID mitigation strategies suggested by the The Department of Labour, Karnataka State for the migrant workers and for building and construction workers. OKPPL is further required to ensure maintaining HSE documentation for all workforce engaged at Site along with COVID-19 Precaution training records at Site.

Performance Standard	Performance Standard (PS) requirements in brief	Applicability to project	Actions Taken/Requirements
			OKPPL needs to adhere to implementation of Labour Camp Management Plan Guidelines as provided under "Worker's Accomodation Processes and Standards: A Guidance Note by IFC and EBRD2" and ensure that the worker's accommodation should be at a neat and clean, safe place and, at a minimum, should meet the basic needs of workers. In particular, the provision of accommodation should meet national legislation and international good practice in relation, but not restricted, to the following: the practice for charging for accommodation; the provision of minimum amounts of space for each worker; provision of sanitary, laundry and cooking facilities and potable water; the location of accommodation in relation to the workplace; any health, fire safety or other hazards or disturbances and local facilities; the provision of first aid and medical facilities; and heating and ventilation. Workers' freedom of movement to and from the employer-provided accommodation should not be unduly restricted.

[2]https://www.ifc.org/wps/wcm/connect/60593977-91c6-4140-84d3-737d0e203475/workers_accomodation.pdf?MOD=AJPERES&CACHEID=ROOTWORKSPACE-60593977-91c6-4140-84d3-737d0e203475-jqetNIh

Performance Standard	Performance Standard (PS) requirements in brief	Applicability to project	Actions Taken/Requirements
			Requirements: Workers' Organizations OKPPL will not restrict workers from developing alternative mechanisms to express their grievances and protect their rights regarding working conditions and terms of employment. OKPPL should not discourage workers from forming or joining a workers' organization or discriminate or retaliate against workers who attempt to form or join workers' organizations.
			Requirements: Non-Discrimination and Equal Opportunity OKPPL will not discriminate with respect to any aspects of the employment relationship, such as recruitment and hiring, compensation (including wages and benefits), working conditions and terms of employment, access to training, job assignment, and promotion, termination of employment or retirement, and disciplinary practices. OKPPL will take appropriate measures to prevent any discriminatory treatment of migrant workers. Measures to prevent any harassment, including sexual harassment or psychological mistreatment within the workplace will also be undertaken.

Performance Standard	Performance Standard (PS) requirements in brief	Applicability to project	Actions Taken/Requirements
			Requirements: Retrenchment OKPPL should ensure that all workers receive notice of dismissal and severance payments mandated by law and collective agreements in a timely manner. OKPPL should ensure that proper consultations are undertaken with the workers before the retrenchment, if any. Selection criteria for those to be laid off should be objective, fair, and transparent. The retrenchment should not be based on personal characteristics, unrelated to inherent job requirements.
			Requirements: Grievance Mechanism OKPPL will provide a grievance mechanism for workers (and their organizations, where they exist) to raise workplace concerns. In providing a grievance mechanism through which workers may raise workplace concerns, OKPPL should ensure that matters are brought to management's attention and addressed expeditiously. OKPPL needs to document all grievances and follow up on any corrective actions.

Performance Standard	Performance Standard (PS) requirements in brief	Applicability to project	Actions Taken/Requirements
			Requirements: Protecting the Work Force OKPPL will not employ children in any manner that is economically exploitative, or is likely to be hazardous or to interfere with the child's education, or to be harmful to the child's health or physical, mental, spiritual, moral, or social development. OKPPL needs to ensure that no child labour (as defined in IFC PS2), forced labour is employed by the contractor during construction and operation phase of the project. OKPPL should also exercise diligence with regard to key contractors and subcontractors so that they do not knowingly benefit from practices that lead to bonded or indentured status of workers.
			Requirements: Occupational Health and Safety (OHS) OKPPL will provide a safe and healthy work environment, taking into account inherent risks in its particular sector and specific classes of hazards in OKPPL's work areas, including physical, chemical, biological, and radiological hazards, and specific threats to women. OKPPL will extend a safe and healthy work environment

Performance Standard	Performance Standard (PS) requirements in brief	Applicability to project	Actions Taken/Requirements
			to contracted workers and to any other workers who provide project-related work and services. OKPPL should ensure that training is provided to all workers on relevant aspects of OHS associated with their daily work, including emergency arrangements and OHS briefing for visitors and other third parties accessing the premises.
			Requirements: Workers Engaged by Third Parties OKPPL will establish policies and procedures for managing and monitoring the performance of such third-party employers in relation to the requirements of this Performance Standard. OKPPL shall implement procedures to manage and monitor performance of third parties. These procedures should be integrated in the day-to-day operations of the company and requirements should be clearly communicated to third parties, and if possible, to workers engaged by these third parties.
Resource Efficiency and Pollution Prevention	Performance Standard 3 recognizes that increased economic activity and urbanization often generate increased levels of pollution	The proposed project is a clean energy project and will not have major pollution sources associated with it. The construction works for the development of project will	***Requirements: Resource Efficiency*** OKPPL will implement technically and financially feasible and cost-effective measures for improving efficiency in its consumption of energy, water, as well as other resources and material inputs, with a focus on

Performance Standard	Performance Standard (PS) requirements in brief	Applicability to project	Actions Taken/Requirements
	to air, water, and land, and consume finite resources in a manner that may threaten people and the environment at the local, regional, and global levels. The objectives of PS 3 are: • To avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities. • To promote more sustainable use of resources, including energy and water. • To reduce project related GHG emissions.	entail generation of wastes like wastewater, waste oil and construction debris. The operation phase will result in generation of minor quantities of waste such as transformer oil.	areas that are considered core business activities. ***Requirements: Greenhouse Gases*** OKPPL will consider alternatives and implement technically and financially feasible and cost-effective options to reduce project-related GHG emissions during the design and operation of the project. Being a cleaner source of energy, greenhouse gases emissions will be comparatively less. Wind Turbine life cycle assessments show that electricity generated from Wind Turbine has substantially lower greenhouse gas emissions compared to fossil-fuel based electricity generation technologies. ***Requirements: Water Consumption*** When the project is a potentially significant consumer of water, in addition to applying the resource efficiency requirements of this Performance Standard, OKPPL shall adopt measures that avoid or reduce water usage so that the project's water consumption does not have significant adverse impacts on others. The water requirement during construction phase shall

Performance Standard	Performance Standard (PS) requirements in brief	Applicability to project	Actions Taken/Requirements
			be met by private water tanker sourced from nearby water sources. The records for water consumption should be maintained by OKPPL at Site on daily basis. Further, there is a borewell in PSS Phase I used for meeting domestic water requirement. NOC needs to be obtained from Karnataka Ground Water Authority and water meter needs to be installed for monitoring water consumption. During the construction stage, the construction water requirement is estimated at 25 – 30 KLD per WTG. In addition, for the labourers engaged during construction, for whom the domestic water requirement will be 9 - 10 KLD. The cumulative water requirement during construction period is estimated at 40 KLD and the domestic wastewater generation is estimated at 8 -9 KLD. At the peak of construction, approximately 200 people would be anticipated in the site at any given point mostly local manpower. Assuming an average of 4L of water per person, a total of 800 L of drinking water would be required per person per day at the maximum. Drinking water would also be sourced from nearby villages.

Performance Standard	Performance Standard (PS) requirements in brief	Applicability to project	Actions Taken/Requirements
			Approximately 2-3 m3/day of domestic water will be required during the O&M phase. The water will be sourced from nearby villages through tankers. Also, project should adopt in-situ rainwater harvesting, storage, treatment and use for module cleaning, if feasible.
			Requirements: Pollution Prevention OKPPL will avoid the release of pollutants or, when avoidance is not feasible, minimize and/or control the intensity and mass flow of their release. OKPPL should monitor emissions to ensure that the requirements of PS 3 are being met. The frequency with which pollutant emissions are monitored should be appropriate to the nature, scale and variability of potential impacts.
			Requirements: Waste and Hazardous Materials Management OKPPL will avoid the generation of hazardous and non-hazardous waste materials. Where waste generation cannot be avoided, OKPPL will reduce the generation of waste, and recover and reuse waste in a manner that is

Performance Standard	Performance Standard (PS) requirements in brief	Applicability to project	Actions Taken/Requirements
			safe for human health and the environment. OKPPL should investigate options for waste avoidance, waste recovery and/or waste disposal during the design and operational stage of the project. Material Safety Data Sheet (MSDS) for all the hazard chemicals to be used during construction and operation phase should be readily available.
Community Health, Safety, and Security	PS 4 recognizes that project activities, equipment, and infrastructure can increase community exposure to risks and impacts. Its main stress is to ensure that the safeguarding of personnel and property is carried out in accordance with relevant human rights principles and in a manner that avoids or minimizes risks to the Affected Communities.	The proposed project will involve transportation of construction material and movement of construction machinery which may pose safety risks to the affected communities.	***Requirements: Community Health and Safety and Community Exposure to Disease*** Community health and safety considerations should be addressed through a process of environmental and social risks and impacts identification resulting in an Action Plan for disclosure to project Affected Communities. OKPPL is required to address community health and safety aspcts associated with the construction and operation phase of the project. As the project will not use existing village road and a separate approach road from village road or PWD roads towards individual WTGs for transportation of equipments and machinery will be carried out therefore, impacts due to transportation will be low.

Performance Standard	Performance Standard (PS) requirements in brief	Applicability to project	Actions Taken/Requirements
			Requirements: Infrastructure and Equipment Design and Safety For all projects with risks to workers and the public, OKPPL should also build its internal capacity to monitor engineering and fire safety of its operations, including periodic monitoring and internal audits. OKPPL is required to maintain adequate number of fire extinguishers to cater any emergency.
			Requirements: Hazardous Materials Management and Safety OKPPL will avoid or minimize the potential for community exposure to hazardous materials and substances that may be released by the project. The project will not use any hazardous chemicals. Limited amount of hazardous substances will be required such as diesel in Diesel Generators (DG sets), transformer oil etc. OKPPL will either engage a Contractor for handling Used Oil or will ensure proper handling and storage procedures are followed to minimize any contamination due to accidental spills of such substances.

Performance Standard	Performance Standard (PS) requirements in brief	Applicability to project	Actions Taken/Requirements
			Requirements: Ecosystem Services The project's direct impacts on priority ecosystem services may result in adverse health and safety risks and impacts to Affected Communities. Wind Turbine is a cleaner form of production of energy and there will be no significant change to the physical environment, such as natural vegetation cover, existing topography, and hydrologic regimes due to the project.
			Requirements: Emergency Preparedness and Response OKPPL will also assist and collaborate with the Affected Communities, local government agencies, and other relevant parties, in their preparations to respond effectively to emergency situations, especially when their participation and collaboration are necessary to respond to such emergency situations. OKPPL has designed emergency response plans based on the risks to the health and safety of the Affected Community and other stakeholders. Emergency plans should be developed in close collaboration and consultation with potentially Affected Communities and other stakeholders and should include detailed

Performance Standard	Performance Standard (PS) requirements in brief	Applicability to project	Actions Taken/Requirements
			preparation to safeguard the health and safety of workers and the communities in the event of an emergency.
			Requirements: Security Personnel When OKPPL retains direct or contracted workers to provide security to safeguard its personnel and property, it will assess risks posed by its security arrangements to those within and outside the project site. OKPPL will make reasonable inquiries to ensure that those providing security are not implicated in past abuses; will train them adequately in the use of force (and where applicable, firearms), and appropriate conduct toward workers and Affected Communities.
Land Acquisition and Involuntary Resettlement	PS 5 recognizes that project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons that use this land. Its main aim is to anticipate and avoid, or where avoidance is not possible, minimize adverse social and economic impacts	PS 5 is not applicable for the project presently as land acquisition is still in progress and no issues related to Resettlement and Rehabilitation and issues related to compensation paid to land owners have been observed in approx. 280 acres of land out of 548 acres of land acquired for the project.	***Requirements: Compensation and Benefits for Displaced Persons*** When displacement cannot be avoided, OKPPL will offer displaced communities and people's compensation for loss of assets at full replacement cost and other assistance. There is no revenue land procured for the proposed project. During land acquisition for the proposed project compensation for land and other assets has been

Performance Standard	Performance Standard (PS) requirements in brief	Applicability to project	Actions Taken/Requirements
	from land acquisition or restrictions on land use by providing compensation for loss of assets at replacement cost and ensuring that resettlement activities are implemented with appropriate disclosure of Information, consultation, and the informed participation of those affected.	There is no revenue land parcel acquired for the proposed project. Only private land parcels have been acquired for WTG erection. The proposed site can be classified as rainfed agricultural land where farming done during monsson season only due to scarity of water in the project area. However, due to dependency of agriculture on rains, the agricultural acivities is very limited. During interactions with project affected people, it was evident that no physical or economic displacement has been taken place for the land parcels wherein project land has been acquired.	calculated at the market value plus the transaction costs related to restoring the assets. A total of 548 acres of land in Jagalur, Kudligi & Chitradurga Taulka will be acquired for setting up of the project. The land acquired for the project comprises of rainfed agricultural land with limited agriculture activity due to scarity of water. Approx. 280 acres of private land on Willing Buyer-Willing Seller transactions has been acquired for the project till date. However, since land acquisition is in progress for Wind Power project and remaining 268 acres of land are yet to be acquired for the project therefore OKPPL should ensure adherence w.r.t. Willing Buyer-Willing Sellor approach adopted in the project and avoidance of Physical and Economic displacement issues, if any. The Project Affected Persons (PAP) and Project Affected Families (PAF) if any in the land to be acquired for the project needs to be resettled or rehabilitated and in case of physical structures if any in the acquired land, then PS5 requirements must be met through adequate

Performance Standard	Performance Standard (PS) requirements in brief	Applicability to project	Actions Taken/Requirements
			compensation among others. The acquisition of private land is being carried out on "Willing Buyer-Willing Seller basis" The revenue rates for rainfed agricultural land parcels which is being acquired for wind power project for the dry land is Rs. 1,00,000 to 2,00,000 per acre, for wet land is Rs. 1,25,000 to 3,00,000 per acre. OKPPL is acquiring the land for the project through six land land aggregators. It was observed that the rates provided for the land taken is more than twice the prevailing market rates in the project area. The land for the project is being purchased on willing buyer-willing seller (WBWS) mode following the guidance based on IFC PSs: • Land markets or other opportunities for the productive investment of the sales income exist; • The transaction took place with the seller's informed consent; and • The seller was provided with fair compensation which was higher than prevailing market values

Performance Standard	Performance Standard (PS) requirements in brief	Applicability to project	Actions Taken/Requirements
			3 nos. of land parcels have been acquired from Schedule tribes community (3 PAP's belonging to same family) from Kanamadagu (Alur) Village till date. However, no assigned land was acquired till date for the project. During stakeholder consultations, it was inferred that land sellers including 3 nos. PAP from ST community have alternative land parcels apart from land provided for the project and were observed to be contented. The project site is rainfed agricultural land with red soil. No physical displacement has been taken place in the transaction. Further, no issues related to landlessness were observed and PAPs have additional land parcels which is presently used for cultivation and henceforth have sold rainfed agricultural land parcels for repaying loans and buying cultivated land parcels in nearby areas. OKPPL has also followed the norms: (i) seller's informed consent; and (ii) the seller was provided with fair compensation based on prevailing market values. In addition, following criteria was ascertained during

Performance Standard	Performance Standard (PS) requirements in brief	Applicability to project	Actions Taken/Requirements
			selection and purchase of land for project: • No land sellers had structures on the land • No revenue land, Gauchar land (common land for grazing), reserved forest land has been acquired. • No land owner took land for land or cash or became landless. • Land markets or other opportunities for the productive investment of the sales income exist and on basis of discussions with land sellers; it was inferred that the land sellers will utilize amount received from selling off rainfed agricultural land parcels given for the Project to OKPPL for purchase of agricultural land in the nearby áreas and for adoption of mechanized agricultural practices • The transaction took place with the seller's informed consent; and • The seller was provided with fair compensation based on prevailing market values All acquired land is private land. Since the acquired land does not belong to any government agency or villages sarpanch, VAO/patwari/revenue department, land registry office, therefore no farm laborers, cattle grazers

Performance Standard	Performance Standard (PS) requirements in brief	Applicability to project	Actions Taken/Requirements
			etc who might be dependent on such land will be affected due to project related activities. The land sellers have agricultural land other than the land being sold to OKPPL which shall remain available for livelihood after the execution of Sale deed for respective land parcels. OKPPL needs ensure that no issues related to landlessness should come up during acquisition of the remaining land parcels for the project
			Requirements: Community Engagement OKPPL will engage with Affected Communities, including host communities, through the process of Stakeholder Engagement. OKPPL will engage community for disclosure of relevant information and participation of Affected Communities during the planning and implementation stage of the project. A Stakeholder Engagement Plan has been developed as a part of environment and social management plan.
			Requirements: Grievance Mechanism OKPPL will establish a grievance mechanism consistent with Performance Standard 1 as early as possible in the project development phase. OKPPL will ensure to resolve grievances at the

Performance Standard	Performance Standard (PS) requirements in brief	Applicability to project	Actions Taken/Requirements
			community level. It is also to be ensured that a designated person will be trained and available to receive grievances and coordinate efforts to redress those grievances through the appropriate channels, taking into consideration any customary and traditional methods of dispute resolution within the Affected Communities.
			Requirements: Economic Displacement Economically displaced persons who face loss of assets or access to assets will be compensated for such loss at full replacement cost. There are no land owners who have become land less due to land acquisition of the proposed project till date. The land sellers also have rainfed agricultural land other than the land being sold to OKPPL Wind Power Project which shall remain available for livelihood after the execution of sale deed for respective land parcels.
Biodiversity Conservation and Sustainable Management of Living Natural Resources	PS 6 recognizes that protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources are	The project core zone and associated facilities does not encounter with any kind of forest types like reserve forest or un-classed Forest.	***Requirements: Protection and Conservation of Biodiversity*** For the protection and conservation of biodiversity, the mitigation hierarchy includes biodiversity offsets, which may be considered only after appropriate avoidance, minimization, and restoration measures.

Performance Standard	Performance Standard (PS) requirements in brief	Applicability to project	Actions Taken/Requirements
	fundamental to sustainable development. This standard is aimed to promote the sustainable management of living natural resources through the adoption of practices that integrate conservation needs and development priorities.	However, the proposed WTG locations are devoid of significant vegetation. The project activities are not likely to have any major impact on the ecology. However, the proposed project will involve additional traffic movement which may impact the higher fauna. Rangayyanadurga Four Horned Antelope Wildlife Sanctuary boundary is located at 1.4 km of project area (WTG - SGJA-73; WTG-SGJA-78) and Eco-sensitive zone of Rangayyanadurga Four Horned Antelope Wildlife Sanctuary falls partially within the project area however the construction activities are yet to be initiated at WTG SGJA-78 and land for WTG-SGJA-73 is yet to be finalized. The 2 WTG locations (SGJA-78 and SGJA-73) fall within the ESZ area	Baseline studies for ecological aspects have been described in Chapter-4 (Section 4.9) of the report. The study has been gathered through site survey, literature review, desktop analysis and Site surveys. This region supports rainfed agricultural land however, not many large trees with sizable canopies are present. The project is proposed to be developed in a “Modified Habitat” comprising of rainfed agricultural land. The Buffer Zone comprises of Modified habitats as the project site is characterised by scanty agricultural activities, rural setup and Wind as well as PV projects in the adjoining areas. No species with higher conservation status falling under Critically Endangered categories have been reported/recorded in the Study area. This is most likely due to suitable terrestrial habitats within the study area and its adjoining surroundings. There are no migratory bird pathways, bird corridor and critically endangered bird species in the Core Zone of

Performance Standard	Performance Standard (PS) requirements in brief	Applicability to project	Actions Taken/Requirements
		of Rangayyanadurga Four Horned Antelope Wildlife Sanctuary. However, since the two WTGs locations are falling within ESZ of Rangayyanadurga Four Horned Antelope Wildlife Sanctuary however impact on ecological balance of the area is expected to minor. No Important Bird Area (IBA) is located within 15 km radius of the project site. The project study area is very likely to be situated in the flight-path of the various winter, summer and passage visitor-birds migrating either to or through the region. However, peacock corridor is at a distance of 1.63 km in NE direction from SGJA 06; 1.57 km in NNE direction from SG JA-07; 1.28 km in SW direction from SG JA-70 and at	the Study Area and in AoI. Rangayyanadurga Four Horned Antelope Wildlife Sanctuary falls partially within the project area. 2 WTG locations (SGJA-78 and SGJA-73) fall within the ESZ area of Rangayyanadurga Four Horned Antelope Wildlife Sanctuary. There are 12 reserve forst situated within study of 15 km. However, none of the WTG location or associated facilities is falling in any reserve forest. There is no critical habitat with high biodiversity value, including (i) habitat of significant importance to Critically Endangered and/or Endangered species; (ii) habitat of significant importance to endemic and/or restricted-range species; (iii) habitat supporting globally significant concentrations of migratory species and/or congregatory species; (iv) highly threatened and/or unique ecosystems; and/or (v) areas associated with key evolutionary processes in the project premises, AoI and buffer zone of 15 km radius. Further, it is being inferred on the basis of ecological survey investigations and discussions with Forest and Wildlife Department that due to presence of two WTGs within the ESZ of Rangayyanadurga Four Horned

Performance Standard	Performance Standard (PS) requirements in brief	Applicability to project	Actions Taken/Requirements
		a distance of 4.68 km in SW direction from PSS Phase I. OKPPL needs to adhere to measures as devised in ESMP to avoid adverse impacts due to loss of foraging habitats and nesting grounds and to avoid collision and mortality of avi fauna during Operation Phase.	Antelope Wildlife Sanctuary; approvals/clearances are sought from Forest and Wildlife Department for laying WTG's for the project. OKPPL should take all precautionary measures during laying of transmission line avoid any impact during project construction activities, planning and erection of transmission line from pooling substation to grid substation. Further, OKPPL should adopt mitigation measures to achieve no net loss of biodiversity wherever feasible. Appropriate actions include: • Avoiding impacts on biodiversity through the identification and protection of set asides; • Restoring habitats during operations and/or after operations; and • Avoiding intentionally introduce any new alien species

Performance Standard	Performance Standard (PS) requirements in brief	Applicability to project	Actions Taken/Requirements
			Requirements: Management of Ecosystem Services With respect to impacts on priority ecosystem services of relevance to Affected Communities and where OKPPL has direct management control or significant influence over such ecosystem services, adverse impacts should be avoided. Being a cleaner source of energy, no significant degradation and loss of ecosystem services are associated with the project that can pose operational, financial and reputational risks to project sustainability.
			Requirements: Sustainable Management of Living Natural Resources Clients who are engaged in industries (forestry, agriculture, animal husbandry, aquaculture, and fisheries) will manage living natural resources in a sustainable manner, through the application of industry-specific good management practices and available technologies.
Indigenous Peoples	Performance Standard 7 recognizes that Indigenous Peoples, as social groups with identities that are distinct from mainstream groups in	PS 7 is not applicable for the project. The project area or its surroundings inhabits people from Scheduled	The land has been acquired from 3 nos. of project affected persons belonging to same family from ST community for the proposed project. However, it was envisaged that project affected persons from ST community are also having separate land parcels apart

Performance Standard	Performance Standard (PS) requirements in brief	Applicability to project	Actions Taken/Requirements
	national societies, are often among the most marginalized and vulnerable segments of the population. In many cases, their economic, social, and legal status limits their capacity to defend their rights to, and interests in, lands and natural and cultural resources, and may restrict their ability to participate in and benefit from development.	Tribe community as well however the tribal community were observed to be migrants from adjoining States who have settled in these areas since a long time. Further, Karnataka state wherein project site is located does not fall under Schedule V areas. The tribals in these areas are involved in agricultural activities and other jobs for sustaining livelihood. It was noted that none of the tribals were: • Nomadic or who seasonally migrate over relatively short distances, and whose attachment to ancestral territories may be periodic or seasonal in nature; • Observed to retain ties to those lands through traditional ownership and/or customary	from the land provided for the project. Further, no material degradation or adverse impact is expected on land resources on which indigenous peoples are dependent.

Performance Standard	Performance Standard (PS) requirements in brief	Applicability to project	Actions Taken/Requirements
		usage, including seasonal or cyclical use; • Having lost collective attachment to lands and territories in the project area of influence, occurring within the concerned group members' lifetime, as a result of forced severance, conflict, involuntary resettlement programs by governments, dispossession from their lands, natural calamities or incorporation into an urban area but who retain ties to lands affected by a project; • Residing in mixed settlements, such that the Affected Indigenous Peoples only form one part of the more broadly defined community	
Cultural Heritage	PS 8 recognizes the importance of cultural heritage for current and future generations. Consistent with	There are no structures of archaeological significance or culturally important Sites in or around the project site. PS 8 is	Not Applicable

Performance Standard	Performance Standard (PS) requirements in brief	Applicability to project	Actions Taken/Requirements
	the Convention concerning the Protection of the World Cultural and Natural Heritage, this Performance Standard aims to ensure that clients protect cultural heritage in the course of their project activities. In addition, the requirements of this Performance Standard on a project's use of cultural heritage are based in part on standards set by the Convention on Biological Diversity. For the purposes of this Performance Standard, cultural heritage refers to tangible forms of cultural heritage, such as tangible moveable or immovable objects, property, sites, structures, or groups of structures, having archaeological (prehistoric),	therefore not applicable for the project.	

Performance Standard	Performance Standard (PS) requirements in brief	Applicability to project	Actions Taken/Requirements
	paleontological, historical, cultural, artistic, and religious values.		

2.6 IFC'S CATEGORIZATION OF PROJECTS

As part of its review of a project's expected social and environmental impacts, IFC uses a system of social and environmental categorization. This categorization is used to reflect the size of impacts understood as a result of OKPPL's social and environmental assessment and to specify IFC's institutional requirements. The categories used by the IFC are:

1. ***Category A Projects***: Projects with potential significant adverse social or environmental risks or/and impacts that are diverse, irreversible or unprecedented;
2. ***Category B Projects***: Projects with potential limited adverse social or environmental risks or/and impacts that are few in number, generally site-specific, largely reversible and readily addressed through mitigation measures;
3. ***Category C Projects***: Projects with minimal or no adverse social or environmental risks or/and impacts, including certain financial intermediary (FI) projects with minimal or no adverse risks;
4. ***Category FI Projects***: All FI projects excluding those that are Category C projects.

IFC therefore categorizes the project primarily according to the significance and nature of its impacts. IFC defines the project's area of influence as the primary project site(s) and related facilities that OKPPL (including its contractors) develops or controls; associated facilities that are not funded as part of the project (funding may be provided separately by a client or a third party including the government), and whose viability and existence depend exclusively on the project and whose goods or services are essential for the successful operation of the project; areas potentially impacted by cumulative impacts from further planned development of the project; and areas potentially affected by impacts from unplanned but predictable developments caused by the project that may occur later or at a different location. The area of influence does not include potential impacts that would occur without the project or independently of the project.

2.7 APPLICABLE ENVIRONMENTAL STANDARDS

The applicable environmental standards for the proposed project have been discussed in the subsequent sections. The ambient air quality standards will be applicable only during the construction phase of the project and the wastewater discharges from the project during both construction and operation phases shall be as per the general discharge standards as sector specific standards are not available for wind power projects. Noise standards notified by MoEFCC for different land uses will be followed.

2.7.1 AMBIENT AIR QUALITY

As per EHS guidelines of IFC, "the ambient air quality standards are ambient air quality levels established and published through national legislative and regulatory process and ambient quality guidelines refers to ambient quality level primarily developed through clinical, toxicological and epidemiological evidences (such as those published by the World Health Organization)".

In India, the Central Pollution Control Board (CPCB) has specified National Ambient Air Quality Standards (NAAQS) for residential, commercial, industrial and sensitive zones for the country as a whole. Revised National Ambient Air Quality Standards (MoEF notification G.S.R 826(E), dated 16th November, 2009) have been presented below in **Table 2-6**.

Table 2-6: Ambient Air Quality Standards

S. No	Pollutant	Time Weighted Average	Concentration in ambient air for Industrial Area Residential, Rural & other Areas
1	Sulphur Dioxide(SO_2)	Annual Avg*	50.0 µg/m^3
		24 hours**	80.0 µg/m^3
2	Oxides of Nitrogen as NO_2	Annual Avg*	40.0 µg/m^3
		24 hours**	80.0 µg/m^3
3	Particulate matter (size less than 10µm)	Annual Avg*	60.0 µg/m^3
		24 hours**	100.0 µg/m^3
4	Particulate matter (size less than 2.5 µm)	Annual Avg*	40.0 µg/m^3
		24 hours**	60.0 µg/m^3
5	Lead (Pb)	Annual Avg*	0.5.0 µg/m^3
		24 hours**	1.0 µg/m^3
6	Carbon Monoxide (CO)	8 hours**	2.0 µg/m^3
		1 hour	4.0 µg/m^3
7	Ozone	8 hours**	100.0 µg/m^3
		1 hour	180.0 µg/m^3
		24 hours**	60.0 µg/m^3
8	Ammonia (NH3)	Annual Avg*	100.0 µg/m^3
		24 hours**	40.0 µg/m^3
9	Benzene	Annual Avg*	5.0 µg/m^3
10	Benzo(a) pyrene	Annual Avg*	1.0 ng/m^3
11	Arsenic	Annual Avg*	6.0 ng/m^3
12	Nickel		20.0 ng/m^3

Note:

**Annual Arithmetic mean of minimum 104 measurements in a year taken twice a Week 24 hourly at uniform interval*

*** 24 hourly / 8 hourly or 1 hourly monitored values as applicable shall be complied with 98 % of the time in a year. However, 2% of the time, they may exceed the limits but not on two consecutive days of monitoring.*

2.7.2 WATER QUALITY STANDARDS

The designated best use classification as prescribed by CPCB for surface water is given in **Table 2-7** below.

Table 2-7: Primary Water Quality Criteria for Designated Best Use Classes

Designated Best Use	Class of Water	Criteria
Drinking water source without conventional treatment but after disinfections	A	1. Total coliform organisms (MPN/100 ml) shall be 50 or less 2. pH between 6.5 to 8.5 3. Dissolved Oxygen (DO) 6 mg/l or more, and 4. Biochemical Oxygen Demand (BOD) 2 mg/l or less
Outdoor bathing (Organised)	B	1. Total coliform organisms (MPN/100 ml) shall be 500 or less 2. pH between 6.8 to 8.5 3. Dissolved Oxygen 5 mg/l or more, and 4. Biochemical Oxygen Demand 3 mg/l or less
Drinking water with conventional treatment followed by disinfections	C	1. Total coliform organisms (MPN/100 ml) shall be 5000 or less 2. pH between 6 and 9 3. Dissolved Oxygen 4 mg/l or more, and 4. Biochemical Oxygen Demand 3 mg/l or less
Propagation of wild life and fisheries	D	1. pH between 6.5 to 8.5 2. Dissolved Oxygen 4 mg/l or more, and 3. Free ammonia (as N) 1.2 mg/l or less
Irrigation, industrial cooling, controlled waste disposal	E	1. pH between 6.0 and 8.5 2. Electrical conductivity less than 2250 micro mhos/cm, 3. Sodium Absorption Ratio (SAR) less than 26, and Boron less than 2 mg/l.
	Below E	Not meeting A, B, C, D & E Criteria

Note: MPN= Most Probable Number
Source: Central Pollution Control Board

The drinking water quality standards as per IS 10500, 2012 by Bureau of Indian Standards (BIS) is presented in **Table 2-8** below.

Table 2-8: Drinking Water Standards as per IS 10500, 2012

S. No	Parameters	Measurement Unit	IS 10500* specification for drinking water Desirable limit (Permissible limit)
1	pH Value	Unit	6.5-8.5 (No relaxation)
2	Turbidity	NTU	1 (5)

3	Colour	Hazen units	5 (15)
4	Total Dissolved Solids	mg/L	500 (2000)
5	Total Alkalinity (as $CaCO_3$)	mg/L	200 (600)
6	Nitrate	mg/L	45 (No relaxation)
7	Chlorides (as Cl)	mg/L	250 (1000)
8	Sulphate	mg/L	200(400)
9	Calcium (as Ca)	mg/L	75 (200)
10	Magnesium (as Mg)	mg/L	30 (100)
11	Fluorides (as F)	mg/L	1.0 (1.5)
12	Total Hardness (as $CaCO_3$)	mg/L	200 (600)
13	Arsenic (as As)	mg/L	0.01 (0.05)
14	Iron (as Fe)	mg/L	0.3 (No relaxation)
15	Copper (as Cu)	mg/L	0.05 (1.5)
16	Mercury (as Hg)	mg/L	0.001 (No relaxation)
17	Zinc (as Zn)	mg/L	5 (15)
18	Total Chromium (as Cr)	mg/L	0.05 (No relaxation)
19	Barium (as Ba)	mg/L	0.7 (No relaxation)
20	Cadmium (as Cd)	mg/L	0.003 (No relaxation)
21	Conductivity	mS/cm	--
22	Total Suspended Solids (TSS)	mg/L	---
23	Salinity	mg/L	---
24	Oil & Grease	mg/L	---
25	Dissolved Oxygen (DO)	mg/L	---
26	COD	mg/L	---
27	BOD	mg/L	---
28	Phosphate	mg/L	---
29	Lead	mg/L	0.01 (No relaxation)
30	Total Coliform	MPN/100mg	10 (No relaxation)
31	Faecal Coliform	---	---

**The figures in the brackets indicated permissible limit in absence of alternate source*

2.7.3 AMBIENT NOISE STANDARDS

As per EHS guidelines of IFC, for residential, institutional and educational area, the one hourly equivalent noise level (Leq hourly) for day time is 55 dB (A) while the Leq hourly for night time is prescribed as 45 dB (A). Noise standards notified by the MoEFCC vide gazette notification dated 14 February 2000 based on the A- weighted equivalent noise level (Leq) are as presented in **Table 2-9**.

Table 2-9: Ambient Noise Standards

Area Code	Category of Area	Limits in dB(A) Leq	
		Day time*	Night Time
A	Industrial Area	75	70
B	Commercial Area	65	55
C	Residential Area	55	45
D	Silence Zone**	50	40

*Note: * Day time is from 6 am to 10 pm, Night time is 10 pm to 6.00 am;*
*** Silence zone is defined as area up to 100 meters around premises of hospitals, educational institutions and courts. Use of vehicle horns, loud speakers and bursting of crackers are banned in these zones.*

Noise Standards for Occupational Exposure

Noise standards in the work environment are specified by Occupational Safety and Health Administration (OSHA-USA) which in turn are being enforced by Government of India through model rules framed under the Factories Act. The standards for Occupational Noise Exposure are given in **Table 2-10.**

Table 2-10: Standards for Occupational Noise Exposure

Total Time of Exposure per Day in Hours (Continuous or Short term Exposure)	Sound Pressure Level in dB(A)
8	90
6	92
4	95
3	97
2	100
3/2	102
1	105
¾	107
½	110
¼	115
Never	>115

Note:

a. *No exposure in excess of 115 dB (A) is to be permitted.*
b. *For any period of exposure falling in between any figure and the next higher or lower figure as indicated in column (1), the permissible level is to be determined by extrapolation on a proportionate scale.*

2.8 APPLICABLE INTERNATIONAL CONVENTIONS

Environmental problems which migrate beyond the jurisdiction (Trans-boundary) require power to control such issues through international co-operation by either becoming a Contracting Party (CP) i.e. ratifying treaties or as a Signatory by officially signing the treaties and agreeing to carry out provisions of various treaties on environment and social safeguards. The relevant international conventions are as provided in **Table 2-11**.

Table 2-11: Relevant International Conventions applicable to the project

S. No.	International Conventions	Salient Features
1.	Montreal Protocol on Substances That Deplete the Ozone Layer (and subsequent Amendments)	India signed the Montreal Protocol along with its London Amendment on September 17, 1992 and also ratified the Copenhagen, Montreal and Beijing Amendments on March 3, 2003.
2.	UN (Rio) Convention on Biological Diversity	India is a party since February 18, 1994 by Ratification; Protocol - Party since September 11, 2003.
3.	Conventions on the Conservation of Migratory species of wild animals and migratory species	India is a contracting party to the convention on conservation of migratory species of wild animals and migratory species.
4.	Kyoto Protocol	The Kyoto protocol was signed by India in August 2002 and ratified in February 2005. The convention pertains to the United Nations framework on Climate Change. The 3rd Conference of the Parties to the Framework Convention on Climate Change (FCCC) in Kyoto in December 1997 introduced the Clean Development Mechanism (CDM) as a new concept for voluntary greenhouse-gas emission reduction agreements between industrialized and developing countries on the project level. The 1st period of the protocol implementation terminated in 2012. The 2nd period (2012-2017) is currently under operation. In the Doha Climate Change Conference in November 2012, nitrogen trifluoride (NF_3) was added to the list of greenhouse gases (GHGs) as identified under the protocol.
5.	The Rotterdam Convention on the Prior Informed Consent (PIC) Procedure	The Rotterdam Convention on the Prior Informed Consent (PIC) Procedure for Certain Hazardous Chemicals & Pesticides in international Trade was adopted by India at the Conference of Plenipotentiaries at Rotterdam in 1998

6.	International Labour Organization conventions	India has also ratified many of the International Labour Organization conventions that are relevant to the Project including: • C1 Hours of Work (Industry) Convention, 1919 (14:07:1921, ratified); • C5 Minimum Age (Industry) Convention, 1919 (09:09:1955, ratified): • C11 Right of Association (Agriculture) Convention, 1921 (11:05:1923, ratified): • C14 Weekly Rest (Industry) Convention, 1921 (11:05:1923, ratified); • C29 Forced Labour Convention, 1930 (30:11:1954, ratified) & C105 Abolition of Forced Labour Convention, 1957 (18:05:2000, ratified); • C100 Equal Remuneration Convention, 1951 (25:09:1958, ratified); • C107 Indigenous and Tribal Populations Convention, 1957; • C111 discrimination (Employment and Occupation) Convention, 1958 (03:06:1960, ratified).

3 PROJECT DESCRIPTION

This section of the report provides a description of the site settings and project components along with other associated facilities. This section also elaborates on the various phases of the project with its associated project infrastructure and activities during the project lifecycle along with its implementation mechanism and schedule.

3.1 PROJECT LOCATION

The proposed wind farm is is spread across 38 nos. villages i.e. Alur, Lokikere, Hullikere, Kenchamalanhalli, Yerrahali, Bangarakkan gudda, Huchavanhalli, Anabur, Mugichukkanhalli, Chikamalanhalli, Hirekumbalakunte, Harlakatte, Hullehal, Nellikatte, Yellagodu, Issamudra, Chennapura, Matadhavvannahalli, Sagalgatte, Guttidurga, Taitoni, Madamuttenhalli, Ajjanppnahalli, Rastamachekere, Kalagere, Gollarahalli, Kotadagudda, Nagathihalli, Adavigollarahalli, Medaginakere, Karinamanahalli, Dibbadahatty, Byranaikanahalli, Rangavvanahalli, Kakabalu villages in Jagalur, Kudligi & Chitradurga Talukas falling in Davanagere, Bellary & Chitradurga Districts in the State of Karnataka, India.

Around 548 acres of flat rainfed agricultural land and few patches of barren dry land with minor undulation has been procured for Wind power project. The 300 MW wind power plant will have 143 WTGs of 2.1 MW each SG 2.1-114 model). Currently all 143 proposed WTG locations have been finalized out of which land for 80 locations have already been acquired. The nearest commercial city, Davanagere is 60 Km away from the Project site location and the nearest major airport to the site is at Bengaluru approximately 200 km away from the site.

The proposed project is partly operational and divided into two phases (Phase-I and II). Phase-I comprises of 72 WTG's falling in Davangere and Bellary districts which are partly operational. Out of these; 60 land locations are final and 30 WTG’s are already operational which were procured from Siemens Gamesa. The land for 12 WTG’s is yet to be finalized. The Phase-II comprises of 71 WTG’s falling in Davangere and Chitradurga districts out of which Agreement To Sell (ATS) has been signed for 20 WTG’s and land is yet to be finalized for 51 WTG’s.

The site (Phase I) is accessible from the PWD and village road which connects to Solapur-Mangalore National Highway (NH-50) at 280 m from WTG SGJA 33. The proposed project site (Phase II) is connected to Jagalur Taluka via State Highway (SH-65) which further connects to SH-50 located at 9 km in the South-East direction.

The site is approachable by black top PWD road that on north and south side for both Phase I & Phase II. This road in turn leads to the individual WTGs with many kuccha village roads. OKPPL will need to develop access road to individual WTGs from the available village road. In case village road is used for the transportation of construction material it should be done with proper traffic management plan and should be continually repaired in case the road is damaged.

The site boundaries for the wind farm site are given below in **Table 3-1** and the location map and vicinity map of the project site is given in **Figure 3-1**. The land boundary of selected land under procurement is given in **Figure 3-2** which was used as a reference point for the site visit and related observations.

Table 3-1: Boundaries of 300 MW Wind Power Project (Phase I & II)

Boundary	WTG Phase I	Geographical Coordinates	WTG Phase II	Geographical Coordinates
Northern Boundary	SGJA - 03	14°38'15.36"N 76°29'18.73"E	SGJA - 73	14°32'5.38"N 76°16'33.01"E
Southern Boundary	SGJA - 31	14°32'36.33"N 76°27'19.63"E	SGJA - 99	14°21'23.84"N 76°14'2.78"E
Eastern Boundary	SGJA - 01	14°35'55.50"N 76°29'50.47"E	SGJA - 77	14°30'51.58"N 76°17'49.15"E
Western Boundary	SGJA - 67	14°35'32.86"N 76°23'46.17"E	SGJA - 88	14°25'24.81"N 76°13'3.06"E

The location map of the project site and vicinity map are given in **Figure 3-1** and **3-2** respectively.

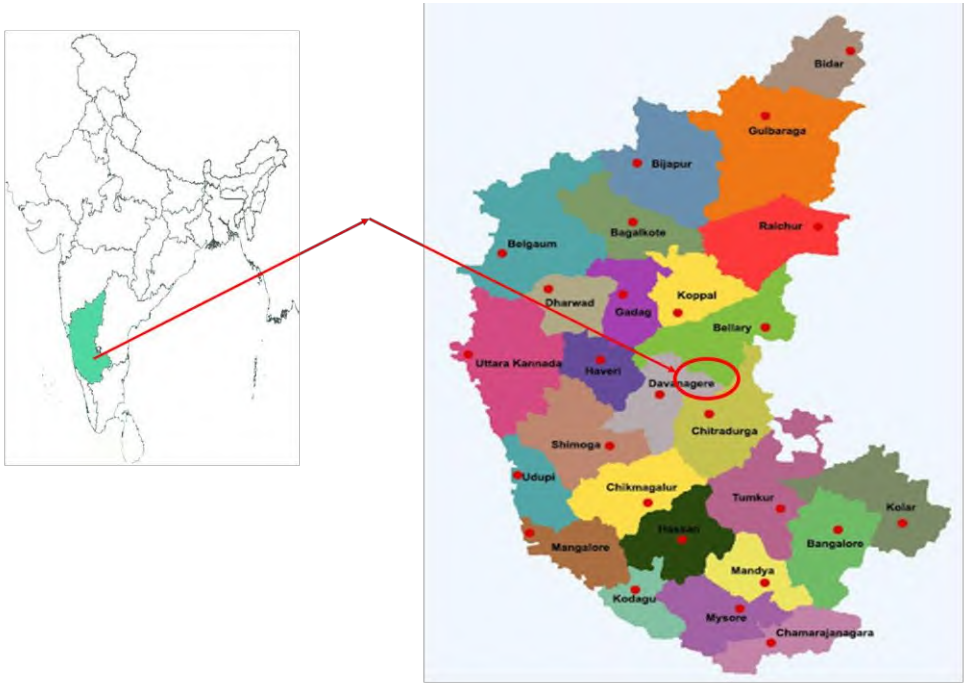
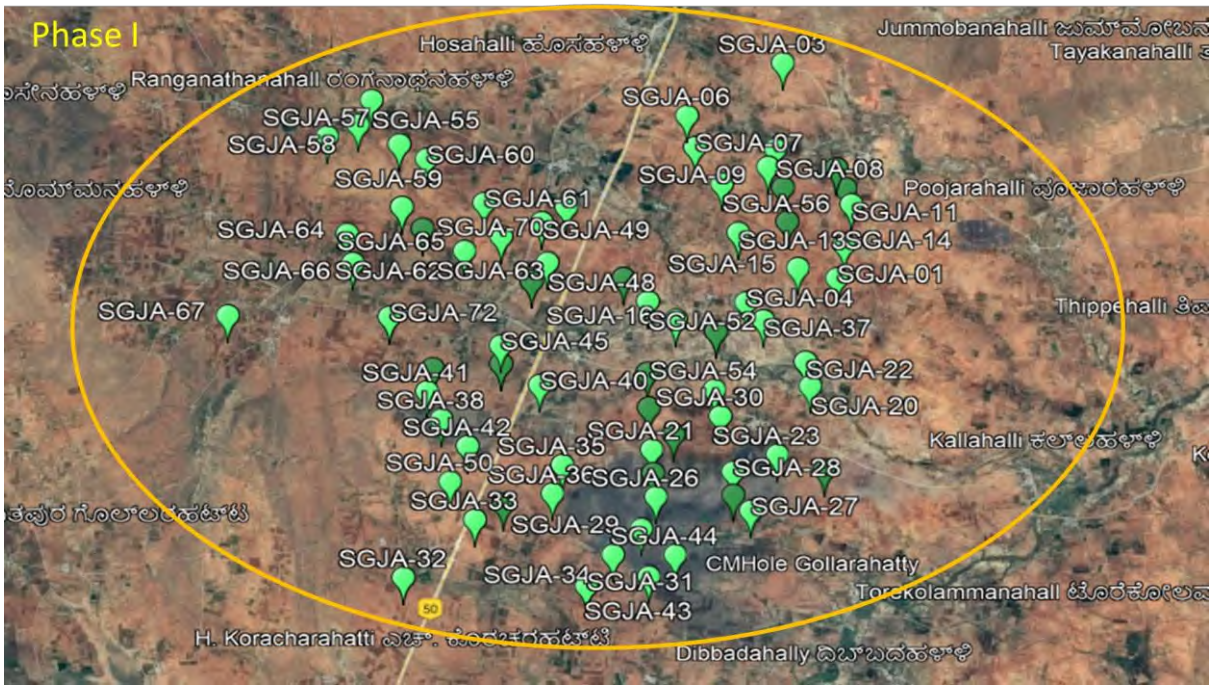


Figure 3-1: Location Map of Project Site



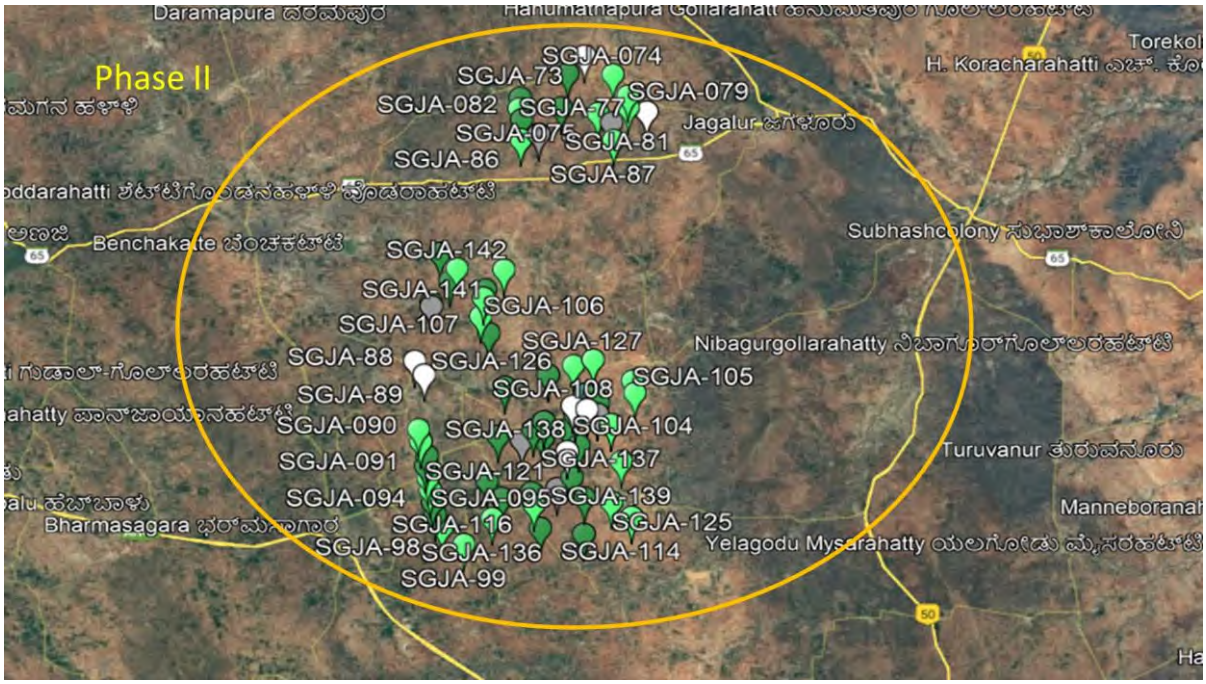


Figure 3-2: Vicinity Map (Phase I & II) of 300 MW Jagalur Wind Power Project

The Project comprises of 143 WTGs with an individual capacity of 2.1 MW each, totalling 300 MW. As part of the ESIA study, social and environmental sensitivities were identified for each of the WTG locations. Any structures that fall in a 500 m radius of a proposed WTG were identified as a receptor for shadow flicker assessment and noise impact. The WTG profiling for the wind farm is given in **Table 3-3.**

Table 3-2: Brief project information

Project Component	Description	Current status
300 MW Wind farm project	Wind project spread over three talukas comprising of Alur, Lokikere, Hullikere, Kenchamalanhalli, Yerrahali, Bangarakkan gudda, Huchavanhalli, Anabur, Mugichukkanhalli, Chikamalanhalli, Hirekumbalakunte, Harlakatte, Hullehal, Nellikatte, Yellagodu, Issamudra, Chennapura, Matadhavvannahalli, Sagalgatte, Guttidurga, Taitoni, Madamuttenhalli, Ajjanppnahalli, Rastamachekere, Kalagere, Gollarahalli, Kotadagudda, Nagathihalli, Adavigollarahalli, Medaginakere, Karinamanahalli,	Micro-siting has been completed for the 300 MW wind project. Out of total 143 locations, 80 WTG locations have been finalized as on date of issue of this report.

	Dibbadahatty, Byranaikanahalli, Rangavvanahalli, Kakabalu villages.	
Land Requirement	Total land requirement for installation of WTGs will be around 548 acres (private land). 3.5 to 4 acres of land is acquired for the project including the access road as larger area is needed for movement of machinaries and WTG component.	The land acquisition for the proposed project is under progress wherein construction activities have been initiated. Further, 30 WTGs were observed to be operational which were procured from Siemens Gamesa. The land acquisition is being managed by 6 land aggregators from 38 nos. of villages (Alur, Lokikere, Hullikere, Kenchamalanhalli, Yerrahali, Bangarakkan gudda, Huchavanhalli, Anabur, Mugichukkanhalli, Chikamalanhalli, Hirekumbalakunte, Harlakatte, Hullehal, Nellikatte, Yellagodu, Issamudra, Chennapura, Matadhavvannahalli, Sagalgatte, Guttidurga, Taitoni, Madamuttenhalli, Ajjanppnahalli, Rastamachekere, Kalagere, Gollarahalli, Kotadagudda, Nagathihalli, Adavigollarahalli, Medaginakere, Karinamanahalli, Dibbadahatty, Byranaikanahalli, Rangavvanahalli, Kakabalu villages.) along with the land team of OKPPL.
Access roads	The project will provide access roads that connect WTG locations.	Private as well as government panchayat land procurement process for the same is in progress.
Office and substation	The project will include office area at the phase I & II pooling substations in Anabur and Nallikatte villages respectively. There are two pooling substations of 150 MW capacity each which consist a land parcel of 7 acres for phase I & 6 acres for phase II. .	The land acqusiition for Phase I & II pooling substation is completed and construction was underway during site survey. Please refer to Section 3.5 for more details.
Transmission line	The project will consist of approximately 78 km of external transmission line from PSS Phase I to GSS and 25 km from PSS Phase II to PSS Phase I. The power will be evacuated from PSS I as whole of 300 MW consist of output from PSS Phase I & II.	Private land (ROW) for the external transmission line and ROW for internal transmission line is under process.

Table 3-3: WTG Profiling

S.No.	WTG ID	WTG Coordinates (in UTM)		WTG Elevation (m)	WTG Footprint Area	Nearest house/ structure within 500 m from WTG Footprint				Nearest Village		Nearest Culture Site		Distance from the Nearest Road		Land use around WTG Location (Explain) based on visual observation				Remarks/ Issues	Nearest receptor within 500 m from WTG footprint)
		X	Y		Topography	Type of Structure	Distance with direction	Use of Structure	Any Window in direction of WTG	Name	Distance/ Direction	Name/ Identification ID in Map	Distance	Unpaved	Paved	North	East	West	South		
1	SGJA-01	661289	1614478	629	Flat	S1 to S3 is kaccha structure at field S4 Pollutory Farm	S1: 260 m N S2: 303 m SW S3: 355 m SW S4: 292 m SSW	S1 to S3 temporary S4 Permanent	..	Kenchamallanahalli	602 m SE	NA	..	64 m W	261 m S	Agricultural	Agricultural	Agricultural and Barren	Agricultural		
2	SGJA-02	661437	1616278	642	Flat	S1 kaccha strcuture at field	S1: 326 m W	S1 temporary	..	Lokikere	815 m NNE	NA	..	210 m NE	1.28 km NE	Agricultural	Agricultural	Agricultural	Agricultural		
3	SGJA-03	660311	1618770	652	Flat	S1 kaccha strcuture at field	S1: 485 m SW	S1 temporary	..	Lokikere	1.9 km SE	NA	..	53 m NW	450 m N	Agricultural	Agricultural	Agricultural	Agricultural		
4	SGJA-04	659659	1613994	628	Flat	S1 Residential Structure S2 and S3 is Kuccha structure at field	S1: 452 m NNW S2: 267 m WSW S3: 146 m SE	S1 Permanent S2 & S3 Temporary	..	Kenchamallanahalli	524 m NNW	NA	..	188 m N	220 m W	Agricultural	Agricultural	Agricultural and Barren	Barren	381 m SW Waterbody	

5	SGJA-05	661275	1616674	640	Flat	S1 to S3 is Kuccha Structure at field	S1: 485 m NE S2: 489 m NW S3: 389 m SW	S1 toS 3 is temporary	..	Lokikere	565 m NE	NA	..	138 m W	1.14 km NE	Agricultural	Agricultural	Agricultural	Agricultural		
6	SGJA-06	658597	1617716	650	Flat	S1 is Kuccha structure at field	S1: 154 m WSW	S1 Temporary	..	Hosahalli Hulikere	1.5 km NW 2km SW	NA	..	83 m SW	1 km W	Agricultural	Agricultural	Agricultural	Agricultural		
7	SGJA-07	658743	1617091	651	Flat	No Structure	..	..	..	Hulikere	788 km SW	NA	..	72 m E	1.4 km W	Agricultural	Agricultural	Agricultural	Agricultural		
8	SGJA-08	660182	1617054	644	Flat	S1 is Kuccha structure at field	S1: 266 m NW	S1 temporary	..	Lokikere	1.34 km ENE	NA	..	430 m S	1.46 km NE	Agricultural and Barren	Agricultural	Agricultural	Agricultural		

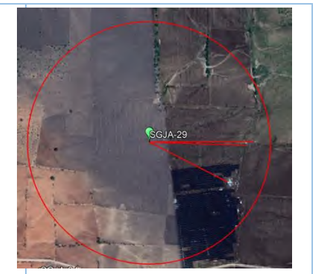
9	SGJA-09	660051	1616698	651	Flat	No Structure	..	..	..	Lokikere	1.6 km ENE	NA	..	64 m S	1.74 km NE	Agricultural	Agricultural	Agricultural	Agricultural		
10	SGJA-10	660317	1616285	648	Flat	S1 Solar Plant Site Office S2 Solar Plant Security Office	S1: 341m NE S2: 484 m NE	S1 & S2 Permanent	..	Lokikere	1.55 km NE	NA	..	72 m S	2.26 km ENE	Agricultural	Agricultural	Agricultural	Agricultural		
11	SGJA-11	661545	1615954	643	Flat	No Structure	..	..	..	Lokikere	1.09 km N	NA	..	159 m E	1.4 km NE	Agricultural	Barren	Agricultural	Barren		
12	SGJA-12	660399	1615607	640	Flat	S1 is Kuccha structure at field	S1: 328 WSW	S1 Temporary	..	Kenchamallanahalli Lokikere	1.3 km SW 1.93 km NE	NA	..	73 m W	1.18 km S	Agricultural	Agricultural	Agricultural	Agricultural		

13	SGJA-13	659520	1615385	636	Flat	S1 Pollutory Farm S2 is kaccha structure at field	S1: 305 m N S2: 470 m SSE	S1 Permanent S2 Temporary	..	Kenchamallanahalli Yambale	648 m S 861 m SW	NA	..	83 m SE	658 m SW	Agricultural	Agricultural	Agricultural	Agricultural	
14	SGJA-14	661417	1615152	641	Flat	S1 is Kuccha structure at field	S1: 426 SSW	S1 Temporary	..	Sulthanpura Lokikere	1 km SE 1.9 km N	NA	..	172 m ESE	956 m S	Agricultural	Agricultural	Agricultural	Agricultural	
15	SGJA-15	660589	1614680	632	Flat	S1 is Commercial shop	S1: 392 m SW	S1 Permanent	..	Yambale Sulthanpura	1.07 km WSW 1.24 km SE	NA	..	260 m W	370 m SE	Agricultural	Agricultural	Agricultural	Agricultural	
16	SGJA-16	658405	1613645	633	Flat	S1 and S2 are Kuccha structure at field	S1: 433 m W S2: 372 m ENE	S1 & S2 Temporary	..	Malur Yambale	644 m S 1.047 km NE	NA	..	73 m SW	602 m SSW	Agricultural and Barren	Agricultural	Agricultural	Agricultural and Barren	

17	SGJA-17	657897	1612584	639	Flat	No Structure	..	..	..	Malur Alur Madamuthnahalli Kenchamallanahalli	590 m NE 1.24 km NW 1.4 km SW 1.8 km ESE	NA	..	62 m E	454 m NNE	Agricultural	Agricultural	Agricultural	Agricultural		
18	SGJA-18	657925	1611891	646	Flat	No Structure	..	..	..	Malur Alur Madamuthnahalli Kenchamallanahalli	1.1 km NNE 1.58 km NW 1.3 km W 1.69 km E	NA	..	185 m E	1.14 km N	Agricultural	Agricultural	Agricultural	Agricultural		
19	SGJA-19	658369	1611359	648	Flat	No Structure	..	..	..	Madamuthnahalli Kenchamallanahalli	1.83 km NW 1.43 km NE	NA	..	714 m ENE	1.32 km NE	Agricultural	Agricultural	Agricultural	Barren		
20	SGJA-20	660817	1612326	626	Flat	S1 and S2 are Kuccha structure at field	S1: 73 m W S2: 386 m SW	S1 & S2 Temporary	..	Kenchamallanahalli	662 m WSW	NA	..	124 m NW	506 m S	Agricultural and Barren	Agricultural	Agricultural	Agricultural		

21	SGJA-21	657979	1611053	649	Flat	No Structure	..	..	..	Madamuthnahalli Kenchamallanahalli	1.53 km NW 1.92 km NE	NA	..	1.13 km WNW	1.78 km NE	Agricultural	Agricultural	Agricultural	Agricultural		
22	SGJA-22	660730	1612812	617	Flat	S1 to S3 are Kuccha structure at field	S1: 383 m W S2: 457 m W S3: 465 m S	S1 to S3 Temporary	..	Kenchamallanahalli Sulthanpura	844 m SW 1.2 km NE	NA	..	74 m E	899 m SSW	Barren	Barren	Barren	Agricultural		
23	SGJA-23	660226	1610956	640	Flat	S1 is Kuccha structure at field	S1: 491 SW	S1 Temporary	..	Kenchamallanahalli Golarahatty	1 km NW 1.5 km SE	NA	..	558 m SW	961 m N	Agricultural	Agricultural	Agricultural	Agricultural		
24	SGJA-24	658005	1610583	650	Flat	No Structure	..	..	..	Madamuthnahalli Kenchamallanahalli	1.8 km NW 2.17 km NE	NA	..	643 m SE	2.2 km NNE	Agricultural	Agricultural	Agricultural	Agricultural		

25	SGJA-25	661074	1610661	641	Flat	No Structure	..	..	..	Kenchamallanahalli Golarahatty Chikkamallanahole	1.5 km NW 1.2 km S 1.76 km SE	NA	..	662 m E	871 m NNE	Agricultural	Agricultural	Agricultural	Agricultural		
26	SGJA-26	658055	1610111	648	Flat	No Structure	..	..	..	Madamuthnahalli Kenchamallanahalli Huchavvanahalli	2.15 km NW 2.47 km NE 2.74 km SW	NA	..	430 m ENE	2.28 km W	Agricultural	Barren	Agricultural	Agricultural		
27	SGJA-27	659753	1609837	633	Flat	S1 and S2 are Kuccha structure at field	S1: 218 m N S2: 393 m SE	S1 & S2 Temporary	..	Kenchamallanahalli Golarahatty	2.1 km N 1 km ESE	NA	..	152 m S	2.2 km NE	Agricultural	Agricultural	Agricultural	Agricultural	202 m NNW Waterbody	
28	SGJA-28	659435	1610613	636	Flat	S1 is Kuccha structure at field	S1: 486 m ESE	S1 & S2 Temporary	..	Kenchamallanahalli Golarahatty	1.38 km NNE 1.68 km SE	NA	..	61 m W	1.56 km NNE	Agricultural	Agricultural	Agricultural	Agricultural	172 m NE Waterbody	

29	SGJA-29	657795	1609472	649	Flat	S1 Solar Plant Security Office S2 and S3 are Kuccha structure at field	S1: 361m SE S2: 399 m W S3: 432 m W	S1 Permanent S2 & S3 Temporary	..	Huchavvanahalli	2.28 km WSW	NA	..	560 m S	3.17 km W	Agricultural	Agricultural	Agricultural	Agricultural and Solar Plant		
30	SGJA-30	659207	1611723	637	Flat	No Structure	..	..	..	Kenchamallanahalli Malur	520 m NE 1.2 km NW	NA	..	58 m WNW	641 m N	Agricultural	Agricultural	Agricultural	Agricultural		
31	SGJA-31	656814	1608328	636	Flat	S1 Residential (Multiple Structures) S2 to S4 kaccha structure at field	S1: 445 m ESE S2: 485 m SE S3: 392 m NNW S4: 438 m SW	S1 Permanent S2 to S4 Temporary	..	Huchavvanahalli H. koracharahatti	1.4 km WNW 445 m ESE	NA	..	216 m WSW	1.5 km W	Agricultural	Agricultural	Agricultural	Residential		
32	SGJA-32	653536	1608491	652	Flat	S1 & S2 Commercial S3 Temple S4 & S5 kaccha structure at fiel	S1: 485 m ESE S2: 500 m SE S3: 464 m ENE S4: 491 m NNE S5: 356 m SW	S1 to S3 Permanent S4 to S5 Temporary	..	Huchavvanahalli Hosa Kananakatte Kananakatte Bangarakkanagudda	1.56 km NE 1.2 km NW 1.08 km NNE 1.67 km SSW	NA	..	71 m E	461 m E	Agricultural	Agricultural	Agricultural	Agricultural and Barren		

33	SGJA-33	654814	1609648	647	Flat	S1 & S2 Residential S3 to S5 Commercial S6 & S7 kaccha structure at field	S1: 497 m SW S2: 462 m SW S3: 250 m SW S4: 367 m WNW S5: 328 m WNW S6: 426 m SSW S7: 500 m SSW	S1 to S5 Permanent S6 & S7 Temporary	..	Huchavvanahalli Hosa Kananakatte Kananakatte	604 m SSE 1.57 km W 497 m SW	NA	..	130 m E	292 m W	Agricultural	Agricultural	Agricultural	Agricultural		
34	SGJA-34	657290	1608952	644	Flat	No Structure	..	..	..	Huchavvanahalli H. koracharahatti	1.71 km W 807 m S	NA	..	88 m N	2.9 km W	Agricultural	Agricultural	Agricultural	Agricultural		
35	SGJA-35	656380	1610744	656	Flat	No Structure	..	..	..	Madamuthnahalli	959 m N	NA	..	70 m E	571 m W	Agricultural	Agricultural	Agricultural	Agricultural		
36	SGJA-36	656203	1610174	647	Flat	No Structure	..	..	..	Madamuthnahalli Huchavvanahalli	1.55 km N 1.32 km SSW	NA	..	195 m E	424 m W	Agricultural	Agricultural	Agricultural	Agricultural		

37	SGJA-37	659972	1613637	625	Flat	S1 is Kuccha structure at field	S1: 326 m NW	S1 Temporary	..	Yambale Sulthanpura Malur Kenchamallanahalli	900 m NW 1.74 km ENE 1.58 km SW 1.36 km S	NA	..	461 SW	768 m NNW	Agricultural and Barren	Barren	Barren	Barren		
38	SGJA-38	654213	1611649	665	Flat	No Structure	..	..	..	Kenchamallanahalli Alur Hosa Kananakatte Kanamadagu	2.23 km ENE 2.15 km N 2.1 km SSW 2 km S	NA	..	..	211 m W	Agricultural	Agricultural	Agricultural	Agricultural		
39	SGJA-39	655324	1609963	644	Flat	S1 & S2 is Kuccha structure at field S3 is Farmhouse	S1: 458 m NE S2: 464 m ESE S3: 424 m NW	S1 & S2 Temporary S3 Permanent	..	Huchavvanahalli Kananakatte	899 m SSE 1.05 km SW	NA	..	401 m E	664 m W	Agricultural	Agricultural	Agricultural	Agricultural		
40	SGJA-40	655970	1612336	646	Flat	S1 is Pollutary Farm S2 & S3 Commercial Stucture	S1: 413 m NE S2: 481 m NW S3: 463 m NW	S1 to S3 Permanent	..	Madamuthnahalli Alur	540 m ESE 792 m NE	NA	..	61 m S	375 m W	Agricultural and Barren	Agricultural	Agricultural	Agricultural		

41	SGJA-41	653952	1612206	669	Flat	No Structure	..	..	..	Madamuthnahalli Alur Kanamadagu	2.5 km W 1.65 km NNE 2.16 km NNE	NA	..	234 m N	196 m WSW	Agricultural	Agricultural	Agricultural	Agricultural		
42	SGJA-42	654683	1611115	655	Flat	S1 Commercial Structure	S1: 495 m NE	S1 Permanent	..	Huchavvanahalli Hosa Kananakatte Kananakatte Madamuthnahalli	1.98 km SSE 1.95 km SW 1.5 km SSW 1.93 km NNE	NA	..	63 m N	386 m E	Agricultural and Barren	Agricultural and Barren	Agricultural and Barren	Agricultural and Barren		
43	SGJA-43	657931	1608519	641	Flat	No Structure	..	..	..	H.Koracharahatti Taitone	719 m SW 1.42 km S	NA	..	65 m E	2.6 km W	Agricultural	Agricultural	Agricultural and Barren	Agricultural		
44	SGJA-44	658403	1608953	644	Flat	S1 Solar Plant Security Office	S1: 432m NW	S1 Permanent	..	H.Koracharahatti Taitone	1.35 km SW 1.93 km S	NA	..	76 m S	3 km W	Agricultural	Agricultural	Solar Plant	Agricultural		

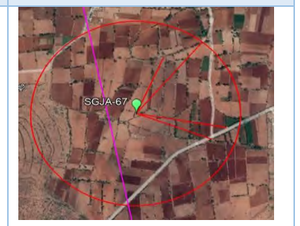
45	SGJA-45	655269	1613124	646	Flat	No Structure	..	..	..	Madamuthnahalli Alur Kanamadagu	1.5 km SE 1.05 km NE 1 km NNW	NA	..	365 m ESE	524 m E	Agricultural	Agricultural	Agricultural	Agricultural		
46	SGJA-46	657466	1614473	633	Flat	No Structure	..	..	..	Yambale Hulikere Alur	1.47 km ENE 1.15 km N 1.28 km SW	NA	..	71 m E	350 m SE	Agricultural	Agricultural	Agricultural	Barren		
47	SGJA-47	655823	1614414	638	Flat	S1 & S2 Residential S3 & S4 Kaccha Structure at Field	S1: 449 m NW S2: 491 m SW S3: 371 m W S4: 387 m ENE	S1 &S2 Permanent S3 & S4 Temporary	..	Alur Kanamadagu	805 m SE 491 m SW	NA	..	111 m SW	361 m SSW 470 m W	Agricultural	Agricultural	Agricultural	Agricultural		
48	SGJA-48	656103	1614781	648	Flat	S1 to S3 Commercial S4 & S5 Kuccha Structure at field S6 Residential Structure	S1: 351 m ENE S2: 402 m SE S3: 430 m E S4: 449 m NE S5: 324 m ENE S6: 432 m W	S1 to S3 & S6 Permanent S4 & S5 Temporary	..	Alur Kanamadagu	1.14 km SSE 938 m SW	NA	..	..	307 m W 536 m E	Agricultural	Agricultural	Agricultural	Agricultural		

49	SGJA-49	656000	1615583	656	Flat	S1 is Kuccha structure at field	S1: 356 m NE	S1 Temporary	..	Hulikere Kanamadagu	1.2 km N 1.42 km SSW	NA	..	220 m NNW	206 m W	Agricultural	Agricultural	Agricultural	Agricultural		
50	SGJA-50	654370	1610407	655	Flat	S1 Residential S2 Kuccha Structure at field S3 Commercial	S1:489 m WNW S2: 249 m SE S3: 359 m ESE	S2 is Temporary S1 & S3 is Permanent	..	Huchavvanahalli Hosa Kananakatte Kananakatte	1.45 km SW 1.3 km SW 725 m S	NA	..	73 m W	389 m E 428 m W	Agricultural	Agricultural	Agricultural	Agricultural		
51	SGJA-51	659442	1610151	638	Flat	S1 Kuccha Structure at field	S1:284 m ESE	S1 temporary	..	Kenchamallanahalli Golarahatty	1.84 km NNE 1.43 km SE	NA	..	65 m S	2.13 km N	Agricultural	Agricultural	Agricultural	Agricultural	203 m SE Waterbody	
52	SGJA-52	657903	1614011	627	Flat	S1 Kuccha Structure at field	S1:337 m SSE	S1 temporary	..	Yambale Alur Malur	1.16 km NE 1,25 km WSW 1.1 km SSE	NA	..	145 m W	271 m NNW	Agricultural	Agricultural and Barren	Agricultural and Barren	Agricultural		

53	SGJA-53	659126	1613415	622	Flat	S1 & S2 Kuccha Structure at field	S1:275 m NE S2: 432 m NW	S1 & S2 temporary	..	Yambale Kenchamallanahalli Malur	1.15 km NNE 1.28 km SE 740 m SW	NA	..	243 m W	752 m SW	Agricultural and Barren	Agricultural and Barren	Agricultural and Barren	Agricultural	477 m W Waterbody	
54	SGJA-54	659132	1612226	631	Flat	S1 Pucca Vacant Structure	S1: 423 m ENE	S1 Temporary	..	Kenchamallanahalli Malur	595 m E 838 m NW	NA	..	59 m S	187 m NNE	Agricultural	Agricultural	Agricultural	Agricultural		
55	SGJA-55	652951	1618010	666	Flat	No Structure	..	..	..	Chikkakumbalagunte Ranganathanahall Dasavanahalli	663 m W 1.1 km NW 976 m NNW	NA	..	281 m E	298 m N	Agricultural	Agricultural	Agricultural	Agricultural		
56	SGJA-56	660412	1615220	648	Flat	S1 Kuccha Structure at field	S1:478 m NW	S1 temporary	..	Yambale Sulthanpura	1.1 km SW 1.67 km SE	NA	..	66 m W	821 m S	Agricultural	Agricultural	Agricultural	Agricultural		

57	SGJA-57	652159	1617285	674	Flat	No Structure	..	..	..	Chikkakumbalagunte Hirekumbalagunte	726 m N 1.72 km WNW	NA	..	67 m W	928 m N	Agricultural	Agricultural	Agricultural	Agricultural		
58	SGJA-58	652711	1617520	671	Flat	S1 Kuccha Structure at field	S1:385 m WSW	S1 temporary	..	Chikkakumbalagunte Ranganathanahall	642 m NW 1.34 km NW	NA	..	194 m	696 m N	Agricultural	Agricultural	Agricultural	Agricultural		
59	SGJA-59	656326	1611098	655	Flat	No Structure	..	..	..	Madamuthnahalli	610 m NNE	NA	..	22 m S	258 m NW	Barren	Agricultural	Agricultural	Agricultural		
60	SGJA-60	653936	1616841	668	Flat	No Structure	..	..	..	Chikkakumbalagunte Ranganathanahall	2.02 km NW 2.59 km NW	NA	..	63 m SSW	1 km NE	Agricultural	Agricultural	Agricultural	Agricultural		

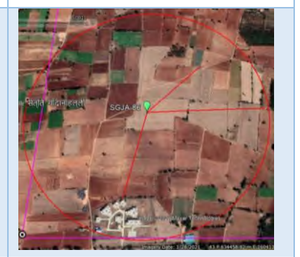
61	SGJA-61	654967	1615966	660	Flat	No Structure	..	..	..	Hulikere Kanamadagu	1.34 km NE 1.4 km SSE	NA	..	146 m W	895 m E	Agricultural	Agricultural	Agricultural	Agricultural		
62	SGJA-62	654618	1615007	641	Flat	No Structure	..	..	..	Kanamadagu	433 m SE	NA	..	65 m E	755 m ESE	Agricultural	Agricultural	Agricultural	Agricultural		
63	SGJA-63	655277	1615302	649	Flat	S1 Commercial Structure S2 Kuccha Structure at Field	S1: 449 m ESE S2: 369 m E	S1 Permanent S2 Temporary	..	Kanamadagu Hulikere	857 m S 1.68 km NNE	NA	..	500 m W	414 m E	Agricultural	Agricultural	Agricultural	Agricultural		
64	SGJA-64	652519	1615343	651	Flat	S1& S2 Kuccha Structure at Field	S1: 439 m NW S2: 314 m WNW	S1 & S2 Temporary	..	Anabur	1.43 km SW	NA	..	74 m E	1.15 km S	Agricultural	Agricultural	Agricultural	Agricultural		

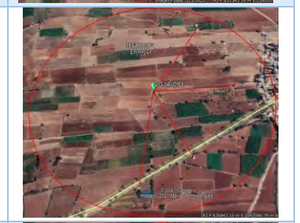
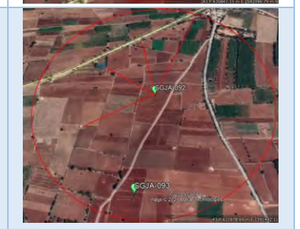
65	SGJA-65	653796	1615670	646	Flat	S1& S2 Kuccha Structure at Field	S1: 71 m ENE S2: 285 m NNE	S1 & S2 Temporary	..	Kanamadagu	1.41 km SE	NA	..	273 m N	1.28 km S	Agricultural and Barren	Agricultural	Agricultural	Agricultural and Barren		
66	SGJA-66	652620	1614764	649	Flat	S1 to S3 Kuccha Structure at field S4 is Pollutary Farm	S1: 231 m SE S2: 361 m ESE S3: 282 m SSW S4: 372 m SSW	S1 to S3 temporary S4 Permanent	..	Anabur Kanamadagu	1.24 km SW 2 Km E	NA	..	296 m SSW	549 m S	Agricultural	Agricultural and Barren	Agricultural and Barren	Agricultural		
67	SGJA-67	650391	1613713	674	Flat	S1 to S3 Temporary Structure at field S4 is Residential Structure	S1: 389 m ESE S2: 439 m ESE S3: 331 m NNE S4: 500 m NNE	S1 to S3 temporary S4 Permanent	..	Anabur Byatagaranahalli Gollathatti	686 m E 862 m WNW 580 m NNE	NA	..	367 m E	285 m SE	Agricultural	Agricultural	Agricultural and Barren	Agricultural		
68	SGJA-68	653002	1614019	646	Flat	S1 & S2 Kuccha Structure at Field	S1: 433 m NNE S2: 476 m NNE	S1 & S2 Temporary	..	Kanamadagu Ananbur Alur	1.57km ENE 1.41 km W 1.48 km E	NA	..	237 m NE	241 m NNW	Agricultural	Agricultural	Agricultural	Agricultural		
69	SGJA-69	654726	1615458	648	Flat	No Structure	..	..	..	Hulikere Kanamadagu	1.85 km NE 988 m SE	NA	..	66 m E	992 m E	Agricultural	Agricultural	Agricultural	Agricultural		

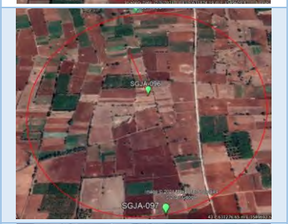
70	SGJA-70	656314	1615927	652	Flat	S1 Kuccha Structure at Field	S1: 223 m SSW	S1 Temporary	..	Hulikere Kanamadagu	966 m NW 1.94 km SW	NA	..	137 m SSW	349 m E 511 m W	Agricultural	Agricultural	Agricultural	Agricultural		
71	SGJA-71	654966	1611871	644	Flat	S1 & S2 Commercial Structure	S1: 396 m SE S2: 480 m SSE	S1 & S2 Permanent	..	Madamuthnahalli Alur	1.42 km E 1.86 km NE	NA	..	451 m WNW	1.07 km S	Agricultural	Agricultural	Agricultural	Agricultural and Barren		
72	SGJA-72	653279	1613690	656	Flat	No Structure	..	..	..	Ananbur Kanamadagu	1.73 km WNW 1.2 km ESE	NA	..	227 m ESE	887 m SW	Agricultural	Agricultural	Agricultural	Agricultural		
73	SGJA-73	637464	1607261	714	Flat	S1 Residential S2: Commercial	S1: 165 m NE S2: 290 m NE	S1 and S2 permanent	..	Huchapalanahalli	1 km W	NA	..	64 m NE	242 m N	Agri	Agri	Agri	Agri		
74	SGJA-74	638508	1606511	703	Flat	S1, S3, S4, S5, S6: Kaccha Structure at Field S2 & S7 Residential	S1: 143 m N S2: 190 m NE S3: 305 m NE S4: 275 m SE S5: 337 m SE S6: 311 m S S7: 390 m SW	S1, S3, S4, S5, S6 temporary S2 & S7 Permanent	..	Byranaikanahalli	540 m WSW	NA	..	70 m N	803 m NW	Agri	Agri	Agri	Agri	429 m W waterbody	

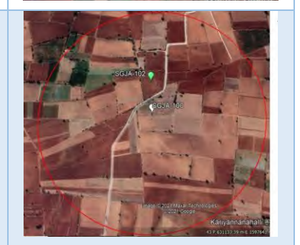
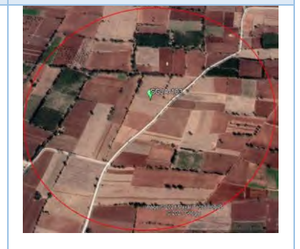
75	SGJA-75	637957	1604943	700	Flat	S1 & S2 Residential multi structures	S1: 323 m S S2: 335 m SW	S1 & S2 permanent	..	Baggenahalli Channapura	323 m S 335 m SW	NA	..	73 m W	851 m S	Agri	Agri	Agri	Agri		
76	SGJA-76	638466	1604560	696	Flat	No Structure	..	..	..	Baggenahalli	340 m W	NA	..	67 m S	415 m S	Agri	Agri	Agri	Agri		
77	SGJA-77	639756	1605006	683	Flat	S1 residential	S1: 473 m S	S1 permanent	..	Rastemachikere	473 m S	NA	..	62 m W	785 m S	Agri	Agri	Agri	Agri		
78	SGJA-78	636847	1606547	708	Flat	S1 residential	S1 284 m SSE	S1 permanent	Window front	Huchapalanahalli	695 m NW	NA	..	59 m N	947 m N	Agri	Agri	Agri	Agri		
79	SGJA-79	639061	1605654	692	Flat	S1; S3; S4 kaccha structure at field S2 Residential (2-3 structures)	S1: 225 m NE S2: 238 m NW S3: 235 m E S4: 390 m SW S5: 240 m SE	S1; S3; S4 is temporary S2 is permanent	..	Byranaikanahalli	800 m N	NA	..	62 m N	1 km NE	Agri	Agri	Agri	Agri		

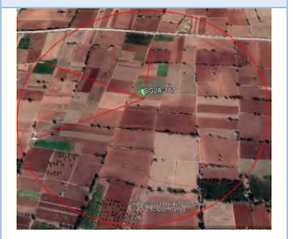
80	SGJA-80	636602	1605164	700	Flat	S1 kaccha S2 Residential (multi structures)	S1: 361 m NE S2: 451 m W	S1 is temporary S2 is permanent	S2 1 structure window front	Channapura	451 m W	NA	..	30 m N	1.4 km SE	Agri	Agri	Agri	Agri		
81	SGJA-81	639073	1605181	686	Flat	S1; S2; S3; S4 kaccha	S1: 276 m NE S2: 419 m NE S3: 338 m SW S4: 406 m NW	S1; S2; S3; S4 is temporary	..	Baggenahalli Rastemachikere	1.1 km SW 945 m SE	NA	..	165 m SW	986 m S	Agri	Agri	Agri	Agri		
82	SGJA-82	635063	1605123	684	Flat	No Structure	..	..	..	Basavapura Kotadagudda	778 m W 1 km NW	NA	..	Adjacent to WTG	1.9 m N	Agri	Agri	Agri	Agri		
83	SGJA-83	635103	1605564	690	Flat	No Structure	..	..	..	Kotadagudda Basavapura Channapura	594 NW 883 SW 1 km SE	NA	..	224 m NE	1.5 km N	Agri/dry land	Agri	Agri	Agri		
84	SGJA-84	635159	1604676	678	Flat	No Structure	..	..	..	Basavapura Settigondanahalli	943 m NW 1 km SW	NA	..	60.7 m N	1.32 km S	Agri	Agri	Agri	Agri		

85	SGJA-85	635789	1604096	676	Flat	S1 to S5 Kuccha Structure at field kaccha S6 Residential	S1: 86.3 m SW S2: 254 m SW S3: 495 m ESE S4: 467 m NE S5: 454 m NNW S6: 337 m NW	S1 to S5 temporary S6 Permanent	..	Maharajanahatty	764 m SE	NA	..	156 m SE	733 m S	Agri	Agri	Agri	Agri		
86	SGJA-86	635129	1603880	681	Flat	S1 commercial/ residential S2, S3 kaccha	S1: 358 m SW S2: 312 m NE S3: 486 m E	S1; S2 temporary	..	Settigondanahalli Meldaginakere Basavapura	637 m W 1.2 km SE 1.3 km NW	NA	..	55 m W	535 m S	Agri	Agri	Agri	Agri		
87	SGJA-87	638538	1603859	701	Flat	S1 kaccha	S1: 376 NW	S1 temporary	..	Baggenahalli Bullanahalli	741 m NW 1 km SE	NA	..	65 m W	285 m N	Agri	Agri	Agri	Agri		
88	SGJA-88	631245	1594918	658	Flat	S1 kaccha	S1: 447 m SE	S1 temporary	..	Kalgere Kodihalli	1.2 km E 1.5 km NW	NA	..	to check	247 m NW	Agri	Agri	Agri	Agri		

89	SGJA-89	631598	1594361	661	Flat	S1 residential	S1: 484 m SW	S1 Permanent	..	Beerapura	484 m SW	NA	..	70 m SE	600 m W	Agri	Agri/dry	Agri	Agri/dry		
90	SGJA-90	631386	1592154	680	Flat	S1: kaccha	S1: 292 m SE	S1 temporary	..	Issamudra	629 m SE	NA	..	71 m SW	764 m SE	Agri	Agri	Agri	Agri		
91	SGJA-91	631476	1591662	687	Flat	S1 & S3 residential S2 & S4 Kuccha Structure at Field	S1: 359 m E S2: 406 m NE S3: 410 m S S4: 328 m SE	S1 & S3 permanent S2 & S4 temporary	..	Issamudra	359 m E	NA	..	Adjacent to WTG site	303 m SE	Agri	Agri	Agri	Agri		
92	SGJA-92	631709	1591089	695	Flat	S1 & S3 residential S2 & S4 Kuccha Structure at Field	S1: 260 m NW S2: 317 m SW S3: 473 m NE S4: 294 m N	S1: Permanent S2: temporary S3: permanent S4: Temporary	..	Issamudra	473 m NE	NA	..	58 m SE	297 m NW	Agri	Agri	Agri	Agri		
93	SGJA-93	631656	1590679	695	Flat	S1 kaccha S2: pakka temporary	S1: 345 m SE S2: 343 m NW	S1 temporary S2 Temporary	..	Issamudra	500 m SE	NA	..	60.8 m W	325 m S	Agri	Agri	Agri	Agri		

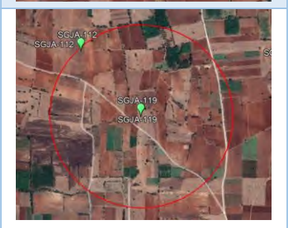
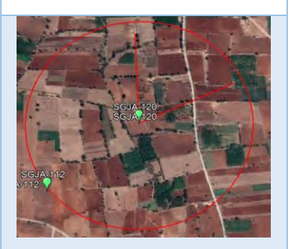
94	SGJA-94	631746	1590187	693	Flat	S1 residential multi structure S2: pakka temporary	S1: 419 m E S2: 487 m SW	S1 permanent S2: temporary	..	Issamudra	419 m E	NA	..	137 m SE	173 m N	Agri	Agri	Agri	Agri		
95	SGJA-95	631836	1589695	695	Flat	S1 S2 pakka temporary	S1 : 227 m NW S2: 452 m NW	S1 S2 Temporary	..	Issamudra	522 m NE	NA	..	19 m S	674 m N	Agri	Agri	Agri	Agri		
96	SGJA-96	631925	1589203	700	Flat	S1 pakka temporary	S1: 286 m NW	S1 Temporary	..	Issamudra	921 m NW	NA	..	199 m E	894 m W	Agri	Agri	Agri	Agri		
97	SGJA-97	632015	1588711	708	Flat	S1 kaccha	S1: 279 m WSW	S1 Temporary	..	Heggadehalu Issamudra	1.3 km SW 1.3 km NE	NA	..	165 m E	1.6 km N	Agri	Agri	Agri	Agri		
98	SGJA-98	632272	1588210	715	Flat	No Structure	..	..	..	Heggadehalu	1.5 km W	NA	..	50 m W	1 km NE	Agri	Agri	Agri	Agri		

99	SGJA-99	633073	1587523	718	Flat	No Structure	..	..	..	Bedarashivanakere	1.7 km SE	NA	..	60.5 m NE	662 m NE	Agri	Agri	Agri	Agri		
100	SGJA-100	631853	1597127	664	Flat	No Structure	..	..	..	Sagalagatte Kariyannanahalli	1 km N 1 km E	NA	..	54 m NW	1.2 km S	Agri	Agri	Agri	Agri		
101	SGJA-101	632532	1598158	666	Flat	No Structure	..	..	..	Sagalagatte	550 m NW	NA	..	60 m W	290 m SW	Agri	Agri	Agri	Agri		
102	SGJA-102	631842	1597277	662	Flat	S1: kaccha	S1: 429 m NW	S1 Temporary	..	Sagalagatte Kariyannanahalli	865 m N 1 km E	NA	..	66 m E	1 km N	Agri	Agri	Agri	Agri		
103	SGJA-103	633967	1596047	676	Flat	No Structure	..	..	..	Gollarahalli Kiryannahalli	1.4 km SE 1.2 km NW	NA	..	71 m SE	1 km NE	Agri	Agri	Agri	Agri		

104	SGJA-104	635154	1592906	692	Flat	S1 S2 kaccha	S1: 438 m NE S2: 48 m NW	S1 S2 Temporary	..	Nallikatte	892 m NE	NA	..	61 m WNW	363 m N	Agri	Agri	Agri	Agri		
105	SGJA-105	639251	1594134	696	Flat	No Structure	..	..	..	M. Vadarahatty Mathadadyamavvanahalli	585 m NE 812 m W	NA	..	135 m E	766 m NW	Agri	Agri	Agri	Agri		
106	SGJA-106	633764	1597472	678	Flat	S1 kaccha	S1: 456 m SW	S1 temporary	..	Kiryannahalli	734 m WSW	NA	..	398 m S	1.6 km N	Agri	Agri	Agri	Agri		
107	SGJA-107	633666	1596723	681	Flat	S1 S2 S3 kaccha	S1: 437 m SW S2: 302 m N S3: 481 m NW	S1 S2 S3 temporary	..	Kiryannahalli	714 m NW	NA	..	351 m N	822 m SW	Agri	Agri	Agri	Agri		

108	SGJA-108	639341	1593642	703	Flat	No Structure	..	..	..	Mathadadyamavvanahalli M. Vadarahatty	1 km NW 851 m NE	NA	..	104 m W	1.17 km NW	Agri	Agri	Agri	Agri		
109	SGJA-109	637966	1592797	709	Flat	S1 kaccha	S1: 392 m SW	S1 temporary	..	Mathadadyamavvanahalli	1 km NE	NA	..	351 m W	150 m N	Agri	Agri	Agri	Agri		
110	SGJA-110	634558	1593880	685	Flat	S1 commercial S2 S3 kaccha	S1: 445 m S S2: 190 SW S3: 434 m SW	S1 Permanent S2 S3Temporary	..	Gollarahalli	640 m NE	NA	..	..	190 m E	Agri	Agri	Agri	Agri		
111	SGJA-111	634318	1591888	690	Flat	S1 to S4 Kuccha Structure at Field	S1: 364 m NNW S2: 439 m SSW S3: 417 m SSE S4: 475 m SSE	S1 to S4 Temporary	..	Hosapete Pamarahalli	887 m NW 799 m SSW	NA	..	68 m N	298 m W	Agri	Agri	Agri	Agri		

112	SGJA-112	635615	1592143	700	Flat	No Structure	..	..	..	Nallikatte Pamarahalli Ajjappanahalli	1.3 km NNE 1.78 km SW 1.06 km SSE	NA	..	146 m SSW	1.23 km NNW	Agri	Agri	Agri	Agri		
113	SGJA-113	635198	1591712	690	Flat	S1 & S2 Kuccha Structure at Field	S1: 438 m WSW S2: 474 m SSW	S1 & S2 Temporary	..	Nallikatte Pamarahalli Ajjappanahalli	1.69 km WNW 1.23 km SW 857 m SE	NA	..	354 m NNE	642 m SSE	Agri	Agri	Agri	Agri		
114	SGJA-114	639233	1588635	700	Flat	S1 Kuccha Structure at Field S2 is Pollutary Farm	S1: 324 m NNE S2: 377 m NNW	S1 Temporary S2 Permanent	..	Yealgodu Chikkabbigere	1.26 km NE 1.72 km SE	NA	..	130 m WSW	337 m W	Agri	Agri	Agri	Agri		
115	SGJA-115	635551	1589618	707	Flat	S1 is Industry S2, S3 & S4 Kuccha Structure at Field S5 is Pollutary Farm	S1: 364 m NNW S2: 439 m SSW S3: 417 m SSE S4: 475 m SSE	S1 & S5 Permanent S2 to S4 Temporary	..	Ajjappanahalli	534 m NE	NA	..	238 m SSW	252 m E	Agri	Agri	Agri	Agri		

116	SGJA-116	635641	1589126	708	Flat	S1 Kuccha Structure at Field S2 Industry	S1: 305 m NE S2: 403 m NNE	S1 Temporary S2 permanent	..	Ajjappanahalli	1.03 km NW	NA	..	166 m W	185 m NE	Agri	Agri	Agri	Agri		
117	SGJA-117	635879	1588177	712	Flat	No Structure	..	..	..	Adavigollarahalli	580 m E	NA	..	255 m NE	540 m ENE	Agri	Agri	Agri	Agri		
118	SGJA-118	637475	1587944	694	Flat	S1& S2 Kuccha Structure at Field S3 & S4 Residential Structure	S1: 314 m NW S2: 231 m SW S3: 493 m NNW S4: 396 m S	S1 & S2 Temporary S3& S4 Permanent	..	Adavigollarahalli Hirekabbigere	640 m W 1.2 km SSE	NA	..	..	215 m SW	Agri	Agri	Agri	Agri	102 m ESE Waterbody	
119	SGJA-119	635968	1591812	704	Flat	No Structure	..	..	..	Ajjappanahalli Nallikatte	668 m S 1.54 km N	NA	..	55 m SW	720 m S	Agri	Agri	Agri	Agri		
120	SGJA-120	636000	1592478	693	Flat	S1 & S2 Kuccha Structure at Field	S1: 460 m ENE S2: 441 m N	S1 & S2 Temporary	..	Ajjappanahalli Nallikatte	1.34 km S 883 m N	NA	..	248 m E	1.09 km NW	Agri	Agri	Agri	Agri		

121	SGJA-121	636905	1591314	704	Flat	S1 Kuccha Structure at Field	S1: 467 m NE	S1 Temporary	..	Ajjappanahalli	708 m SW	NA	..	257 m W	179 m S	Agri	Agri	Agri	Agri		
122	SGJA-122	637041	1590236	714	Flat	S1 Kuccha Structure at Field	S1: 315 m ESE	S1 Temporary	..	Ajjappanahalli	1.19 km NW	NA	..	45 m W	236 m N	Agri	Agri	Agri	Agri		
123	SGJA-123	636493	1589780	708	Flat	No Structure	..	..	..	Ajjappanahalli Adavigollarahalli	1.27km WNW 1.45 km SSE	NA	..	116 m SE	695 m W	Agri	Agri	Agri	Agri		
124	SGJA-124	637496	1589405	711	Flat	No Structure	..	..	..	Adavigollarahalli	1.17 km SW	NA	..	92 m W	890 m SSE	Agri	Agri	Agri	Agri		

125	SGJA-125	638491	1589231	701	Flat	No Structure	..	..	..	Yealgodu Adavigollarahalli	1.49 km NE 1.93 km SW	NA	..	68 m NE	510 m S	Agri	Agri	Agri	Agri		
126	SGJA-126	636642	1594456	699	Flat	S1 Kuccha Structure at Field S2 Commercial	S1: 243 WNW S2: 436 W	S1 Temporary S2 Permanent	..	Nallikatte Dibbadahatty	1 km SW 957 m NNE	NA	..	363 E	529 SE	Agri	Agri	Agri	Agri		
127	SGJA-127	637628	1595528	706	Flat	S1 Temple S2 to S6 Kuccha Structure at Field	S1: 464 m ESE S2: 431 m ESE S3: 488 m ESE S4: 433 m W S5: 478 m SW S6: 328 m SSE	S1 Permanent S2 to S6 Temporary	..	Dibbadahatty	729 m W	NA	..	90 m SW	199 m SE	Agri	Agri	Agri	Agri		
128	SGJA-128	636154	1594363	689	Flat	S1, S2, S4, S5, S6, S7, S8 Kuccha Structure at Field S3 Commercial S9 Residential	S1: 165 m SE S2: 331 m ESE S3: 80 m NNE S4: 320 m NE S5: 304 m NNE S6: 245 m WNW S7: 388 m WSW S8: 431 m SSE S9: 377 m SSE	S1 , S2, S4, S5, S6, S7, S8 Temporary S3 Permanent S9 Permanent	..	Nallikatte Dibbadahatty Gollarahalli	735 m SSW 1.22 km NE 1.36 km N	NA	..	53 m E	695 m SSE	Agri	Agri	Agri	Agri		

129	SGJA-129	637286	1591524	701	Flat	S1 Kuccha Structure at Field	S1: 162 NW	S1 Temporary	..	Ajjappanahalli	1.2 km WSW	NA	..	61 m N	432 m SE	Agri	Agri	Agri	Agri		
130	SGJA-130	637150	1592746	708	Flat	S1 & S2 Kuccha Structure at Field	S1: 466 m ESE S2: 349 m WSW	S1 & S2 Temporary	..	Nallikatte	1.17 km NW	NA	..	265 m SW	666 m NE	Agri	Agri	Agri	Agri		
131	SGJA-131	636866	1592165	702	Flat	S1 to S3 Kuccha Structure at Field	S1: 353 m ESE S2: 487 m N S3: 250 m NW	S1 to S3 Temporary	..	Ajjappanahalli Nallikatte	1.2 km SW 1.45 km NW	NA	..	181 m SE	1.12 km SSW	Agri	Agri	Agri	Agri		
132	SGJA-132	637834	1593550	702	Flat	No Structure	..	..	..	Nallikatte	974 m WNW	NA	..	64 m N	267 m W	Agri	Agri	Agri	Agri		
133	SGJA-133	638000	1593235	709	Flat	No Structure	..	..	..	Nallikatte	1.22 km WNW	NA	..	124 m WNW	222 m SW	Agri	Agri	Agri	Agri		

134	SGJA-134	633923	1590066	694	Flat	S1 Kuccha Structure at Field	S1: 293 m NW	S1 Temporary	..	Haralikatte Pamarahalli Ajjappanahalli	743 m WNW 943 m NNE 900 m ESE	NA	..	95 m SE	155 m S	Agri	Agri	Agri	Agri		
135	SGJA-135	634461	1589390	697	Flat	No Structure	..	..	..	Haralikatte Pamarahalli Ajjappanahalli	1.56 km NW 1.64 km NNW 773 m NE	NA	..	137 m SE	264 m N	Agri	Agri	Agri	Agri		
136	SGJA-136	633417	1589200	698	Flat	S1 Kuccha Structure at Field	S1: 155 m WSW	S1 Temporary	..	Haralikatte Issamudra G.Hatty	987 m NNW 1.42 km NW	NA	..	170 m E	199 m W	Agri	Agri	Agri	Agri		
137	SGJA-137	638470	1592373	702	Flat	S1 Kuccha Structure at Field	S1: 436 m E	S1 Temporary	..	Hullehal	1.32 km ESE	NA	..	68 m SE	229 m E	Agri	Agri	Agri	Agri		

138	SGJA-138	637929	1591927	699	Flat	S1 & S2 Kuccha Structure at Field	S1: 470 m SSE S2:90 m SE	S1 & S2 Temporary	..	Hullehal Ajjappanahalli	1.84 km ENE 2 km SW	NA	..	333 m N	544 m S	Agri	Agri	Agri	Agri / Barren		
139	SGJA-139	638850	1590873	692	Flat	S1 Kuccha Structure at Field	S1: 205 m SE	S1 Temporary	..	Hullehal G. Hatty Yellagodu	952 m NE 1.31 km SE	NA	..	155 m S	492 m NNW	Agri	Agri	Agri	Agri / Barren		
140	SGJA-140	633841	1597807	677	Flat	S1 Residential	S1: 357 m E	S1 Permanent	..	Sagalagatte Gokulahatty Guttidurga	1.94 km WNW 1.58 km E 1.55 km NNE	NA	..	755 m S	2.6 km SW	Agri	Agri	Agri	Agri		
141	SGJA-141	634517	1598617	684	Flat	S1 permanent commercial & S2 school	S1: 377 m NNW S2:414 m NNW	S1 & S2 Permanent	S2 Window front	Guttidurga Gokulhatty	702 m N 1.24 km SE	NA	..	73 m W	250 m ENE	Agri	Agri	Agri	Agri		

142	SGJA-142	632792	1598655	671	Flat	No Structure	..	..	..	Sagalagatte Hosur Guttidurga	927 m WSW 1.84 km NNW 1.63 km ENE	NA	..	70 m E	205 m NNE	Agri	Agri	Agri	Agri		
143	SGJA-143	632161	1599279	663	Flat	S1 Kuccha Structure at Field	S1: 442 m E	S1 Temporary	..	Hosur Sagalagatte	1.04 km N 924 m SW	NA	..	412 m E	570 m SSE	Agri	Agri	Agri	Agri		

** As per IFC ENVIRONMENTAL, HEALTH, AND SAFETY GUIDELINES WIND ENERGY August 7, 2015 the minimum setback distance is 1.5 x turbine height (tower + rotor radius) which is computed to be 1.5 x (127 + 57) = 276 m.*

3.2 PROJECT OVERVIEW

The proposed 300 MW wind power project will be based on WTG of Siemens Gamesa. The technology used for the projects are given as below:

Project Title	WTG Technology
300 MW SECI VI	The Project Company is expected to execute an agreement with M/s. Siemens Gamesa Renewables for Supply, Engineering, Erection Commissioning and O&M of Wind Turbine Generators for this project.

Other Salient features of the Project:

SPV	PPA Company	Name of Project	Wind MW	PPA Agency	PPA
Ostro Kannada Power Private Limited	Ostro Kannada Power Private Limited	300 MW (SECI VI) Wind Power Project	300	SECI	15-Oct-19

The Project comprises of 143 WTGs and minimum distance that has been maintained between WTGs is 500 m. As part of the ESIA study, social and environmental sensitivities were identified for each of the WTG locations. Any structures that fall in a 500 m radius of a proposed WTG were identified as a receptor for shadow flicker assessment and noise impact. The WTG profiling for the wind farm is given in **Table 3-3.** Below are the details of 300 MW Wind Power Project in Davanagere, Bellary & Chitradurga District, Karnataka provided in Table 3.4.

Table 3-4: Overview of 300 MW Wind Power Project

Parameters	Description
Location	143 WTGs are located across 38 nos. villages i.e. Alur, Lokikere, Hullikere, Kenchamalanhalli, Yerrahali, Bangarakkan gudda, Huchavanhalli, Anabur, Mugichukkanhalli, Chikamalanhalli, Hirekumbalakunte, Harlakatte, Hullehal, Nellikatte, Yellagodu, Issamudra, Chennapura, Matadhavvannahalli, Sagalgatte, Guttidurga, Taitoni, Madamuttenhalli, Ajjanppnahalli, Rastamachekere, Kalagere, Gollarahalli, Kotadagudda, Nagathihalli, Adavigollarahalli, Medaginakere, Karinamanahalli, Dibbadahatty, Byranaikanahalli, Rangavvanahalli, Kakabalu villages in Jagalur, Kudligi & Chitradurga Taluka, Davanagere, Bellary & Chitradurga District in the State of Karnataka, India.
Type of WTGs	143 WTGs with a capacity of 2.1 MW each with a rotor diameter of 114 m and 127 m tower height. (Model: SG114 -2.1 MW)
Power Evacuation	• The project will consist of approximately 78 km of external transmission

	line from PSS Phase I to GSS and 26.47 km from PSS Phase II to PSS Phase I. The power will be evacuated from PSS I as whole of 300 MW consist of output from PSS Phase I & II.
Land Requirement	• 143 WTG are proposed on private land only. • Approximately 3.5 to 4 acres land is required including the access road is required per WTG; • Land parcels for 80 out of the 143 WTG locations have already been finalized consist of private land through Willing buyer – Willing Seller Transaction; • 7 acres of land for PSS Phase I & 6 acres for PSS Phase II has also been procured for the pooling substation.
Project Status	• 30 WTG are already operational which were procured by Siemens Gamesa. • Agreement to sell is signed for 80 WTG locations out of which 45 WTGs are already erected and construction work with piling, foundation and erection of WTG's at few locations is under process • Construction phase is anticipated to be completed in a phased manner by the end of March 2022

The Technical Specification of Wind Turbine is presented in **Table 3-5** and the details have been provided in subsequent sections.

Table 3-5: Technical Specification of WTGs

Components/Model	Siemens Gamesa SG2.1-114
General Parameters	
Turbine	SIEMENS GAMESA, SG2.1 – 114
Rated Output	2.1 MW
Wind Class	IEC IIA/IIIA/S
Control	Pitch and Variable Speed
Standard Operation Temperature	Range from -20ºC to 40ºC
Tower Information	
Tower Height	127 m
Tower Type	Multiple technologies available
Generator	
Gear Box Type	3 Stages
Generator Type	Doubly-fed induction machine
Voltage	690 V AC
Frequency	50 Hz/60 Hz
Protection Class	IP 54
Power Factor	0.95 CAP-0.95 IND throughout the power range
Rotor Information	
Rotor Diameter	114 m
No. of blades	3
Length of the blade	56 m
Blade Material	Fiberglass reinforced with epoxy or polyester resin
Swept area	10207 m^2
Power Density	205.74 W/m^2

3.3 SITE SETTING

The site selected for 300 MW has been identified based on the wind data, geotechnical investigations, ease of land procurement, and the distance from main substation, line construction length and complexity required for line construction.

Site Selection criteria

The main factors considered for selection of a suitable site are:
a) Availability of adequate land for power plant along with suitability for operational facilities.
b) Land Topography, terrain and Geotechnical conditions
c) Annual Wind Resource Availability
d) Evacuation Infrastructure of power
e) Market requirement for power
f) Minimal rehabilitation requirement
g) Environmental compatibility
h) Road Connectivity and access to other infrastructure facilities.

The micro-siting for the project has been completed for the project and on the basis of the same locations were finalized and the land is being acquired accordingly. The project area is characterized by rural setup, flat rainfed agricultural land and few patches of barren dry land with minor undulation. The project area has an elevation in the range of 660 - 666 m above mean sea level for Phase I and elevation in the range of 656- 760 m above mean sea level for Phase II. As per the revenue records, the land use of the project area is classified as rainfed agricultural land and few patches of barren dry land with minor undulation. The project area comprises of seasonal crops which includes cotton, groundnut, sunflower, maize depending on the availability of water. The approach roads are mostly kachcha village roads with few stretches of black top road and concrete roads (when it passes through the villages).

The construction of pooling substation Phase I is completed and commissioning is under process in Anabur village. Further, construction was observed to be ongoing for PSS phase II in Nallikatte village at the time of site survey conducted. The proposed Wind Turbines of Phase I cluster will be connected to Plant's Internal 33 / 220 kV Pooling Substation PSS I & Phase II near Village Anabur and Nallikatte respectively. The wind power from proposed 300 MW project will be evacuated at the PGCIL 400/220 kV Hiriyur Grid Substation located near village Beerenahalli in Hiriyur. The Power from Pooling Substation Phase II will be evacuated to PSS Phase I through 26.47 km long 220 kV Single Circuit Transmission Line along with associated bay and metering infrastructure and the overall power from 300 MW wind power

project (PSS Phase I) is expected to be evacuated to PGCIL Substation, Hiriyur through 78 km long 220 kV Single Circuit Transmission Line along with associated bay and metering infrastructure.

The project area of Influence (AoI) does not fall within any sensitive receptors viz. Wildlife Sanctuaries, Biosphere Reserves, National Parks etc. Also, there are no migratory pathways for avian fauna. No forest land is associated with the land taken for the project. The peacock corridor is at a distance of 1.63 km in NE direction from SGJA 06; 1.57 km in NNE direction from SG JA-07; 1.28 km in SW direction from SG JA-70 and at a distance of 4.68 km in SW direction from PSS Phase I.

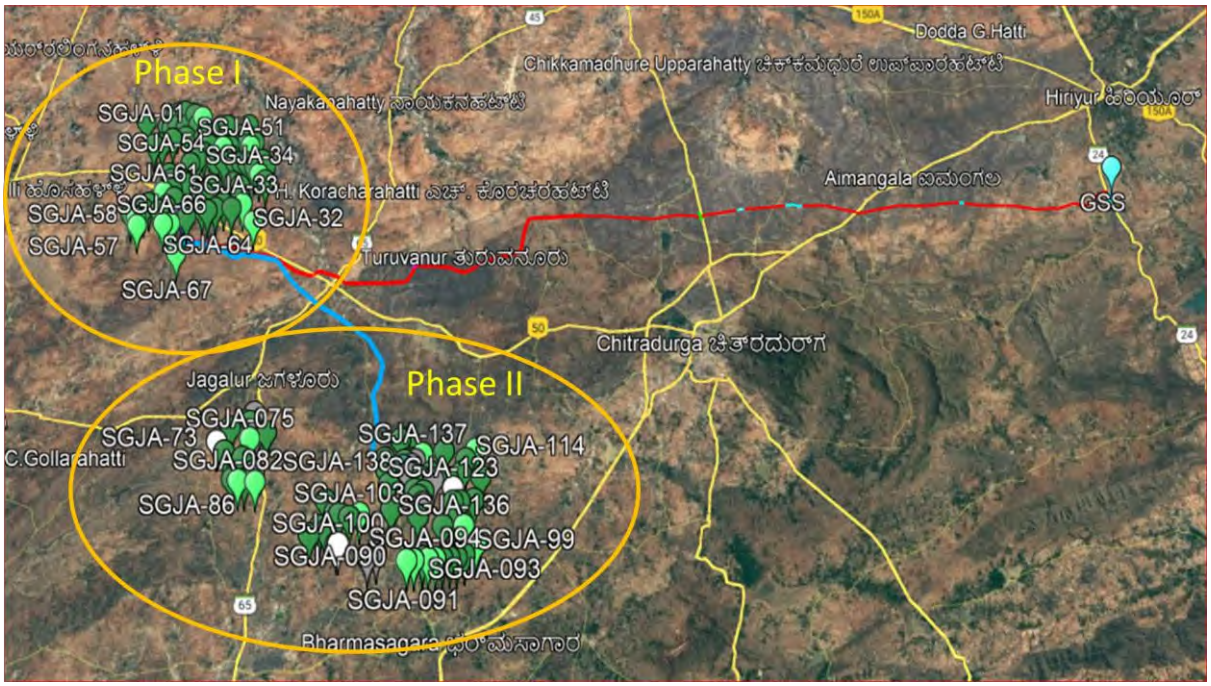
Rangayyanadurga Four Horned Antelope Wildlife Sanctuary boundary is located at 1.4 km of project area (WTG - SGJA-73; WTG-SGJA-78) and Eco-sensitive zone of Rangayyanadurga Four Horned Antelope Wildlife Sanctuary falls partially within the project area however the construction activities are yet to be initiated at WTG SGJA-78 and land for WTG-SGJA-73 is yet to be finalized.

The 2 WTG locations (SGJA-78 and SGJA-73) fall within the ESZ area of Rangayyanadurga Four Horned Antelope Wildlife Sanctuary. Rangayyanadurga Four Horned Antelope Wildlife Sanctuary Eco-sensitive zone is located at 11.8 km distance from transmission line.

Further, the transmission line from Phase II to Phase I & from Phase I to GSS also does not pass through any sensitive areas. Also, there are no structures of archaeological significance in the Study Area.

There are three wind power projects in the vicinity of the project namely; 110.5 MW Cleanmax Hybrid project adjacent to the project, 19.5 MW Windfarm in Anabur of S S Renewable Energy Ventures Pvt. Ltd. and another Wind Power Project in Lingannanahalli village at 7 km in south east direction. Also, a 10 MW Solar Power Project of Vedanga Energy Private Limited is located at 0.7 km from the project site in north direction and another solar plant in Mudlamachikere village. Chitradurga district is located at 35 km south of the project site which has one of the largest hub of wind power project in Karnataka.

Environmental assessment was done at WTGs for which the micro siting is complete and where currently construction is going on as shown in the figure below:



View of Project Site and Transmission Line from PSS II to PSS I & PSS I to GSS

View of Pooling Substation I, Anabur village

View of 400 kV / 220 kV PGCIL Hiriyur Substation at Beeranhalli village

View of PSS Phase II (under construction) at Nellikatte village

View of Internal Transmission line from WTGs to PSS

	
WTG SJGA - 14	WTG SJGA - 1

View of Construction activity at Project site

View of Transmission line from PSS I to GSS

View of Village road leading to project site

View of WTG access road from village road

View of Storage yard near WTG SGJA -15

View of erected WTG SGJA -15

View of agricultural crop near project site

View of NH-50 leading to project site

View of roads leading to project site

	
SGJA 78 – S1	SGJA 13 – S1
	
SGJA 141 – S2	KSGJA 67 – S4
	
SGJA 80 – S2	

View of Permanent structures within 500 m of WTGs

View of Peacock corridor near project site

View of other projects in the vicinity

Figure 3-3: View of the Project Site and surrounding areas

3.4 WIND POWER GENERATION TECHNOLOGY

In wind energy generation, kinetic energy of wind is converted into mechanical energy and subsequently into electrical energy. Wind has considerable amount of kinetic energy when blowing at high speeds. This kinetic energy when passes through the blades of the wind turbines, it is converted into mechanical energy and rotates the wind blades. When the wind blades rotate, the connected rotor also rotate, thereby producing electricity with the help of a

generator connected to the rotor. Typical construction of Wind farm is given below in **Figure 3-4**.

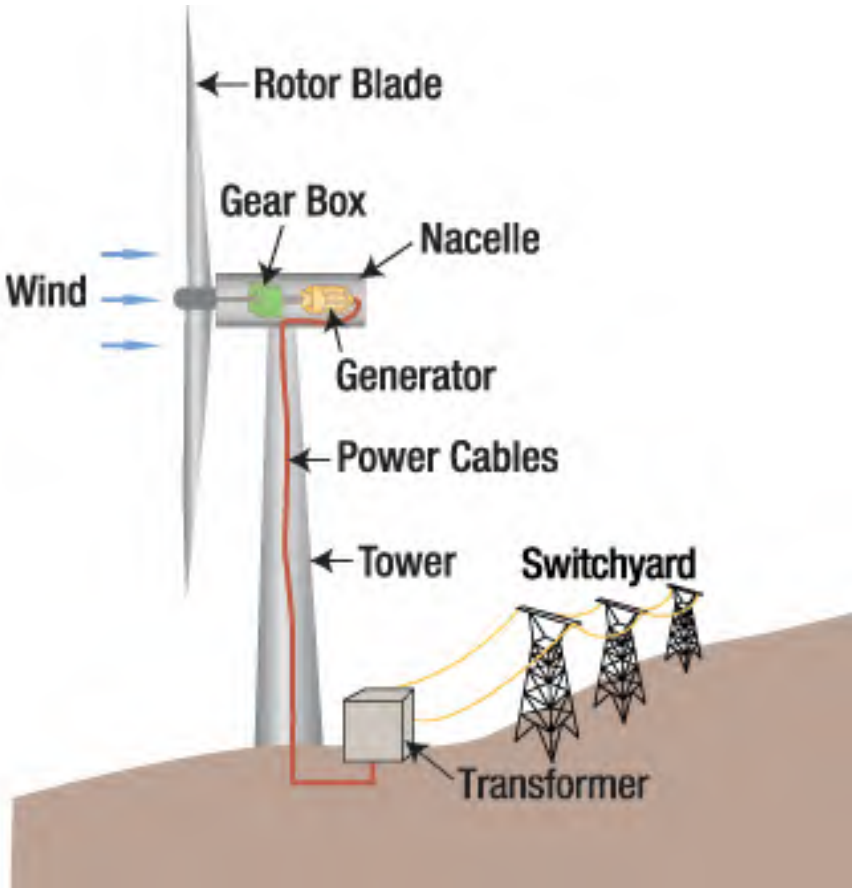


Figure 3-4: Schematic Diragram of Wind Power Plant

Wind Turbine

The wind turbine is a three bladed, upwind, horizontal-axis turbine. The turbine rotor and nacelle are mounted on top of a tubular tower.

The machine employs active yaw control (designed to steer the machine with respect to the wind direction), active blade pitch control (designed to regulate turbine rotor speed), and a generator/power electronic converter system.

The wind turbine features a distributed drive train design wherein the major drive train components including main shaft bearings, gearbox, generator, yaw drives, and control panel are attached to a bedplate. Wind turbine parts are shown in the below figure **Figure 3-5**.

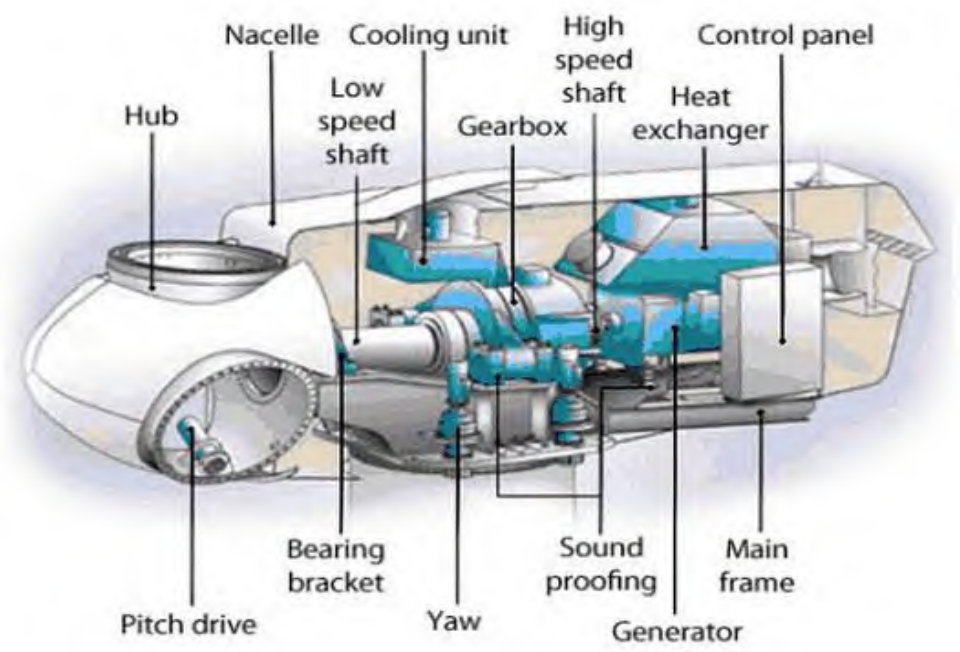


Figure 3-5: Generator mechanism Details

Rotor

The rotor is designed to operate between specific rpm. Rotor speed is regulated by a combination of blade pitch angle adjustment and generator/converter torque control. The rotor spins in a clock-wise direction under normal operating conditions when viewed from an upwind location.

Full blade pitch angle range is approximately 90°, with the 0°-position being with the airfoil chord line flat to the prevailing wind. The blades being pitched to a full feather pitch angle of approximately 90° accomplishes aerodynamic braking of the rotor; whereby the blades “spill” the wind thus limiting rotor speed.

Blades

There are three rotor blades used on each wind turbine. The airfoils transition along the blade span with the thicker airfoils being located in-board towards the blade root (hub) and gradually tapering to thinner cross sections out towards the blade tip.

Blade Pitch Control System

The rotor utilizes three (one for each blade) independent electric pitch motors and controllers to provide adjustment of the blade pitch angle during operation. Blade pitch angle is adjusted by an electric drive that is mounted inside the rotor hub and is coupled to a ring gear mounted to the inner race of the blade pitch bearing Active-pitch controller enables the wind

turbine rotor to regulate speed, when above rated wind speed, by allowing the blade to "spill" excess aerodynamic lift. Energy from wind gusts below rated wind speed is captured by allowing the rotor to speed up, transforming this gust energy into kinetic which may then be extracted from the rotor.

Three independent back-up units are provided to power each individual blade pitch system to feather the blades and shut down the machine in the event of a grid line outage or other fault. By having all three blades outfitted with independent pitch systems, redundancy of individual blade aerodynamic braking capability is provided.

Hub

The hub is used to connect the three rotor blades to the turbine main shaft. The hub also houses the three electric blade pitch systems and is mounted directly to the main shaft. Access to the inside of the hub is provided through a hatch.

Gear Box

The gearbox in the wind turbine is designed to transmit power between the low-rpm turbine rotor and high-rpm electric generator. The gearbox is a multi-stage planetary/helical gear design. The gearbox is mounted to the machine bedplate. The gearing is designed to transfer torsional power from the wind turbine rotor to the electric generator. A parking brake is mounted on the high-speed shaft of the gearbox.

Bearings

The blade pitch bearing is designed to allow the blade to pitch about a span-wise pitch axis. The inner race of the blade pitch bearing is outfitted with a blade drive gear that enables the blade to be driven in pitch by an electric gear-driven motor/controller.
The main shaft bearing is a roller bearing mounted in a pillow-block housing arrangement. The bearings used inside the gearbox are of the cylindrical, spherical and tapered roller type. These bearings are designed to provide bearing and alignment of the internal gearing shafts and accommodate radial and axial loads.

Brake System

The electrically actuated individual blade pitch systems act as the main braking system for the wind turbine. Braking under normal operating conditions is accomplished by feathering the blades out of the wind. Any single feathered rotor blade is designed to slow the rotor, and each rotor blade has its own back-up to provide power to the electric drive in the event of a grid line loss.
The turbine is also equipped with a mechanical brake located at the output (high-speed) shaft of the gearbox. This brake is only applied as an auxiliary brake to the main

aerodynamic brake and to prevent rotation of the machinery as required by certain service activities.

Generator

The generator is a doubly-fed induction type. The generator meets protection class requirements of the International Standard IP 54 (totally enclosed). The generator is mounted to the bedplate and the mounting is designed so as to reduce vibration and noise transfer to the bedplate.

Flexible Coupling

Designed to protect the drive train from excessive torque loads, a flexible coupling is provided between the generator and gearbox output shaft this is equipped with a torque-limiting device sized to keep the maximum allowable torque below the maximum design limit of the drive train.

Yaw System

A roller bearing attached between the nacelle and tower facilitates yaw motion. Planetary yaw drives (with brakes that engage when the drive is disabled) mesh with the outside gear of the yaw bearing and steer the machine to track the wind in yaw. The automatic yaw brakes engage in order to prevent the yaw drives from seeing peak loads from any turbulent wind. The controller activates the yaw drives to align the nacelle to the average wind direction based on the wind vane sensor mounted on top of the nacelle.

A cable twist sensor provides a record of nacelle yaw position and cable twisting. After the sensor detects excessive rotation in one direction, the controller automatically brings the rotor to a complete stop, untwists the cable by counter yawing of the nacelle, and restarts the wind turbine.

Tower

The wind turbine is mounted on top of a tower. The tower is manufactured in sections. Access to the turbine is through a lockable steel door at the base of the tower. Service platforms are provided. Access to the nacelle is provided by a ladder and a fall arresting safety system is included. Interior lights are installed at critical points from the base of the tower to the tower top.

Nacelle

The nacelle houses the main components of the wind turbine generator. Access from the tower into the nacelle is through the bottom of the nacelle. The nacelle is ventilated. It is illuminated with electric light. A hatch at the front end of the nacelle provides access to the blades and hub. The rotor can be secured in place with a rotor lock.

Anemometer, Wind Wane and Lightning Rod

Anemometer, wind vane and lightning rod are mounted on top of the nacelle housing. Access to these sensors is accomplished through a hatch in the nacelle roof.

Ligthning Protection

The rotor blades are equipped with a lightning receptors mounted in the blade. The turbine is grounded and shielded to protect against lightning, however, lightning is an unpredictable force of nature, and it is possible that a lightning strike could damage various components notwithstanding the lightning protection deployed in the machine.

Wind Turbine Control System

The wind turbine machine can be controlled automatically or manually from either an interface located inside the nacelle or from a control box at the bottom of the tower. Control signals can also be sent from a remote computer via a Supervisory Control and Data Acquisition System (SCADA), with local lockout capability provided at the turbine controller.
Service switches at the tower top prevent service personnel at the bottom of the tower from operating certain systems of the turbine while service personnel are in the nacelle. To override any machine operation, Emergency-stop buttons located in the tower base and in the nacelle can be activated to stop the turbine in the event of an emergency.

Power Converter

The wind turbine uses a power converter system that consists of a converter, a DC intermediate circuit, and a power inverter on the grid side.
The converter system consists of a power module and the associated electrical equipment. Variable output frequency of the converter allows operation of the generator.

Other Auxiliary

The electrical system consists of LT & HT switchgear, transformer, switchyard equipment, MCC, DC system, and lighting, UPS, emergency power supply, and earthling and associated protection devices.

SCADA and Monitoring

The Plants' shall have an independent integrated SCADA system that shall be controlled and monitored from the respective main control / switchgear rooms. The SCADA system will be a combination of web based internet portal solution and on site local area network for acquisition of data through onsite servers located in plant main control / switchgear rooms. In addition to the plant with integrated SCADA system for controlling and monitoring the wind plant and the switchyard, the projects shall also comprise of a Central Monitoring Station (CMS) within the project boundary. The CMS would be located in a dedicated building that

may have an administrative office and a facility centre. The plant shall incorporate a communication system to monitor all the individual inputs of the Wind turbines so that system faults can be detected and rectified before they have an appreciable effect on energy generation.

3.5 POWER EVACUATION AND GRID CONECTIVITY

Power Evacuation Transmission Line

The entire wind power plant will be integted with Supervisory Control and Data Acquisition (SCADA) system. The generated energy from PSS Phase II will be evcauted to PSS Phase I and the energy generated from 300 MW (Phase I & II) wind power plant is proposed to be evacuated to the 400 kV / 220 kV PGCIL Hiriyur Substation, Beerenahalli (Hiriyur) at approx. 78 Km from the project site boundary.

Transmission line and infrastructure required for evacuation for 300 MW WPP is developed and maintained by OKPPL. Interconnection point / delivery point is understood to be at substation; therefore, 300 MW plant is metered for revenue generation at the evacuation substations. Transmission line losses are accounted in the OKPPL's scope.

Power Evacuation approval is required to be obtained for the proposed 300 MW Wind Power project.

Power Evacuation

Pooling Substation	
Internal Evacuation Voltage Level	66 kV
Location	Phase I - Village Anabur, Taluka Jagalur, Dist. Davanagere Phase II - Village Nallikatte, Taluka Chitradurga, Dist. Chitradurga
Coordinates – Latitude, Longitude	Phase I: 14°35'43.38"N, 76°25'27.68"E Phase II: 14°24'40.36"N, 76°16'31.21"E
Pooling Substation Ownership	Project Company
Substation Voltage Level	33 kV / 220 kV
Transmission Line	
TL Voltage Level	220 kV
Type	Single Circuit EHV
Length	Phase I to GSS: 78 km Phase II to Phase I: 26.47 km
Connecting Grid Substation	
Evacuation Voltage Level	220 kV
Location	Village Beerenahalli, Taluka Hiriyur, Dist. Chitradurga
Coordinates – Latitude, Longitude	13°57'10.66"N, 76°32'17.52"E
Substation Ownership	PGCIL (Power Grid Corporation of India Ltd.)
Substation Voltage Level	400 kV / 220 kV

A visual inspection of the proposed transmission line was done during Site Visit starting from the project pooling substation Phase II at Nallikatte village to the project pooling substation phase I and further from PSS phase I to PGCIL Hiriyur Substation, in Beerenahalli, Hiriyur. Transmission line was observed to be passing through mostly rainfed agricultural land with some patches of barren land. No major settlement or structure, water body, reserved forest land, Gauchar land, hilly terrain, marshy low lying of submersible areas, oil and grease storage, military firing range or aerodrome was found in the route of the transmission line.

The transmission line route selected has avoided all the sensitive areas like reserved forest, water bodies, large settlements etc.

Figure 3-6: Transmission Line Route for the proposed project (PSS I to GSS)

Figure 3-7: Transmission Line Route for the proposed project (PSS II to PSS I)

3.6 LAND REQUIREMENT

Land for the wind power project is required for the following components;

- Wind Turbine Generators (WTGs);
- RoW for transmission lines – internal and external;
- Access Roads – internal and external
- Pooling Substation (PSS);
- Temporary Labour Camps;
- Batching plant; and
- Material Storage.

Land may also be required for the central monitoring station and other utilities like canteen etc. depending upon the need. The details of land requirement for the various components and the present status of the land procurement and process followed for the same is captured below.

The details of the project and its associated facilities facilities are given below in **Table 3-5**.

Table 3-6: Component breakup of land area required for the Project

Project Facilities	Land Area (in acres)	Land Use Classification		
		Forest	Government	Private
Wind Turbine	~548 acres	No	-	✓
Access Roads	RoW	No	✓	✓
Substation/Switchyard/ Administration Building	Phase I: 7 acres Phase II: 6 acres	No	-	✓
Internal Transmission Lines up to Pooling Substation	ROW requirement yet to be estimated by OKPPL	No	-	✓
External Transmission Lines up to Grid Substation from PSS I (approx.78 km length)	ROW is 35 m	No	-	✓

Based on pitch selection, the project can be developed optimally in the available land area. This includes the WTGs, Pooling Substation, array yard, inverter room and main control room, roads, and other utilities. However, array yard occupies most of the space, hence, must be optimized. Also the approach road connecting to wind project site is a 5 m wide village road which can be used for transportation of equipments and machinery. No forest land and revenue land, assigned land, land under litigation has been acquired for the project.

Around 548 acres of land for installation of WTGs including access roads from Jagalur, Kudligi & Chitradurga Taluka villages will be acquired for the project. The site can be classified as flat rainfed agricultural land and few patches of barren dry land with minor undulation. Out of total 548 acres og land, 280 acres of private land on Willing Buyer-Willing Seller transactions has been acquired for the project till date. However, since land acquisition is in progress for the proposed project project and remaining 2683 acres of land are yet to be acquired for the project therefore OKPPL should ensure adherence w.r.t. Willing Buyer-Willing Sellor approach adopted in the project for the proposed project and avoidance of Physical and Economic displacement issues, if any.

3.6.1 LAND PROCUREMENT FOR WIND POWER PROJECT

Land Types: -

- Private Land: Private land can be purchased or leased directly from the willing owner of the land based on the mutual agreement with the Land Owner. The identified site may be owned by more than one individual which may require negotiating with each of them. The land is either bought or leased based on the mutual agreement with the Land Owners.
- Government Land: Government is the sole/ lead custodian of the land. It can be allotted to for development of Renewable energy project for sale or lease based on the laid down norms of the Government's respective departments. In most of the case, such land is made available to the Project Company on Lease for a period of 25-30 years.

Selection Criteria and Feasibility of the Project land: -

The area for development for Wind project is generally based on the topology of land, climatic conditions with preference to wind speed, favorable Slope of the land and areas with reasonably fewer cloud cover hours, etc. Another important aspect is to have negligible or Nil impact of the project on livelihood or requirement of resettlement by identifying barren/ fallow/ uncultivated land. It is also preferable to have the land nearer to the Grid Connecting substation and adjacent to Road in terms of Approach Connectivity.

Procedure of Land Acquisition:

The procured land is mostly dependent on rain-fed agriculture pattern on seasonal crops and barren land. The compensation for the purchased land is reportedly above the existing government circle and market rate. No physical displacement happened due to the project and private land has purchased through good faith negotiations based on willing sellers and willing buyer basis, which was confirmed on the basis of following;

- Evalution of Agreement to Sell
- Primary consultation with landowners
- Consultation with land aggregator
- Discussions with Revenue Department related to prevailing rates
- Analysis of market value of land to verify compensation provided to landowners are higher than the circle rate. **(Annexure-IV).**
- Evaution of Land Acquisition procedure and assessment that all land was purchased from one seller, and
- Interactions with land sellors and Sarpanch to ensure that nobody was pursued for selling who did not want to sell his land for any reasons known to him.

There are six land aggregators involves fot the land acquisition of the proposed project namely:

- *Revana*
- *Virtuz*
- *Aqua Reality Solutions*
- *RPR*
- *Lawrence Deltekar*
- *Venakatesh Kulkarni*

The procedure in land acquisition involves purchasing land on the basis of General Power of Attorney (GPA) in the name of six different land aggregators from individual farmers on payment of market value/fixed between the both parties which will further transferred in the name of OKPPL i.e. six land aggregators. OKPPL has signed Land Aggregation Agreement which stipulate various conditions for acquiring the land. The land sellers willing to sell land provide documents related to land and then a thorough due diligence is carried out by Land aggregators and OKPPL land team. The mutually agreed compensation is paid to the land sellers after executing GPA in form of a cheque. The GPA holders will then give the Agreement to Sell (ATS) to land aggregators. As per Section 109 and after sec 109 approval land aggregators on behalf of OKPPL can purchase the lands from GPA holders.

The procedure for land acquition for the project is as follows:

- OKPPL appoints six land aggregators as provided above.
- OKPPL provide the coordinates to each land aggreagator for identififcation of land for 143 WTGs
- Land aggregators approaches land owners for purchase of land
- Willing land owners provide documents related to land
- Due Diligence is carried out by Land Aggregators and OKPPL Land Team
- Clearance for purchase is received

- Land aggregator consults and negotiates with land owners regarding compensation for land purchase
- Pre-Agreement to Sell (ATS) is signed by the individual land seller in the name of land aggregators by providing some token money through land aggregators
- ATS is signed by the individual land seller in the name of land aggregators by providing agreed compensation is paid in the form of cheque
- Non - agricultural report is obtained
- Land Sale deed is signed by the individual land seller in the name of land aggregators
- Land Aggregators will transfer the sale deed in the name of "Ostro Kannada Power Private Limited".

This project property does not involve any resettlement and rehabilitation in terms of physical and economical aspects hence do not attract Resettlement and Rehabilitation plan as per applicable national / state legislation. The rates offered to PAP have been considered based on market rates determined by Department of Stamps and Registration, Karnataka. The land is acquired on willing buyer-willing seller (WBWS) considering that

- Land markets or other opportunities for the productive investment of the sales income exist;
- The transaction took place with the seller's informed consent; and
- The seller was provided with fair compensation based on prevailing market values. These principles should apply to land consolidators, aggregators, or land developers in order to ensure fair property transactions.

3 land parcels have been acquired from the persons belong to Schedule tribe community in Kanamadagu (Alur) village however all land parcels from one ST family was procured headed by Deputy Sarpanch whose land parcel has also been acquired for the project. However, no assigned land and land for Common Property Resources like grazing land has been acquired for the project till date. The land acquisition has already taken place for 280 acres on "Willing Buyer-Willing Seller basis" and the land sellers have been compensated with the mutually agreed sale price which minimum 3-4 times higher than the government circle rate and 2-2.5 times higher than the open market private rate for Wind Power Project.

During stakeholder consultations, it was inferred that land sellers have voluntarily given land parcels to the project and were observed to be contented. As there was not much income earlier generated from the rainfed agricultural sinle crop land given for the project. No physical displacement has been taken place in the transaction. Further, no issues related to landlessness were observed. The land sellers have alternative land parcels apart from land provided for the project.

The land was purchased on willing buyer-willing seller (WBWS) mode following the the guidance based on IFC PSs:

IV. Land markets or other opportunities for the productive investment of the sales income exist and on basis of discussions with land sellers; it was inferred that the land sellers will utilize amount received from selling off rainfed land parcels given for the Project to OKPPL for purchase of agricultural land in the nearby áreas and for adoption of mechanized agricultural practices
V. The transaction took place with the seller's informed consent; and
VI. The seller was provided with fair compensation based on prevailing market values as described below.

Villagers and land providers expressed positive perception about the wind power project as it will increase economy in the area. Some of them had taken medical expenditure loan which they will repay and few land sellors will use for marriage of children.

The government rates for the dry land is Rs. 1,00,000 to 2,00,000 per acre, for wet land is Rs. 1,25,000 to 3,00,000 per acre **(Annexure IV)**. The open market rate varies between 2.5-3.0 lakhs. The land sellers have been provided a fixed rate per acre for wind power has been given fixed rate which is 2-2.5 times of the market rate.

OKPPL has also followed the norms:

(iii) seller's informed consent; and
(iv) the seller was provided with fair compensation based on prevailing market values.

In addition, following criteria's were ascertained during selection and acqusition of land for the project that:

- No land sellers had structures on the land;
- No revenue land, Gauchar land (common land for grazing), reserved forest land has been acquired;
- No land owner took land for land or cash or became landless;
- The transaction took place with the seller's informed consent;
- The seller was provided with fair compensation based on prevailing market values;
- All acquired land for the project is private land; and
- No revenue land has been acquired for the project.

3.6.2 LAND PROCUREMENT AND SPECIFIC ISSUES RELATED TO THE PROJECT

On the basis of the information available presently, some of the observations especially with respect to the project related land procurement are mentioned below.

Forest land

The WTGs and PSS are being developed on private rainfed agricultural land and few patches of barren dry land with minor undulation. As reported, no forest land will be used for the project. Till date, no forest land has been acquired for land acquired for 80 WTGs.

However; Rangayyanadurga Four Horned Antelope Wildlife Sanctuary boundary is located at 1.4 km of project area (WTG - SGJA-73; WTG-SGJA-78) and fall within the ESZ area of Rangayyanadurga Four Horned Antelope Wildlife Sanctuary. Therefore; NOC from Forest and Wildlife Department is required for the project.

Tribal (Scheduled Tribe) land[3]

The land in the study area predominantly belongs to caste Hindus such as Brahmins and OBC's. Only 23.92% Scheduled Castes (SC) were reported in project villages whereas 22.96% Scheduled Tribes (ST) is reported in project influenced villages.

In the present project, 3 nos. of land parcel has been acquired from ST community of Kanamadagu (Alur) village for Wind Project footprint.

Schedule V Area[4]

The project area does not fall under Schedule V area as defined in the Indian constitution.

Landlessness

Consultations was performed with land sellers from whom the land for WTGs and PSS has been procured. There are six land aggregators engaged for land procurement by OKPPL and the PAPs, local communities indicated that sale of land for WTGs and PSS has not resulted in landlessness of any land seller till date. Land aggregators are briefed by OKPPL not to

[3] Article 366 (25) of the Indian Constitution defines scheduled tribes as "such tribes or tribal communities or parts of or groups within such tribes or tribal communities as are deemed under Article 342 to be Scheduled Tribes for the purposes of this constitution". The criterion followed for specification of a community, as scheduled tribes are indications of primitive traits, distinctive culture, geographical isolation, shyness of contact with the community at large, and backwardness. This criterion is not spelt out in the Constitution but has become well established. Source: Official website of the Ministry of Tribal Affairs (MoTA), Government of India (GoI). URL:

http://tribal.nic.in/Content/DefinitionpRrofiles.aspx. Accessed on 27.08.2016.

[4] In the Constitution of India, the expression "Scheduled Areas" means such areas as the President may by order declare to be Scheduled Areas. The criteria followed for declaring an area as Scheduled Area are preponderance of tribal population; compactness and reasonable size of the area; under-developed nature of the area; and marked disparity in economic standard of the people. These criteria are not spelt out in the Constitution of India but have become well established. (Source: Official website of the Ministry of Tribal Affairs (MoTA), Government of India (GoI). URL:
http://tribal.nic.in/Content/DefinitionofScheduledAreasProfiles.aspx. Accessed on 27.08.2016

take entire land from any land seller and to acquire only partial land from an individual in order to ensure no adverse impacts on PAP's due to land acquisition.

Encroachment

No encroachments were observed in any of the land parcels for WTGs and PSS land and in the RoW corridor for the 66 kV internal and 220 kV external transmission lines. Review of the ATS copies of the land parcels for the WTGs and consultations with the land aggregators confirm that the entire project- related land requirement has been sourced from private land owners.

Common Property Resources (CPR)[5]

No CPRs like Gaumal (grazing land) were reported on any of the land parcels for WTGs and PSS land and in the RoW corridor for the 66 kV internal and 220 kV external transmission lines.

NOC from Panchayat

The State of Karnataka does not require solar or wind power projects to take a NoC (No Objection Certificate) from the Gram Panchayat of the impacted villages prior to initiation of construction activities. The project has obtained a No - Objection Certificate (NOC) from the Hiremallanahole Gram Panchayat of Jagalur Tehsil, Davangere District, Karnataka **(Annexure- V)** and the entire project land is converted into industrial category. The process is expected to take at least six months post the completion of purchase of all land parcels for the project.

Land use change

As indicated earlier, the project along with all its components is being set up on private land procured on a willing seller-willing buyer basis from individual farmers. All the land parcels are reported to be either under cultivation or are fallow land. Under such circumstances, the setting up of the wind power project will result in permanent land use change of the concerned land parcels from agriculture/ fallow to industrial category.

Karnataka Renewable Energy Policy 2014-2020

The state has a wind energy policy - the Karnataka Renewable Energy Policy 2014-2020 (Wind, Small Hydro, Biomass, Cogeneration and MSW)6 Clauses relevant to the procurement of private land, allotment of government land and diversion of forest land mentioned in the policy are as follows;

[5] Common Property Resources (environmental) are natural resources owned and managed collectively by a community or society rather than individuals

[6] Draft Karnataka Renewable Energy Policy 2014-2020 (Wind, Small Hydro, Biomass, Cogeneration and MSW). URL: http://kredlinfo.in/Policy/RE%20Policy%202014-20.pdf. Accessed on 27.08.2016.

Clauses relating to private land:

- Clause 13: Land (b): If the required land is private land, Developer has to acquire the same directly from land owners by any mode of transfer. If it is on lease, the minimum period of lease shall be 30 years; and
- Clause 18: Policy initiatives under consideration of GoK to promote Renewable power projects (Land): Necessary amendments to section 79 (1), 79 (b) and 80 of the Karnataka Land Reforms Act are to be made to enable the Renewable Energy project developers to purchase suitable private land directly form the owners of the land.

Regarding Government land:

- If the required land belongs to Government, the Developer shall approach concerned Department, i.e., Revenue/ Forest or irrigation Department, as the case may be for obtaining the land on lease basis in favour of the company, as per the circular No: **RD 78 LPG 2009 dated 4.1.2011** and subsequent orders of Revenue Department. Revenue Department will directly lease the land to the company for a period of 30 years. At the end of 30 years, the lease shall be extended for 5 years at a time, subject to condition stipulated by Government.

Regarding Forest land:

- In case, the land belongs to Forest Department, Forest Department should issue facilitation letter as per the standard draft by MoEF, GoI, New Delhi vide letter No: **F.No: 11-113/ 2008 FC dated 30.12.2008** and subsequent orders.

Hand over the land to project team: -

Once all the commercial transaction and documentation is completed for required land, it is then handed over to the project team for the further development of the wind power project.

Reportedly, there is no requirement for acquiring land for the transmission line. The RoW permission will be required for transmission line connectivity to the 400/220 kV grid substation at Hiriyur taluka, Chitradurga district. The adequate compensation shall be paid as per Ministry of Power “Guidelines for payment of Compensation towards damages in regard to Right of Way for Transmission Lines”. As per this guidelines, Compensation towards diminution of land value in the width of Right of Way (RoW) Corridor due to laying of transmission line and imposing certain restriction would be decided by the States as per categorization/type of land in different places of States, subject to a maximum of 15% of land value as determined based on Circle rate / Guideline value / Stamp Act rates.

The approach route identified for the transmission line is based on a criterion to reduce the environmental and socioeconomic footprint of the transmission line. The shortest feasible route after considering following factors has been selected for the transmission line:

- Transmission line route does not fall under any habitations and thick vegetation
- No households or community structures are in the route of the transmission line
- All environmentally sensitive sites, archaeologically significant sites, areas of ecological and cultural significance have been avoided while selecting the route

3.7 POWER PURCHASE AGREEMENT

The Power Purchase Agreement (PPA) vide certificate No. IN-DL69239129406415R dated 30/10/2019 for the capacity of 300 MW has been obtained for the project from Solar Energy Corporation of India (SECI) which given in following table and same is enclosed as **Annexure III.**

SPV	PPA Company	Name of Project	Wind MW	PPA Agency	PPA
Ostro Kannada Power Private Limited	Ostro Kannada Power Private Limited	300 MW (SECI VI) Wind Power Project	300	SECI	30-Oct-19

3.8 MANPOWER REQUIREMENTS

During the regular construction stage, the average labour demand for the project was about 90-100 workers. The peak labour requirement for the project is about 200 persons. The manpower shall be hired locally from the nearby areas.

OKPPL shall employ locals as per requirement based on their skills and expertise in the construction as well as operational phase. In case of requirement of skilled manpower, it will be outsourced from neighboring States. In case of hiring labour from nearby States, a labour camp will be set up during construction.

The construction work will start as per government guidelines when the lockdown is lifted in the state of Karnataka with the COVID mitigation strategies suggested by the The Department of Labour, Karnataka State issued on 5th May 2020 for the migrant workers and for building and construction workers and given in *Annexure – II*. OKPPL is further required to ensure maintaining HSE documentation for all workforce engaged at Site along with COVID-19 safety training records at Site.

Adequate sanitation facilities will be provided for the labour. The labour camps for the Project will be provided within the site premises and will comprise of porta cabins. The security staff will be trained adequately in the use of force (and where applicable, firearms) and appropriate conduct toward workers and the local community and require them to act within the applicable law.

The manpower requirement during operation phase requirement is limited to about 31 nos (11 Tech Staff and rest security/contractor). The operation phase requirement is mainly for technician / skilled employees and Security Staff.

3.9 WATER REQUIREMENTS

Construction Phase

During the construction stage, the construction water requirement is estimated at 25 – 30 KLD per WTG. In addition, for the labourers engaged during construction, for whom the domestic water requirement will be 9 - 10 KLD. The cumulative water requirement during construction period is estimated at 40 KLD and the domestic wastewater generation is estimated at 8 -9 KLD. Hence the above estimation of daily water requirement would be significantly reduced by optimizing various activities during project implementation and scheduling manpower resources and other requirements.

During construction, water will be required for construction activities, domestic purposes and some drinking water for labourers and Project teams. For construction it is anticipated that 170 L of water would be needed for each m^3 of concrete. As the Project anticipates 180 m^3 concrete for the site, a total of 30,600 L of water per foundation would be required for construction activities. This water is being sources through tankers provided by neighbouring villagers.

At the peak of construction, approximately 200 people would be anticipated in the site at any given point mostly local manpower. Assuming an average of 4L of water per person, a total of 800 KLD of drinking water would be required at the maximum. Drinking water would also be sourced from nearby villages. The details of water requirement during construction phase is given below in **Table 3-7**.

Table 3-7: Water requirement during construction phase

Sr. No.	Area	Approximate Quantity	Source
1	Construction activities	30,600 L / foundation	Tanker Water

2	Domestic water requirement	10,000 L /day	Tanker Water
3	Potable water	800 L/day	RO/Packaged Water

The water requirement for the Project is presently being met from nearby villages. Further, there is a borewell in PSS Phase I used for meeting domestic water requirement. NOC needs to be obtained from Karnataka Ground Water Authority and water meter needs to be installed for monitoring water consumption.

Operation Phase

Approximately 2-3 KLD of domestic water will be required during the O&M phase. The water will be sourced from nearby villages through tankers.

3.10 CONSTRUCTION ACTIVITIES

OKPPL intends developing and implementing the Project through a strategic approach with a mix of turnkey implementation and multi-contract procurement strategy which will prove to be optimum. Following is a general flow of the activities that will take place in the implementation of the Project:

- Land development – This includes the land acquisition and registrations, investigation studies, land leveling and construction of pathways, fencing and site offices.
- Vendor selection of major packages - Selecting the vendors for major packages followed by preparation of detail designing, technical specification, bill of material.
- Procurement – This shall include procurement of various components through vendor bidding and techno-commercial evaluations.
- Building site infrastructure – Making provision of stores, labours, electricity and water for construction.
- Civil Construction – This shall include civil work required for evacuation substation and infrastructure like roads, trenches and buildings.
- Installation & Erection of evacuation systems including transmission line.
- Testing and Commissioning of all the components, grid connection and testing and commission of switchyard.

A comprehensive schedule indicating the associated tasks, timescale of each task, the ordering of key equipment and key deadlines may be prepared during detail designing of the project. However, first level implementation schedule of key activities is presented in the subsequent section.

3.10.1 SITE DEVELOPMENT

The site development activities for the proposed project will entail the following:

- soil investigations;
- site surveys;
- site leveling;
- construction of access roads;
- fencing of site;
- laying of foundations;

The land for the proposed site is fairly levelled and no major cutting and filling will be required.

Soil Conditions

In order to determine the actual safe bearing capacity of the soil and to understand the details of stratification, soil investigation fieldwork will to be carried out and the same shall be entrusted to experienced and reputed agency.

The foundation for the Wind Turbine Generators shall be designed taking into consideration the local soil conditions.

Site Clearance

The current status of the site is mainly arid land, intermingled with crop fields and bushing trees of 1 m to 1.2 m height; scattered some short-term plantations and small scale seasonal livestock feeding. The activities shall include:

- Clearing of weeds, chopping down of small bushes and trees.
- Levelling of land with excavation and back filling of soil, if required for project equipment movement.
- Construction of culverts on cross flow, if required.

3.10.2 APPROACH ROAD AND INTERNAL ROAD

Road and Surface Preparation

The site (Phase I) is accessible from the PWD and village road which connects to Solapur-Mangalore National Highway (NH-50) at 280 m from WTG SGJA 33. However, the proposed project site (Phase II) is connected to Jagalur Taluka via State Highway (SH-65) which further connects to SH-50 located at 9 km in the South-East direction. The wind site can be approached by black top PWD road that on north and south side for both Phase I & Phase II.

This road in turn leads to the individual WTGs with many kuccha village roads. The access road is kaccha which may lead to rough movement of transport vehicles during construction phase at few WTGs location. However, all the approach road will be made paved for the smooth movement of transport vehicles. These roads are required to be widened and strengthened for heavy movement of trailers and cranes. Approach road has to be constructed to carry the WTGs to site. Impact of the project on local infrastructure of the area such as road network will be minimal. OKPPL is advised to upgrade existing village road and develop any additional infrastructure would need to be constructed.

The strength of the road has been designed to carry the cranes and heavy trailers. At each tower location the surface shall be levelled and compacted for crane handling and tower assembly.

In order to assess the exact depth of cutting required for the proposed slope, the profile survey shall be done and it is proposed that the length of the road be increased if required to reduce the depth of cutting. For constructing the road and to prepare the top surface 3 numbers of series excavators will be deployed with the rocker buckets, two numbers of compressors, two numbers tippers, one number water tanker and one number of road roller will also be deployed for speedy execution of works.

Therefore, transportation of goods will be carried out by vehicles covered with tarpaulin sheets and a Traffic Management Plan (TMP) will be followed to avoid disturbance to the community during transportation of construction equipments and vehicles. Also, all construction and movement of vehicles will be limited to day time only and no work or transportation will be done at night time.

3.10.3 CIVIL WORKS

The foundation for the Wind Turbine Generator will be casted as per the design supplied by the manufacturer. In general, the entire wind generator manufacturing companies having different type of foundation for the same machine depends on the strata of the soil.

The design supplied by the company for the same will be done according to the relevant IS standards. The steel shall be of FE430 / FE 500 grade.

Before take up the construction activities the following factors will be considered.

- Soil bearing capacity of the particular location.
- Soil resistively.

3.10.4 ELECTRICAL WORKS

All the electrical infrastructure works will be carried out as per the IE rules and as per the specification of KPTCL / DISCOM for the designing and construction of electrical works.

3.10.5 CONSTRUCTION POWER SUPPLY

The construction power shall be met from stand-alone DG sets which shall be under scope of Contractor. Prior permission from KSPCB shall be taken if required for DG sets. However, handling of used oil and filled oil containers shall be in scope of contractors engaged for the project. Also, there shall not be any storage of Used Oil and Oil filled containers in the project premises.

3.10.6 CONSTRUCTION WASTE

The main construction waste expected from the construction activities are packing and material of Wind turbines, wires, inverters and other accessories, construction debris and construction debris. The major construction activities associated with proposed plant are erection and cementing of the base structure for module installation. Waste out material like used oil, empty paint cans, tins, etc. were found stored haphazardly at the site and no mechanism for disposal through a KSPCB/CPCB authorized vendor for handling hazardous waste was done.

3.11 OPERATION AND MAINTENANCE ACTIVITIES

The operation and maintenance phase includes the following activities:

- Regular remote monitoring of WTG operations;
- Normal greasing and cleaning of WTG components;
- Annual shut-down maintenance, which will mostly include cleaning and greasing, change of parts, etc.; and
- Internal road repairs, as and when required.

The design life of the Project is expected to be 20 years from the date of commissioning. Regular maintenance would be required to ensure that the turbines are kept in optimal working order. Most day-to-day facility operations are done remotely through the use of computer networks and a small team. Some limited maintenance and repair activities would need to be undertaken occasionally on site.

3.12 MAINTENANCE ACTIVITIES

The typical maintenance and repair activity during operation phase involves preventive and breakdown maintenance of WTGs and/or the related equipment in accordance with the safety management plans and procedures as applicable and/or in accordance with accepted industry practices.

The main objectives of the plant maintenance are to keep the plant running reliably and efficiently as long as possible. The reliability is impaired when a plant undergoes forced and unforeseen outages. This aspect assumes greater significance for a wind power plant exporting power to the State Electricity grid under contractual commitments. It is imperative that any planned maintenance is undertaken with closer coordination with State Electricity board substation.

The efficient operation implies close control not only over the cost of production but also over the cost of maintenance. There are two components in maintenance cost: one is the direct cost of maintenance, (i.e. the material and labour), and the other is the cost of production loss.

The following steps will help in reducing the breakdown maintenance and also in planning for preventive maintenance:

- Careful logging of operation data/historical information from the Data Monitoring Systems, and periodically processing it to determine abnormal or slowly deteriorating conditions.
- Walk down checks of the plant.
- Careful control and supervision of operating conditions.
- Regulate routine maintenance workof delicate ingredients of transformers and circuit breakers. Cleanliness of Isolators also is to be ensured.
- It is extremely important that proper records are maintained not merely for the maintenance work done but also of the material used and actual man hours spent, etc. Data logger shall keep records that are most useful in future planning of outages and providing for effective control.
- Another important requirement of a good maintenance program is to ensure that spares are ordered in time and good stocks of the frequently required spares are maintained.

Depending on the O&M requirements the firm will make necessary arrangements for proper implementation of O&M. This will be through direct presence of the firm's staff or through their local technology partners. The power plant will be typically under the charge of an engineer supported by adequate staff for security and O&M.

3.13 OPERATIONS AND MAINTENANCE SCHEDULE

The general operations and maintenance (O&M) includes a comprehensive service from project commissioning and preliminary acceptance. This essentially includes all project components including spares and consumable as required for successful operation of the plant. The power plant manager would have the primary responsibility for the O&M of the power plant. The organization will comprise of three broad functional areas viz. operation, maintenance and administration. The basic duties covered under each of these functional areas would be as follows:

3.13.1 OPERATIONS ASPECT

The manager, mechanical, electrical, Control and instrumentation team will work in general shift. All other operation personnel would work on three shift basis. Manpower for shift personnel managing key areas has been generally done taking into account leave taken by shift personnel.

3.13.2 MAINTENANCE ASPECT

Unlike conventional Power plant too requires well-planned maintenance and servicing requirements; however thoroughly planned maintenance technique should help to increase plant availability. Expected performance is totally dependent on the quality and capability of operation and maintenance philosophy being adopted. Trained technicians will be employed to assist the maintenance group in day to day maintenance of the plant.

Scheduled maintenance

Scheduled maintenance is planned in advance to prevent faults from occurring as well as keeping the plant operating at its optimum level. Scheduled maintenance of the Wind plant should be based on the technology selected, environmental conditions at site, warranty terms of plant equipment and seasonal variation.

Scheduled maintenance to be conducted on a regular basis (frequency will vary with equipment) to ensure that each plant equipment is functioning as desired. Tasks will include cleaning and maintaining mechanical systems, checking of cable correctness & connection tightness, condition of rotating parts, transformer and switchgear routine checks and any defects will be highlighted and rectified at the earliest to avoid further issues to the system. The turnaround time will be maintained at a minimum.

Unscheduled maintenance

Unscheduled maintenance is carried out in response to failures and any defects in plant equipment. This type of maintenance considered to be expensive, since defective equipment can damage other parts and cause multiple damages. Thus speed of response and time required for restoration is key parameter when carrying out the unscheduled maintenance. Although the shortest possible response is preferable for increasing energy yield, this should be balanced against the likely increased contractual costs of shorter response times.

It is advisable to have clear understanding within the O&M manual, on the expected turned around time for critical equipment. Although turnaround time is dependent on site location, depending on the type of fault, an indicative response time may be appropriately set, with liquidated damages if this limit is exceeded.

Spares parts inventory

The operation and maintenance being usually comprehensive, contractors provide all consumables and spares as required for full functioning of plant. In order to facilitate a rapid response, a suitably stocked spares inventory is essential. Adequate supplies of the necessary components should be essentially held onsite It is important that spares stock levels are maintained. Therefore, when the O&M team consumes any of the spares it should replenish the stocks immediately. This arrangement will reduce the time gap between the identification of the fault and replacement of the non-operational component, resulting in increased plant availability.

Typical resources required for O&M

Operation and maintenance (O & M) expenses typically comprises of spares, extended warranties, scheduled and unscheduled maintenance, insurance, employee remuneration and administrative costs. The typical O&M annual cost for first year has to be escalated at the rate of 5% per year over the O&M contract period. This cost is understood to be based on the resources that actually go in the O&M.

Periodic Training of the team

Training provides opportunities to personnel at various levels of the organization hierarchy to take-up higher responsibility and skills and also to re-orient them to keep pace with the advancement in power plant operations / technology. This package basically has three components Viz. Management development for senior level executives for developing functional knowledge and managerial skills, specialized training activities to acquaint the employees with the latest technology in power industries and employee development

programs to develop and upgrade skills and also to attain higher educational levels for the benefit of personnel at different levels.

Wind Turbine Generator OEM

OKPPL has executed an agreement with M/s. Siemens Gamesa Renewable Energy for Supply, Engineering, Commissioning and O&M of Wind Turbine Generators for this project.

3.14 DECOMMISIONING PHASE

The wind farm site, after having remained in operation for the lifecycle estimated at 20 years, will not lose its value as a wind power generation system. However, it is not yet decided if the Project would approach for upgrading/expansion, once this Project life is completed.

If the site is to be abandoned after completion of the designed plant life, decommissioning should be initiated by dismantling the turbines, supporting towers, O&M building and transporting them out of the Project area. It is expected that this activity will take approximately 3-4 months. The turbine components should be sold as scrap.

The concrete should be broken up and removed to a landfill site. The stored fuel and oil should be transported out of the site for sale/disposal to the authorised seller/disposal facility. The site should be restored as far as possible to its original condition. Infrastructure such as roads and transmission lines should be handed over to the government for use.

4 ENVIRONMENTAL AND SOCIAL BASELINE CONDITIONS

4.1 STUDY AREA

This chapter summarises the available baseline data on physical and biological resources within the principal area of interest i.e. the project area that would comprise of project components and associates facilities. Key existing sources of information used for this section comprises of government departments, analysis of available research papers and secondary data review from established sources such as Indian Meteorological Department, etc. The present report is prepared on the basis of reconnaissance visits and physical, social field surveys were carried out in October, 2021 to supplement the existing baseline data.

The area falling within 15 km radius from the 300 MW SECI VI project boundary has been considered as “Study Area” for the purpose of conducting ESIA Study. The WTG zone has been considered as “Core Zone” and Study Area of 15 km radius has been considered as “Buffer Zone”. Further, the area falling within 500 m from the proposed project has been considered as Area of Influence (AoI) for evaluation of impact assessment of the project on noise and shadow flicker on the receptors in area falling with 0.5 km from the Wind Turbines for 300 MW SECI VI Jagalur Wind Power Project.

The baseline data generation includes site visits, ecological surveys, social surveys and interviews, and secondary data review from established sources such as Indian Meteorological Department, Census of India.

The details pertaining to both the project taluka and district, from authentic government sources, have been presented where project area / project site specific information was not available in public domain.

4.2 TOPOGRAPHY

The topography of Davanagere district primarily comprises of undulating plains, interspersed with sporadic ranges, isolated dusters of low ranges of rocky hills. The project area mostly comprises of rural areas, with a uneven terrain region comprising of small patches of flat terrain mixed with mostly rocky land. Geology of the area is composition of rock with layer of 6 to 12 inches of top soil in average. Topography of this region has large diversified surface.

The project area in Bellary district mostly comprises of rural areas, with an uneven terrain region comprising of small patches of flat terrain mixed with mostly rocky land. The geology

of the area is a composition of Gneisses rock which consists of black, grey and red soil having thickness 0.2 to 1.00 m. The topography of this region has large diversified surface.

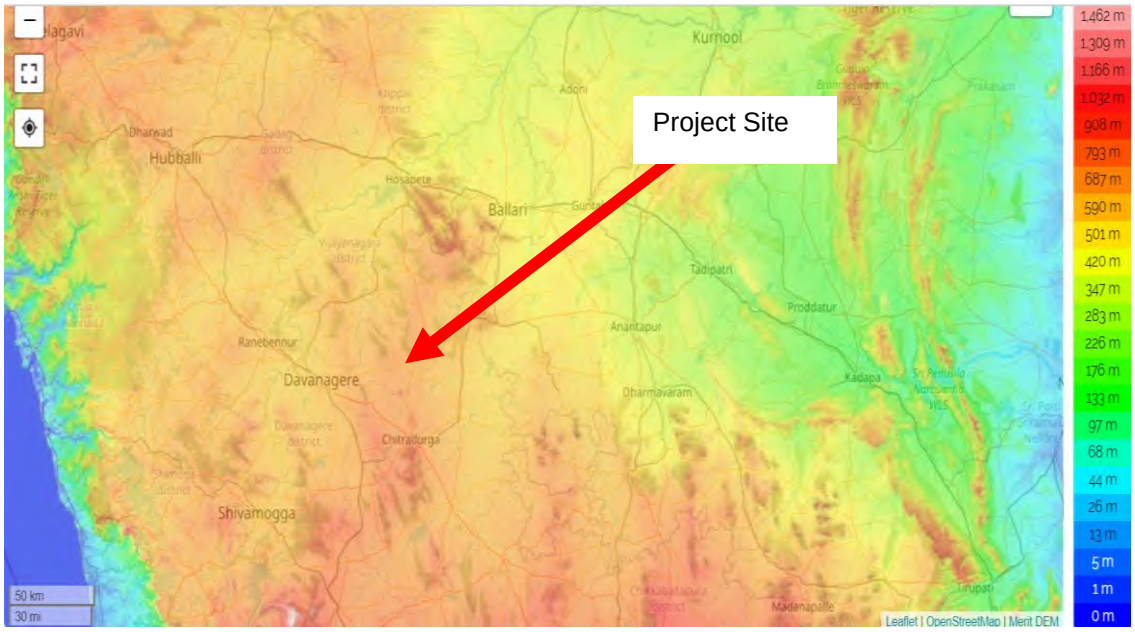
Physiographically the Chitradurga district comprises of undulating plains, interspersed with sporadic ranges and isolated low ranges of rocky hills. The project area comprises of rural areas with an uneven terrain region comprising of small patches of flat terrain mixed with mostly rocky land.

The project area is characterized by rural setup and flat rainfed agricultural land with minor undulation. The project area has an elevation in the range of 638- 666 m above mean sea level for Phase I and elevation in the range of 656- 704 m above mean sea level for Phase II. As per the revenue records, the land use of the project area is classified as rainfed agricultural land.

The PSS site and the 143 WTGs are at average elevation ranges from 660 - 666 m above mean sea level for Phase I and elevation in the range of 656- 760 m above mean sea level for Phase II.

A reconnaissance survey of project site was carried out by representatives of TUV SUD in October 2021. The reconnaissance visit was concentrated on existing land use of the surrounding and present landuse of site, and identification of environmental receptors such as settlement, households and cultural/religious sites such as temples, mosques located in and around the project area.

Based on the geographic coordinates of the project area and the location point of the 143 number of WTGs marked by the technology providers in UTMN and UTME, the majority of the accessible locations were visited by the TUV SUD team and Ground Control Points (GCPs) were freshly marked, verified and mapped. On the basis of the ground truthing the major land use classes have been delineated majorly as agriculture land with sporadic patches of grazing land with some vegetative cover. Few patches of barren rocky land were noticed during the site visit. The topography map of study area is given in **Figure 4-1**.



Source: https://en-in.topographic-map.com/maps/f1pb/Chitradurga/

Figure 4-1: **Topography Map of Davanagere, Bellary and Chitradurga District**

4.3 GEOMORPHOLOGY, GEOLOGY AND DRAINAGE

The geomorphology of the Davanagere district is characterised by vast stretches of undulated plains interspersed with sporadic ranges or isolated clusters of low ranges of rocky hills. This may be broadly divided into two regions. The eastern hilly region consisting of Jagalur and north –eastern parts of Harpanahalli talukas and the plain region consisting of Harihar, Davanagere, Honnali, Channagiri and parts of Harpanahalli talukas. Dalba Ranga Gudda (1013mamsl) in Honnali taluka is the highest peak in the district. The other prominent peaks of the district are Jaikal Gudda (863mamsl), and Anaburu (916mamsl).

Major part of the Davanagere district is covered by red sandy soil and followed by black soil. Red sandy soil is spread through out the district except in a small area in the northeastern part of the district where the area is covered by black soil. The Red Sandy soil comprises of red loams, red sandy, sandy loams and medium black soils.

The geomorphology of the Bellary district is classified as Northern Maiden region with monotonous, treeless, and expensive pleateu landscape. The central part of the Bellary district is occupied by hills and plains to east and west. The eastern part consists of Hospet, Bellary and Siruguppa talukas. The western part consists of Hadagalli, Hagaribommanahalli, Kudlugi and Sandur talukas. The project site area falls in southern part of Kudligi Taluka. The

Tungabhadra River forms the eastern and northern boundary of the district. The Sandur hills are the main physical features with valley and its lush green forest growth. It extends from Mallapuram on the bank of river Tungabhadra and runs for 48 kms in the south easterly direction up to Bellary.

The soils of the Bellary district are derived from Granites, Gneisses and Schistose rocks. Major part of the district is covered by red soil found mainly at elevated places especially at fringes of hills due to decomposition of rocks and surrounding granitic and gneissic hills. The Black soil is found in the prolonged submerged areas and canal command areas having low Permeability. The project area is derived from the Gnesses rocks and the covered by red soil.

Soil types of the Chitradurga district comprise deep & shallow black soil, mixed red & black soil, red loamy & sandy soil. Physiographically the district comprises of undulating plains, interspersed with sporadic ranges and isolated low ranges of rocky hills.

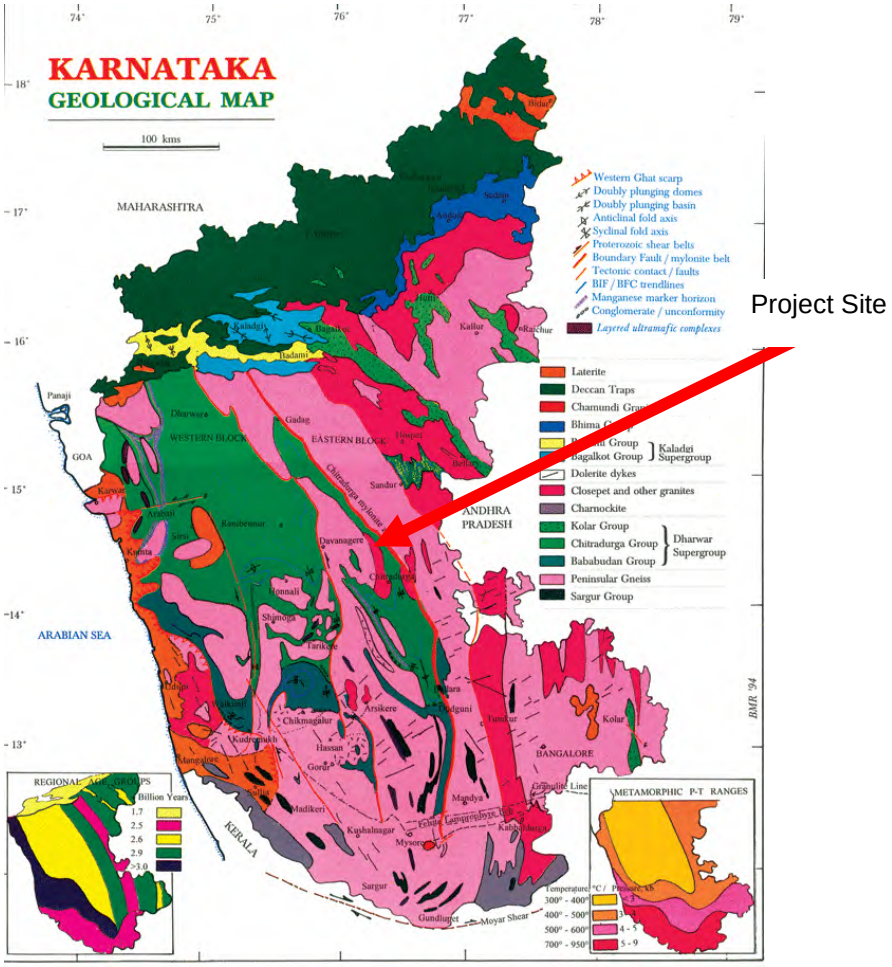


Figure 4-2: Geographical Map of Davanagere, Bellary and Chitradurga District

Major part of the all the three district lies in Krishna basin and is drained by perennial river Tungabhadra which forms major drainage system and river Chikka Hagari and Hagari/Vedavathi are its tributaries runs south to north from the southern tip of the district. These are seasonal rivers flowing during monsoon season. The drainage in the Bellary district is dendritic to sub-dendritic in nature. The drainage network in Davanagere district is influenced by South West monsoon.

There are 3 village lakes present within the study area. Chinna Hagari river is 2.4 km from SGJA 43 WTG location, Jagalur lake is 4.1 km from SGJA 77 WTG location, Sangenahalli lake is 9.7 km from SGJA 108 WTG location, Anaji lake is 14.5 km from SGJA 102 WTG location and Katlalu lake is 9.8 km from SGJA 118 WTG location. These water bodies are seasonal and do not retain water for longer duration. Water from these water bodies is extracted by farmers to fulfill their irrigation needs during and after monsoon.

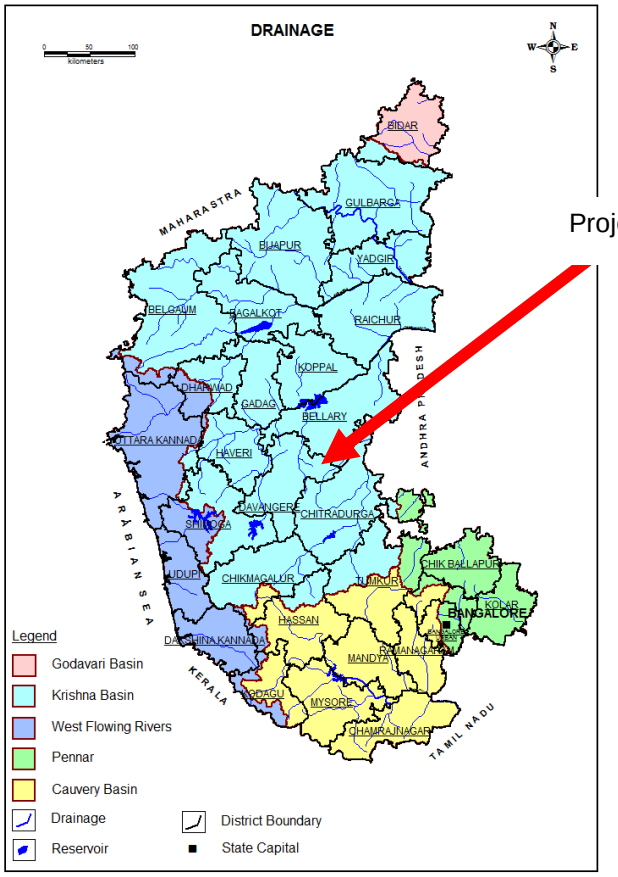


Figure 4-3: Drainage Map of Davanagere, Bellary and Chitradurga District

4.4 HYDROGEOLOGY

In Jagalur taluka, granitic-gneisses and schists are the main water bearing formations. Ground water occurs within the weathered and fractured granitic-gneisses and schists under water table condition and semi-confined condition. Ground water exploration reveals that aquifers were encountered between the depth of 4.1 mbgl and 200 mbgl. In Jagalur taluka bore wells were drilled from a minimum depth of 26 mbgl to a maximum of 200 mbgl. Depth of weathered zone ranges from 5.7 mbgl to 36.74 mbgl. Yield ranges from 0.21 to 18.56 lps.

The hydrogeological profile in study area is shown in **Figure 4-4.**

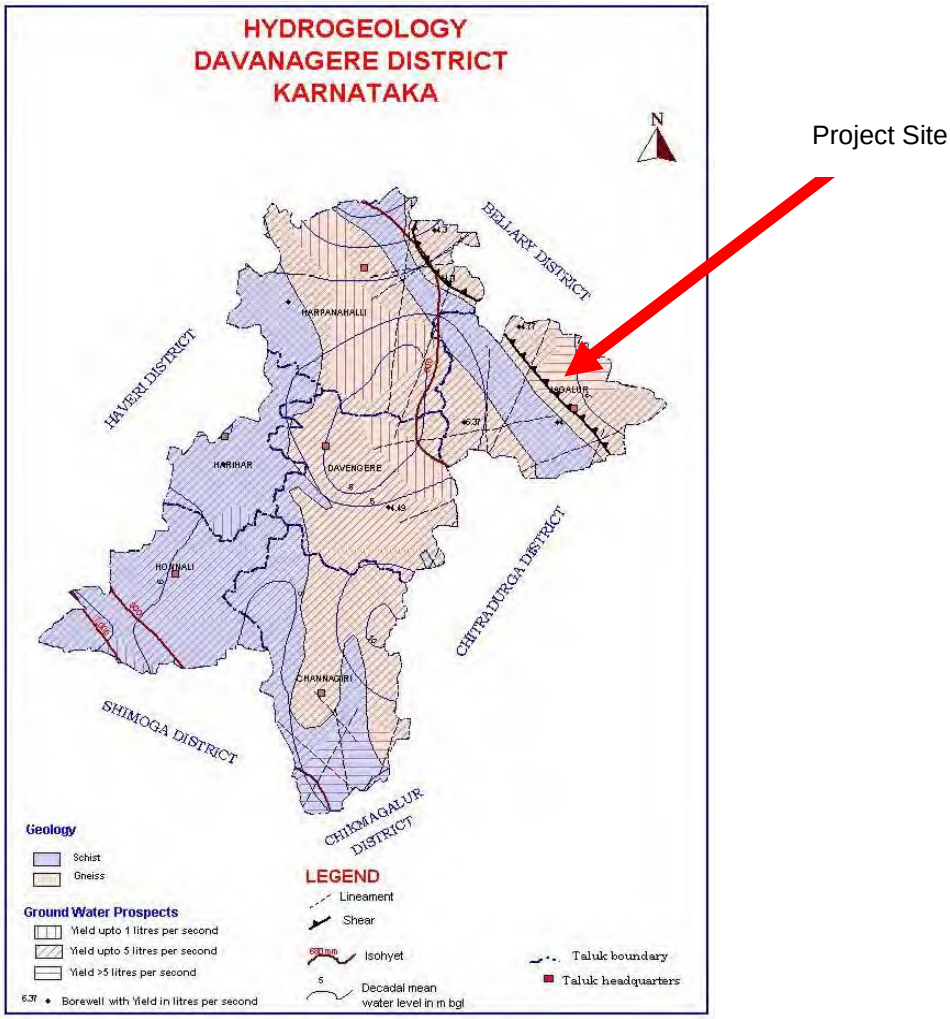


Figure 4-4: Hydro geological Map of Jagalur Taluka

In the Bellary district weathered / fractured & jointed granites, gneisses and schists are the main water bearing formations and aquifer zones occurring at various depths from 7to 197m bgl. Ground water occurs within the weathered and fractured rocks under water-table

conditions and semi-confined conditions. The exploratory bore wells drilled in the district where depths ranging from 96 to 200.00m bgl. In Kudligi taluka bore wells were drilled from a minimum depth upto 58 m bgl. The discharge ranges from <1.0 to 8.20 lps. The yield-cum recuperation tests conducted on the wells show that the drawdown range of 1.20m to 30.61m, Specific capacity ranged from 2.06 250 m3/day/m/dd, transmissivity of aquifer material in general range from 1.54 to 345 m2/day and the static water level recorded is in the range of 1.68m to 32.15m bgl.

The hydrogeological profile in study area is shown in **Figure 4-5.**

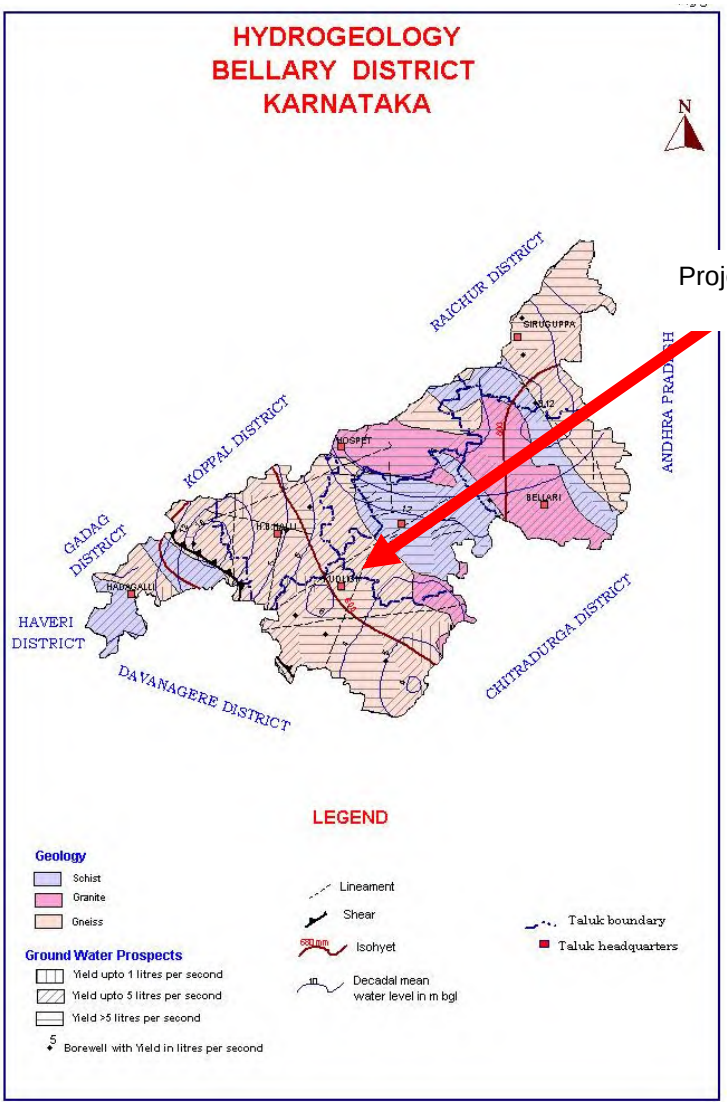


Figure 4-5: Hydro geological Map of Kudligi Taluka

In Chitradurga taluka fractured granitic-gneisses, gneisses and hornblende-schists are the main water bearing formations. Ground water exploration reveals that aquifers are encountered between the depths of 15 mbgl and 192 mbgl. In Chitradurga taluka bore wells were drilled from a minimum depth of 105.34 mbgl to a maximum of 200 mbgl. Depth of weathered zone range from 5.52m to 2.61mbgl. Yield ranges from 0.04 to 5.42 lps. Transmissivity ranges from 2.37 to 40.84m2/day. Specific capacity ranges from 4.53 to 43.94 lpm/m draw down. Ground water occurs within the weathered and fractured rocks under water-table conditions and semi-confined conditions. Seasonal water-level fluctuation varies from 1.38 m to 1.86 m

The hydrogeological profile in study area is shown in **Figure 4-7.**

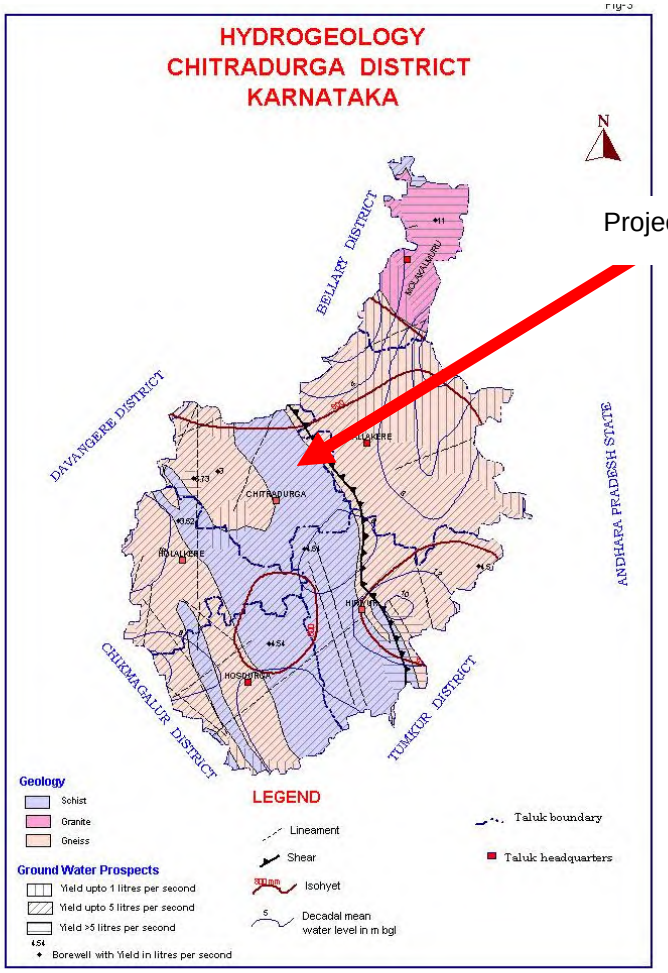


Figure 4-6: Hydro geological Map of Chitradurga Taluka

4.5 DEPTH TO WATER LEVELS

In Jagalur Taluka, During May 2006 (pre-monsoon season) the minimum and maximum depths to water levels were 14.14 mbgl and 20.77mbgl respectively. During November 2006(Post-monsoon) water level ranged from 12.59 mbgl to 23.04 mbgl.

The depth to water levels during pre-monsoon and post-monsoon are given in **Figure 4-7** and **Figure 4-8** respectively.

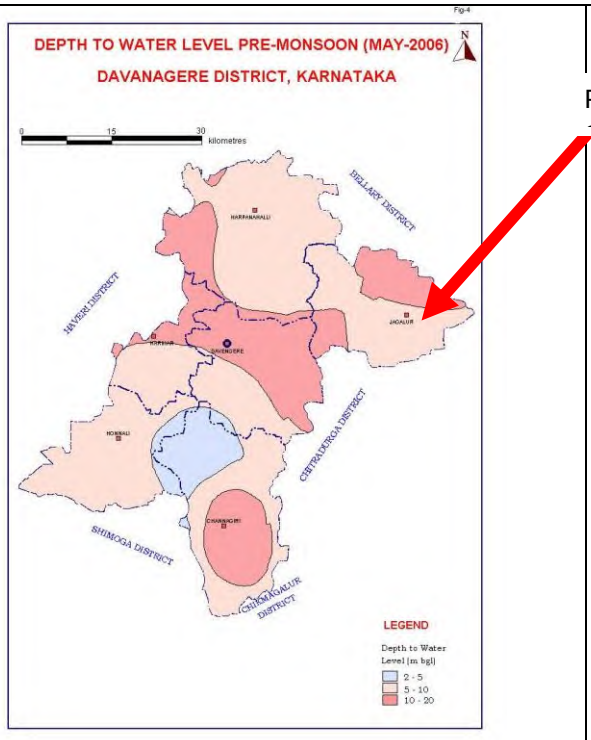


Figure 4-7: Depth to Water Levels (Pre-Monsoon) Jagalur Taluka

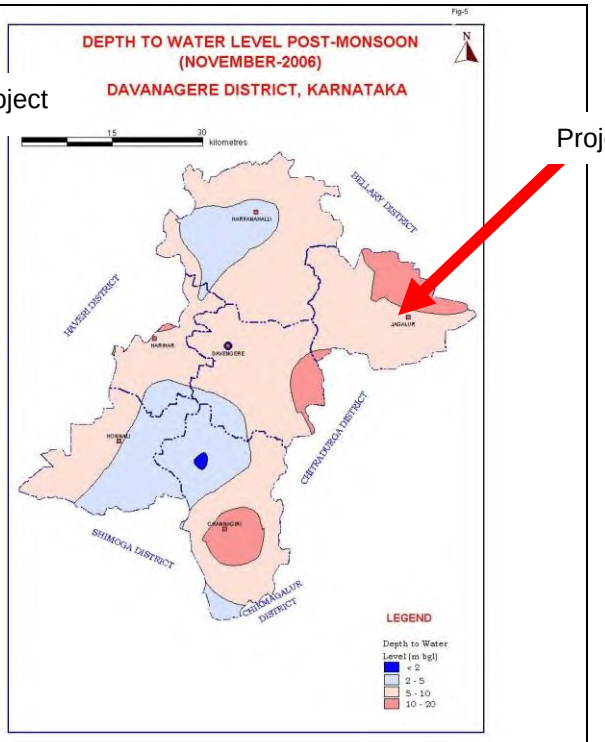


Figure 4-8: Depth to Water Levels (Post-Monsoon) Jagalur Taluka

In Kudligi Taluka, during May 2011 (Pre-monsoon) the minimum and maximum depth to water level was 3.21 mbgl and 7.30 mbgl respectively. During November 2011 (Post-monsoon) water level ranged from 2.82 mbgl to 5.60 mbgl.

The depth to water levels during pre-monsoon and post-monsoon are given in **Figure 4-9** and **Figure 4-10** respectively.

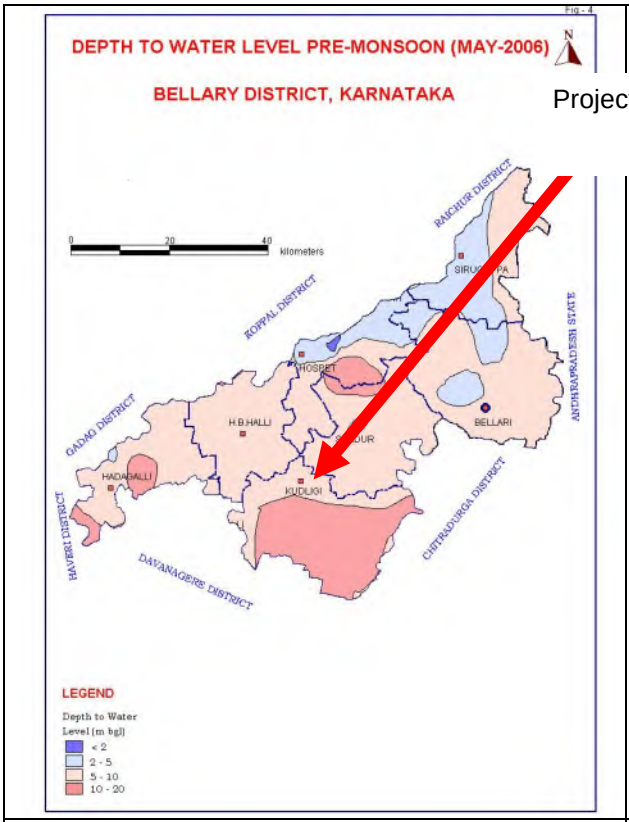


Figure 4-9: Depth to Water Levels (Pre-Monsoon) Kudligi Taluka

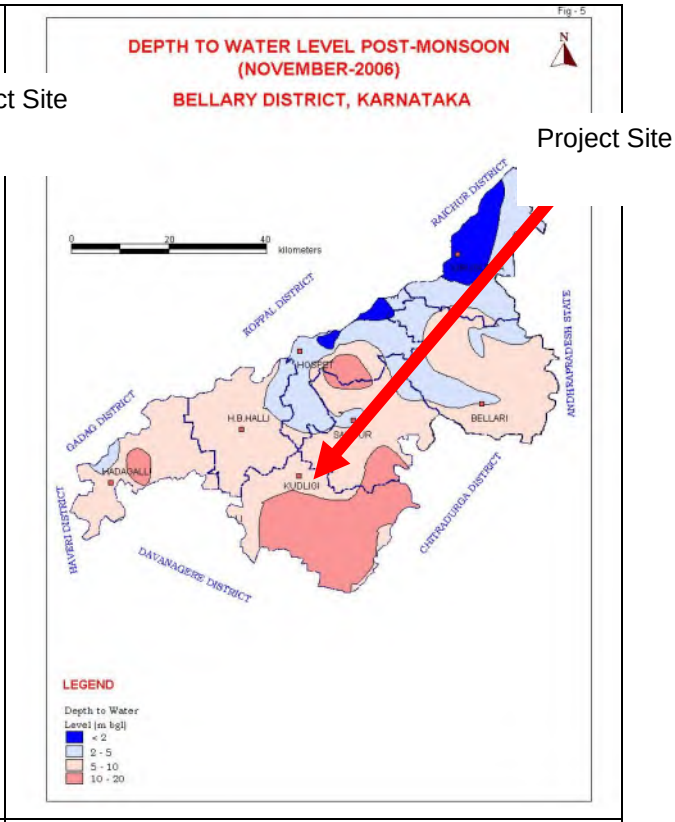


Figure 4-10: Depth to Water Levels (Post-Monsoon) Kudligi Taluka

In Chitradurga Taluka, during May 2006 (pre-monsoon season) the minimum and maximum depth to water level are 2.43 and 13.13 mbgl respectively. During November 2006 (post-monsoon) water level ranges from 2.75 to 11.75 mbgl.

The depth to water levels during pre-monsoon and post-monsoon are given in **Figure 4-11** and **Figure 4-12** respectively.

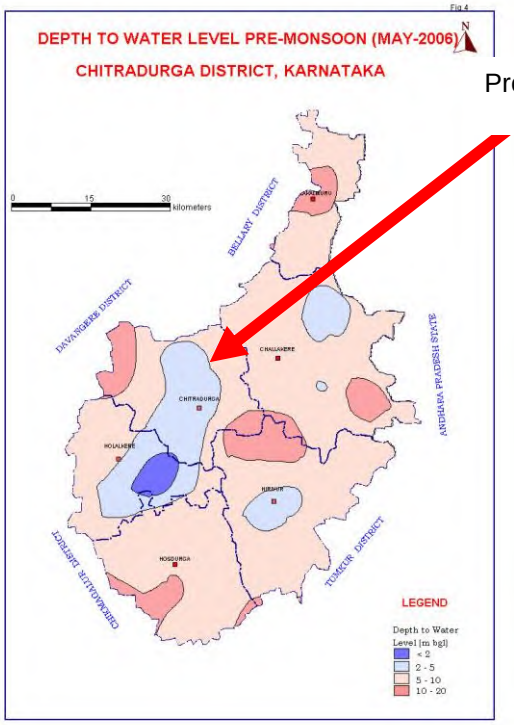


Figure 4-11: Depth to Water Levels (Pre-Monsoon) Chitradurga Taluka

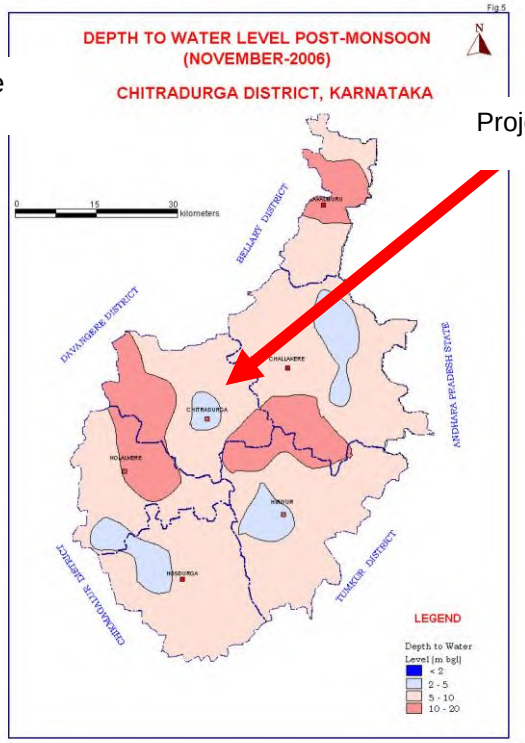


Figure 4-12: Depth to Water Levels (Post-Monsoon) Chitradurga Taluka

4.6 WATER RESOURCES

4.6.1 SURFACE WATER

Major part of the all the three district lies in Krishna basin and is drained by perennial river Tungabhadra which forms major drainage system and river Chikka Hagari and Hagari/Vedavathi are its tributaries runs south to north from the southern tip of the district. These are seasonal rivers flowing during monsoon season. The drainage in the Bellary district is dendritic to sub-dendritic in nature. The drainage network in Davanagere district is influenced by South West monsoon.

There are 4 village lakes and chinna hagari stream present within the study area. Chinna Hagari river is 2.4 km from SGJA 43 WTG location, Jagalur lake is 4.1 km from SGJA 77 WTG location, Sangenahalli lake is 9.7 km from SGJA 108 WTG location, Anaji lake is 14.5 km from SGJA 102 WTG location and Katlalu lake is 9.8 km from SGJA 118 WTG location. These water bodies are seasonal and do not retain water for longer duration. Water from

these water bodies is extracted by farmers to fulfill their irrigation needs during and after monsoon.

4.6.2 GROUND WATER

As per ground water resource estimation studies, the Davanagere district is over exploited with a groundwater draft of 49951 ham as against the available resource of 55706 ham. Thus the stage of ground water development in the district is 91 %. Major part of the district is falling under overexploited category. However very small part of the district falls in semi critical and some parts fall under safe category where there is scope for further Development.
Taluka-wise Groundwater Resource of Davanagere district as on Sept. 2012 **Table 4-1.**

Table 4-1: Taluka-wise Groundwater Resource of Jagalur Taluka as on September 2012

Taluka	NET ANNUAL GROUND WATER AVAILABILITY	EXISTING GROSS GROUND WATER DRAFT FOR IRRIGATION	EXISTING GROSS GROUND WATER DRAFT FOR DOMESTIC AND INDUSTRIAL WATER SUPPLY	EXISTING GROSS GROUND WATER DRAFT FOR ALL USES	PROVISION FOR DOMESTIC AND INDUSTRIAL REQUIREMENT SUPPLY TO 2025	WATER AVAILABILITY FOR FUTURE IRRIGATION	EXISTING STAGE OF DEVELOPMENT (%)	% TALUKA AREA FALLING IN CATEGORY
	HAM	HAM	HAM	HAM	HAM	HAM		
Jagalur	8221	8258	483	8741	518	443	106	20% Semi Critical 80% Over exploited

Source: Ground Water Information Booklet, Davanagere District, Karnataka, Bangalore, November 2011

The stage of ground water development in the district is 40 to 51%. 50% of the area in Kudlugi taluka falls in Semi critical where it is to adopt proper management practices. Around 10 % of the area in Kudlugi falls in Overexploited category where proper ground recharge schemes to be implemented. The details of Ground Water Resources and irrigation potential of the district is given in **Table 4-2.**

Table 4-2: Ground water resources of Kudligi Tehsil, (in mcm)

Taluka	NET ANNUAL GROUND WATER AVAILABILITY	EXISTING GROSS GROUND WATER DRAFT FOR IRRIGATION	EXISTING GROSS GROUND WATER DRAFT FOR DOMESTIC AND INDUSTRIAL WATER SUPPLY	EXISTING GROSS GROUND WATER DRAFT FOR ALL USES	PROVISION FOR DOMESTIC AND INDUSTRIAL REQUIREMENT SUPPLY TO 2025	WATER AVAILABILITY FOR FUTURE IRRIGATION	% TALUKA AREA FALLING IN CATEGORY

	HAM	HAM	HAM	HAM	HAM	HAM	
Kudligi	9634	6047	342	6389	532	3198	40% Safe 50% Semi critical 10% Overexploted

Source: Ground Water Information Booklet, Bellary District, Karnataka, Bangalore, March 2011

In Chitradurga taluka the major part is falling under over-exploited category except a small part in southeast which is under Semi-critical. The details of Ground Water Resources and irrigation potential of the district is given in **Table 4-3.**

Table 4-3: Ground water resources of Kudligi Tehsil, (in mcm)

Taluka	NET ANNUAL GROUND WATER AVAILABILITY	EXISTING GROSS GROUND WATER DRAFT FOR IRRIGATION	EXISTING GROSS GROUND WATER DRAFT FOR DOMESTIC AND INDUSTRIAL WATER SUPPLY	EXISTING GROSS GROUND WATER DRAFT FOR ALL USES	PROVISION FOR DOMESTIC AND INDUSTRIAL REQUIREMENT SUPPLY TO 2025	WATER AVAILABILITY FOR FUTURE IRRIGATION	% TALUKA AREA FALLING IN CATEGORY
	HAM	HAM	HAM	HAM	HAM	HAM	
Chitradurga	5485	6226	573	6799	662	157	27% Semi critical 73% Overexploted

4.6.3 GROUND WATER DEVELOPMENT

Davanagere District

Generally, the ground water development in the district is by dug well, dug –cum-bore well and bore well. The dug wells for irrigation use are mostly rectangular with dimension ranges of 4m x 6m and 10m x 14m. The depth of these wells ranges from 9m to 15m and some cases at the bottom of the dug well, one or two bore wells are constructed. In addition to this bore well irrigation is also common. The bore wells range in depth from 60 mbgl to 200 mbgl with diameter of 148mm to 165mm. The yield of these bore wells varies from <1 to 10 lps.

The stage of groundwater development in the district is quite high. In Channagiri taluka 80% of the area falls under over exploited and 20 % of the area falls under safe category. The stage of development of groundwater for the taluka is 113%. In Davanagere taluka all the area is falling under over exploited category. The stage of development of groundwater for the taluka is 98%. In Harihar taluka 65% area falls under over exploited and 35% of the area falls under safe category. The stage of development of groundwater for the taluka is 69%. In Harpanahalli Taluka 89% area falls under over exploited category, 10% of the area falls under semi critical and 1% of the area falls under safe category. The stage of development of

groundwater for the taluka is 119%, which is the highest in the district. In Honnali taluka 15% under over exploited and 85% of the area falls under safe category. The stage of development of groundwater for the taluka is 41%, which is the lowest in the district. In Jagalur taluka 80% area falls under over exploited and 20% of the area falls under semi critical category. The stage
of development of groundwater for the taluka is 106%.

Bellary District

Generally, the ground water development in the district is extracted by dug well, dug –cum-bore well and bore well. Bore wells are the main ground water development structures for both drinking and irrigation purposes. All the villages have been provided with drinking water supply like piped water supply schemes, mini water supply schemes and hand pumps. There are 708 bore wells fitted with hand pumps, 102 bore wells used for piped water supply schemes and 226 mini water supply schemes through bore wells, fulfilling drinking water needs and support the above fact.

Considering the annual ground water development and water level trend during various seasons over the period the Kudlugi taluka is categorised under Semi critical with 50 % and OE (overexploited) with 10% in non command areas. Overal 40 % falls under Safe category having further scope for ground water development. Considering the 50 % under semi critical and 10 % OE category where it demands proper ground water augmenting projects to recharge the ground water system.

Chitradurga District

Generally, the ground water development in the district is by dug well, dug –cum-bore well and bore well. The dug wells for irrigation use are mostly rectangular with dimension ranges of 4m x 6m and 10m x 14m. The depth of these wells ranges from 9m to 15m and some cases at the bottom of the dug well, one or two bore wells are constructed. In addition to this bore well irrigation is also common. The borewells range in depth from 60m to 200m with diameter of 148mm to 165mm. The yield of these bore wells varies from >1 to about 10 lps.
In Chitrdurga taluka 27% of the area falls under semi critical and 73% under over exploited category. The stage of groundwater development for the taluka is 127%, which is the highest in the district.

Based on the annual ground water availability for future irrigation use, it is proposed that the ground water development structure viz, dug well, dug cum bore wells and bore wells can be constructed in those areas falling under safe & semi critical category. Location of structure may be decided based on local hydro geological condition and topography of the area, after scientific surveys.

4.7 CLIMATE

Davanagere District

The district enjoys semi arid climate, dryness in the major part of the year and hot summer. In general, southwest monsoon contributes 58 % of total rainfall and northeast monsoon contributes 22 % rainfall. The remaining 20 % rainfall is received as sporadic rains in summer months. It receives low to moderate rainfall. Normal annual rainfall varies between 556 mm in Jagalur and 808 mm in Channagiri taluka.

The district falls under central dry agro-climatic zone of the Karnataka state and is categorized as drought prone. Normal climatic parameters of Davanagere district are increasing temperature from March to May, usually maximum in April month and minimum temperature that is coldest month during month of December.

The following table shows Temperature, Relative Humidity, Wind, and Rainfall Data.

Table 4-4: Climatological Data of Davanagere (*Meteorological Centre, Bengaluru*)

Month	Maximum Temperature	Minimum Temperature	Relative Humidity	Av. Wind Speed	Total Rainfall
	°C	°C	%	kmph	mm
January	30.1	15.2	59.2	6.4	1.5
February	32.7	17.4	53.7	6.4	1.1
March	35.5	20.0	49.4	5.8	3.8
April	36.8	22.3	52.5	5.6	35.7
May	35.6	22.7	59.2	7.2	79.2
June	31.1	21.8	70.8	10.7	67.2
July	28.8	21.3	77.1	11.2	99.6
August	28.9	21.0	78.7	10.2	83.5
September	29.6	20.6	74.9	7.5	119.4
October	29.6	20.2	72.8	6.9	112.5
November	29.3	17.9	68.2	5.7	42.1
December	28.9	15.5	63.9	8.2	7.7

4.7.1 TEMPERATURE

The mean daily maximum and minimum temperature of each month of the last 30 years for Jagalur is shown in the **Figure 4.13.**

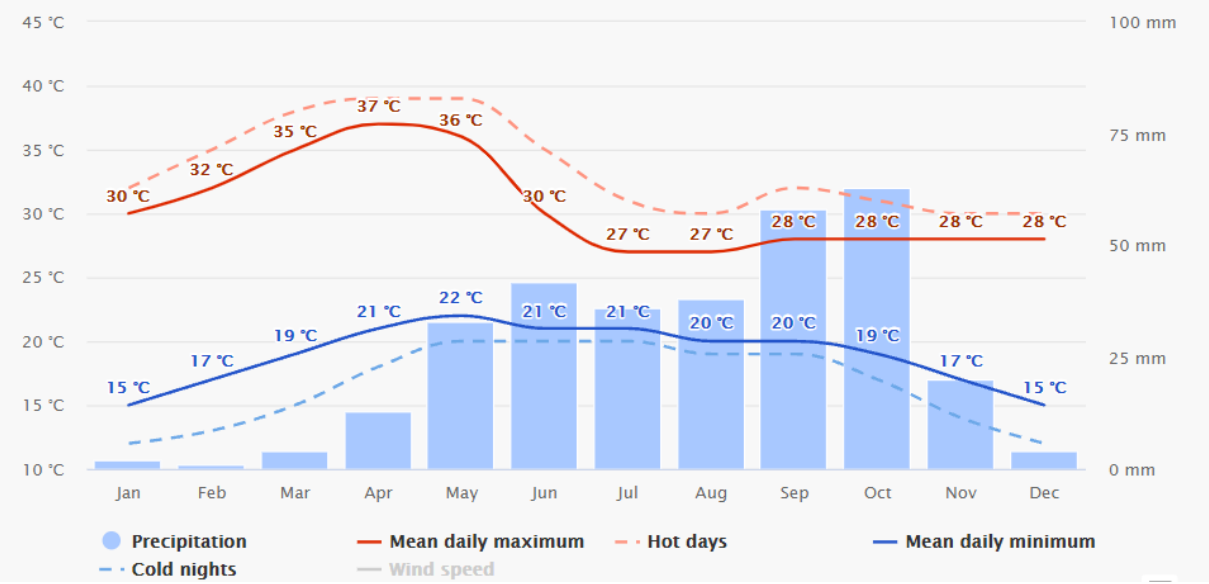


Figure 4-13: Average temperature and precipitation of Taluka Jagalur

4.7.2 RAINFALL

The normal annual rainfall in the district based on 70 years is 644 mm. However in the last decade (2002-2011) the district received an average annual rainfall of the 674.14 mm. Further analysis of the rainfall data indicate that there was deficient rainfall in the years 2003, whereas the year 2010 received excess rainfall. Jagalur taluka received deficit rainfall during the years 2002-2003. Most of the other talukas had deficit rainfall during the year 2003. Rainfall is the lowest in Jagalur taluka and the highest in Channagiri taluka.

The 5 years rainfall data collected from Customized Rainfall Information System (CRIS), Hydromet Division, IMD, Davanagere district is mentioned in **Table 4-5.**

Table 4-5: Five Year Trend of Rainfall (mm) in Davanagere district (2016-20)

Year/Month	2016	2017	2018	2019	2020
January	0.4	0.0	0.0	0.0	1.0
February	0.0	0.0	0.4	2.0	0.0
March	0.0	2.0	27.3	1.8	2.1
April	0.4	11.2	23.4	26.5	63.7
May	76.5	76.4	134.1	54.6	94.4
June	147.6	53	72.5	47.8	86.6
July	126.2	71.6	77.1	102.1	134.7
August	35.1	99.6	114.3	221.6	98.8
September	85.4	233	91.7	111	178.9

October	15.7	193.6	87.9	312.8	179.6
November	0.0	1.0	26.4	31.9	3.5
December	7.2	0.0	1.2	7.6	4.3

Source: IMD

4.7.3 WIND

The predominant wind direct in Davanagere is West-South West (WSW) to North-East (NE). The wind-rose diagram for Jagalur taluka is given in **Figure 4-14**.

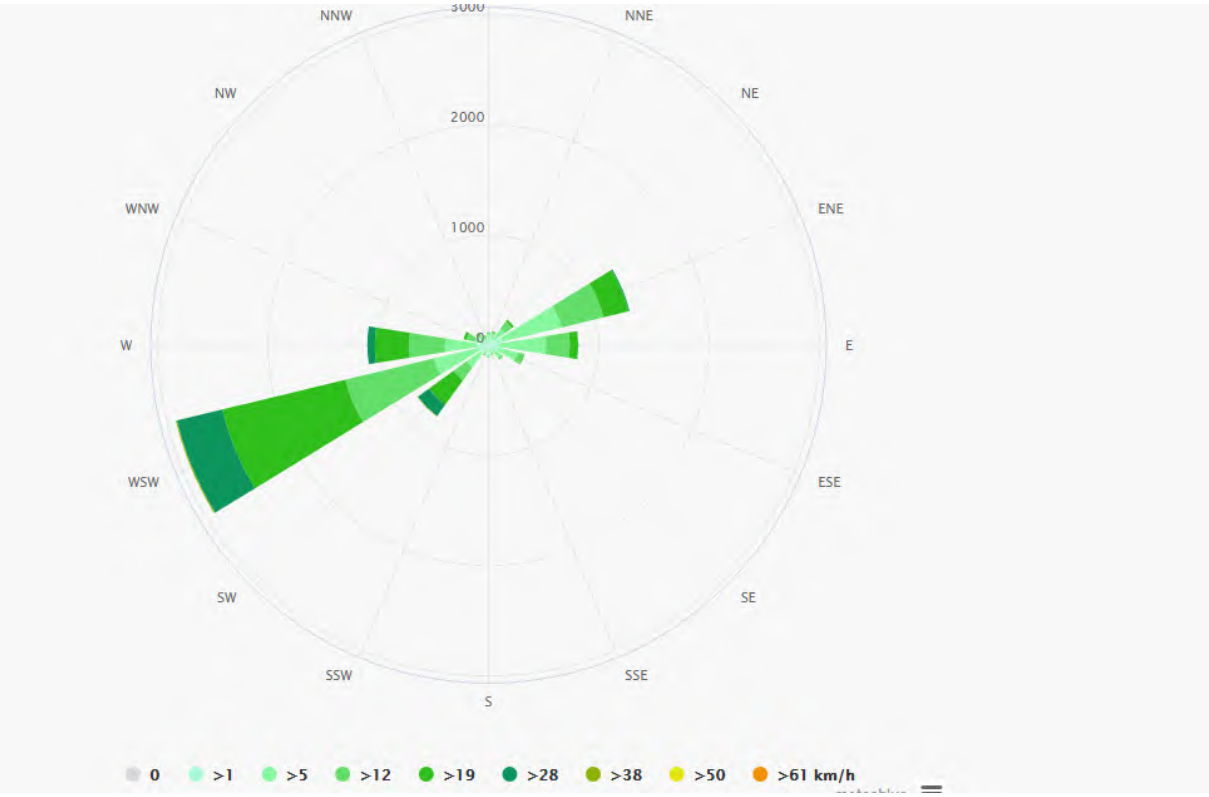


Figure 4-14: Wind Rose Diagram of SECI VI Wind Power Project

Bellary District

The climate of Bellary district is quite moderate and shows dryness in major part of the year and a hot summer. In general, the precipitation during southwest monsoon accounts for 60% of the total amount of rainfall and during northeast monsoon it is 24%. The remaining rainfall is sporadically received in summer. September is the wettest month in the year. It receives low to moderate rainfall. The normal annual rainfall in Bellary district is 611 mm.

The district falls under central dry agro-climatic zone of the Karnataka state and is categorized as drought prone. Normal climatic parameters of Bellary district are increasing temperature from March to May, usually maximum in April month and minimum temperature that is coldest month during month of December. The following table shows Temperature, Relative Humidity, Wind, and Rainfall Data.

Table 4-6: Climatological Data of Bellary (Indian *Meteorological Centre, Bengaluru*)

Month	Maximum Temperature	Minimum Temperature	Relative Humidity		Av. Wind Speed	Total Rainfall
	°C	°C	Morning %	Evening %	kmph	mm
January	34.3	12.4	70	43	3.9	2.9
February	37.4	14.9	61	37	3.6	2.3
March	41	17.2	51	30	3.8	6
April	42.7	20.4	50	29	4.6	17.2
May	42.7	21.2	55	34	7	54.3
June	39.9	20.8	66	50	10	59.2
July	36.3	20.7	68	56	10.7	42.6
August	34.8	20.5	70	58	9.9	70
September	35.4	20.1	72	58	6.8	111
October	34.9	18	73	62	3.7	89
November	33.4	14.1	72	56	2.8	39.5
December	32.3	12.3	71	50	4.2	5.5

4.7.4 TEMPERATURE

The study area lies in the northern plains of Karnataka and has semi – arid type of climate. Dry climate prevails for most part of the year. December is the coldest month with mean maximum temperature in the district is 40.4°C and the mean minimum temperature is 14.3°C. During peak summer, temperature shoots up to 43ºC. Relative humidity ranges from 48 to 74% in the morning and in the evening it ranges from 27% to 61%.
The mean daily maximum and minimum temperature of each month of the last 30 years for Kudligi is shown in the **Figure 4-15.**

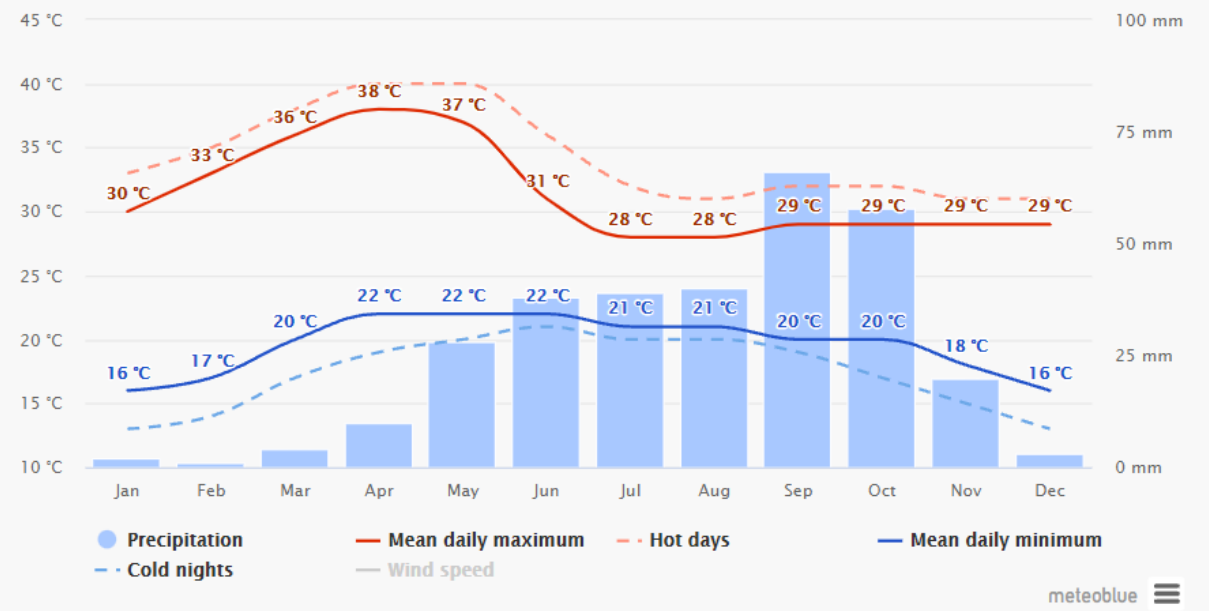


Figure 4-15: Average temperature and precipitation of Taluka Kudligi

4.7.5 RAINFALL

The normal annual rainfall in the district based on last 30 years years is 500 mm. However, in the last decade the district received an average annual rainfall of the 674.14 mm. The analysis of the last ten years rainfall data (1996-2005) shows that the highest rainfall occurred in Sandur taluka with 752.1mm and the lowest at Bellary with 452mm and over all annual normal rain fall in the district is 611mm. Deficiency in rainfall is observed in the four talukas for the last ten years in the range of 2.40% (Kudlugi taluka) to 26.02% (Bellary taluka). In 2019, the normal rainfall precipitation in Bellary district was noted 623 mm.
The 5 years rainfall data collected from Customized Rainfall Information System (CRIS), Hydromet Division, IMD, Davanagere district is mentioned in **Table 4-7.**

Table 4-7: Five Year Trend of Rainfall in Bellary district (2016-20)

Year/Month	2016	2017	2018	2019	2020
January	9.4	0.0	0.0	0.0	0.0
February	0.0	0.0	0.1	1.9	0.0
March	0.0	21.9	1.2	1.4	0.2
April	4.2	5.8	20	16.8	30.3
May	67.9	55.6	60.9	25.2	64.1
June	128.5	58.1	60.2	54.9	78.3
July	68.4	50.8	21.5	65.7	183.9
August	24.7	129.9	73.4	80.2	84.7
September	47.9	238.8	52.7	235.5	221.7

October	11.4	168.5	67	223	167.6
November	4.2	0.0	2.6	10.7	10.5
December	4.6	0.0	0.0	6.4	3.0

Source: IMD

4.7.6 WIND

The predominant wind direct in Kudligi is South-West (SW) to North-East (NE). The wind-rose diagram for Kudligi taluka is given in **Figure 4-16**.

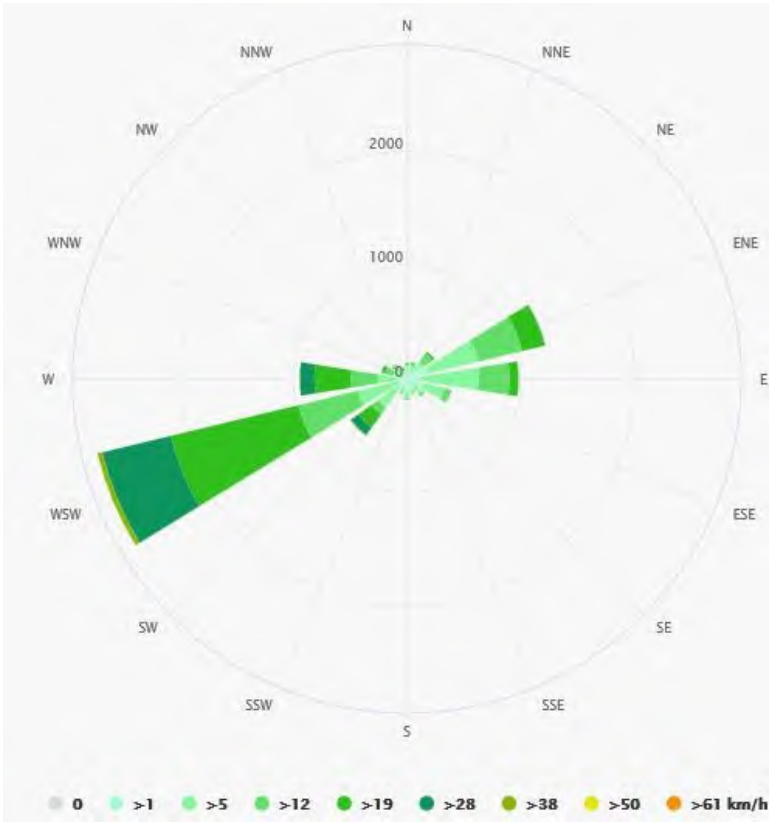


Figure 4-16: Wind Rose Diagram of Kudligi Taluka

Chitradurga District

Chitradurga taluka enjoys semi-arid climate. Dryness and hot weather prevails in major part of the year. The area falls under Central Dry agro-climatic zone of Karnataka state and is categorized as drought prone. The climate of the study area is quite agreeable and free from extremes. The year is usually divided into four seasons: summer from March to May; rainy season or south-west monsoon season from June to September; post-monsoon season

covering the months of October and November and dry or winter Season from December to February. The following table shows Temperature, Relative Humidity, Wind, and Rainfall Data.

Table 4-8: Climatological Data of Chitradurga (Indian *Meteorological Centre, Bengaluru*)

Month	Maximum Temperature	Minimum Temperature	Relative Humidity		Av. Wind Speed	Total Rainfall
	°C	°C	Morning %	Evening %	kmph	mm
January	32	13.3	67	34	7.9	2.2
February	34.7	15.4	56	26	7.7	3.6
March	37.1	17.9	55	25	8.4	6.1
April	38.3	20	65	30	9.1	38.1
May	38.1	19.9	75	41	12.8	65.3
June	34.7	20.1	81	64	16.1	67.8
July	31.9	19.9	85	71	16.1	69.4
August	30.8	19.6	86	74	15.1	99.5
September	32.1	19.2	84	64	12	113.9
October	31.8	17.2	79	59	7.6	128.2
November	30.8	14.1	75	53	7.1	54.3
December	30.1	12.7	74	44	8.1	12.5

4.7.7 TEMPERATURE

The mean daily maximum and minimum temperature of each month of the last 30 years for Chitradurga is shown in the **Figure 4.17.**

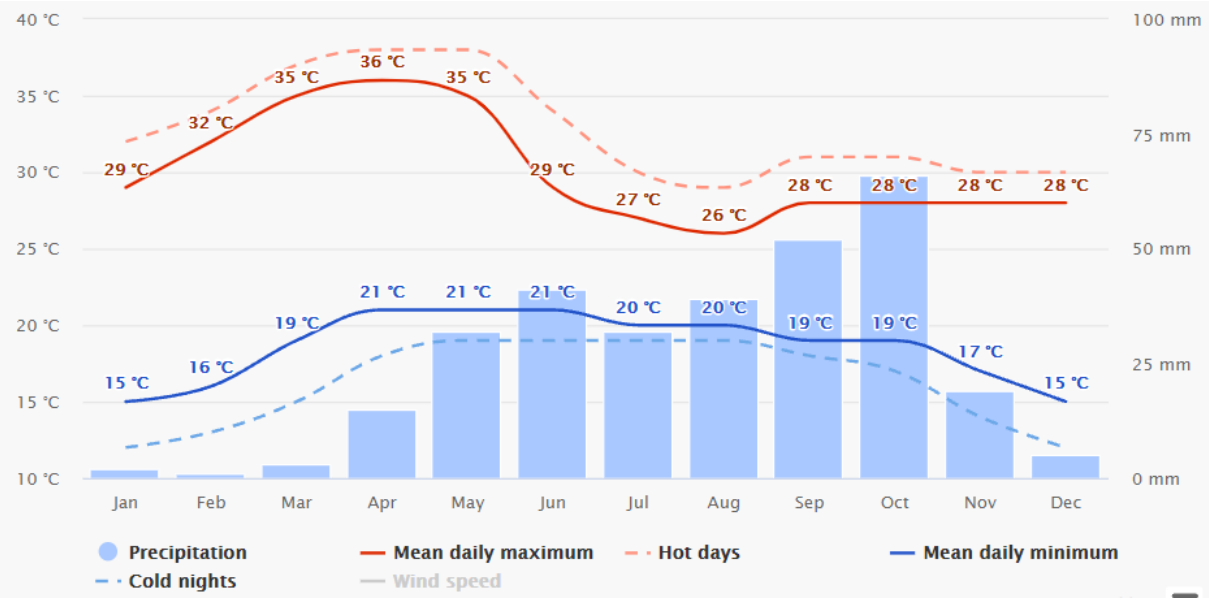


Figure 4-17: Average temperature and precipitation of Taluka Kudligi

4.7.8 RAINFALL

The normal annual rainfall in the district based on 30years is 574mm. However, in the last decade (1996-2005) the district received an average annual rainfall of 631.7mm. The taluka of Chitradurga faced deficit rainfall in the years of 2002 & 2004 as well, most of the other talukas had deficit rainfall during two successive years 2002 and 2003.

The 5 years rainfall data collected from Customized Rainfall Information System (CRIS), Hydromet Division, IMD, Davanagere district is mentioned in **Table 4.9.**

Table 4-9: Five Year Trend of Rainfall in Chitradurga district (2016-20)

Year/Month	2016	2017	2018	2019	2020
January	0.9	0.0	0.0	1.6	0.4
February	0.0	0.0	1.6	4.7	0.0
March	0.8	1.1	30.7	0.0	0.0
April	3.4	11.3	14.8	14.8	33.3
May	65.8	41.1	88.1	48.3	101.1
June	78.5	35.1	68.5	56.2	88
July	81.5	47.2	42.7	50.2	156.1
August	8.3	68	47	113.5	52.7
September	48.8	183	37.9	151.3	205.2
October	18.1	194.3	95.9	247.1	243.7
November	0.2	1.8	25	23	16.5
December	15.5	0.1	0.3	22.8	12.9

Source: IMD

4.7.9 WIND

The predominant wind direct in Chitradurga is from West-South-West (WSW) to East-North-East (NE). The wind-rose diagram for Chitradurga taluka is given in **Figure 4-18**.

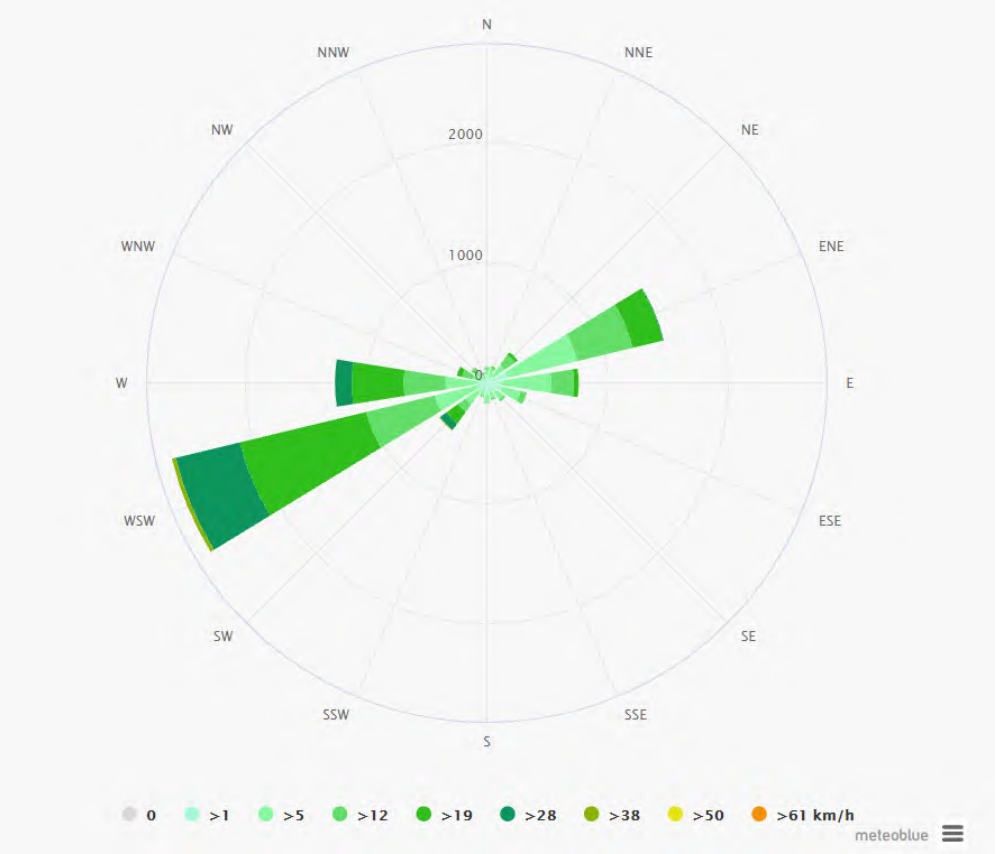


Figure 4-18: Wind Rose Diagram of Chitradurga Taluka

The Wind Hazard Map of Karnataka shows that the area lies in Low Damage Risk Zone with a wind velocity of 33 m/s and is considered as low damage wind zone. The Wind Hazard Map is shown in **Figure 4-19**.

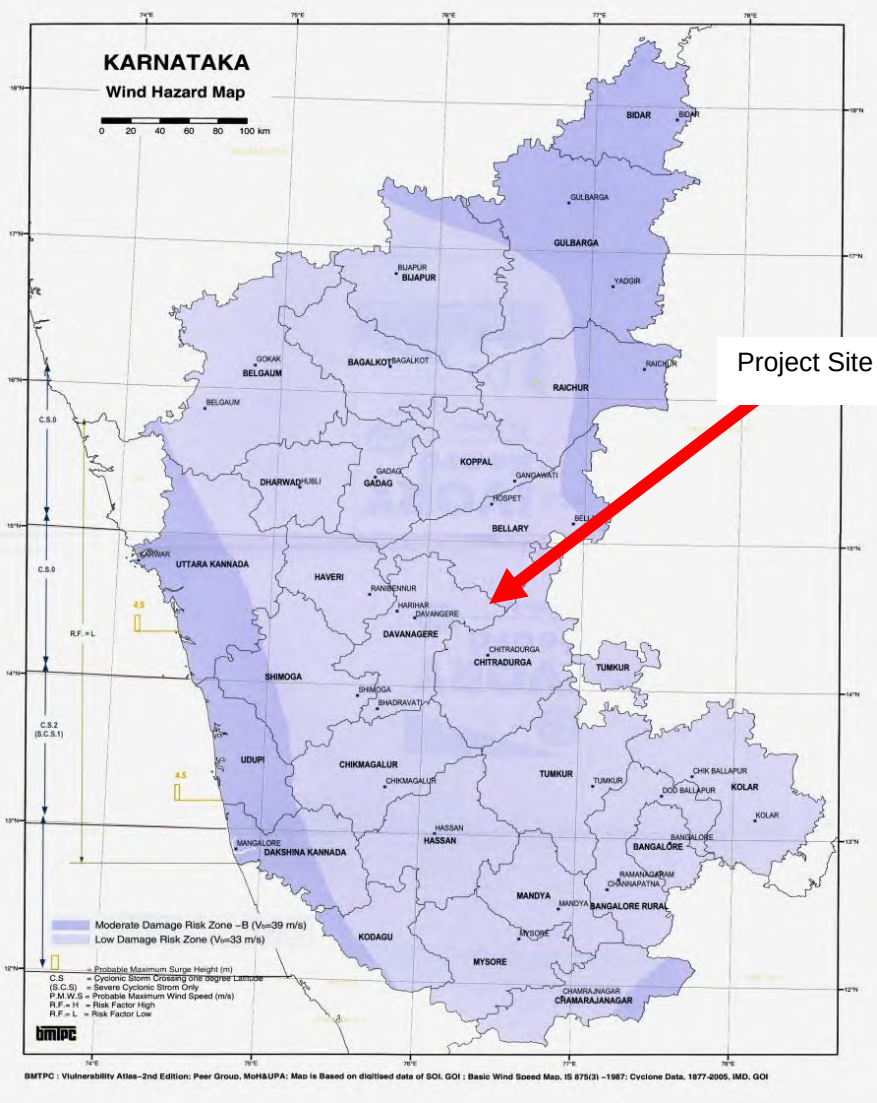


Figure 4-19: Wind Hazard Map of Karnataka District showing Project Site

4.7.10 NATURAL HAZARDS

Natural hazards are naturally occurring physical phenomena caused either by rapid or slow onset events which can be geophysical (earthquakes, landslides, tsunamis and volcanic activity), hydrological (floods), climatological (droughts, etc.), meteorological (cyclones and storms/wave surges) or biological (disease epidemics and insect/animal plagues). Natural hazards can have impacts on the developments; hence assessment of the natural hazards in the area is important for any proposed development.

4.7.10.1 Seismicity

As per the Revised Earthquake Hazard Mapping, 22.13% of the total geographical area in Karnataka is under 'moderate' earthquake damage risk zone & remaining area of the state is under 'low' damage risk zone. The project under the Bellary, Davanagere, and Chitradurga District of Karnataka hence lies in seismic zone II (Low Damage Risk Zone (MSK VI) as shown below in **Figure 4-20**.

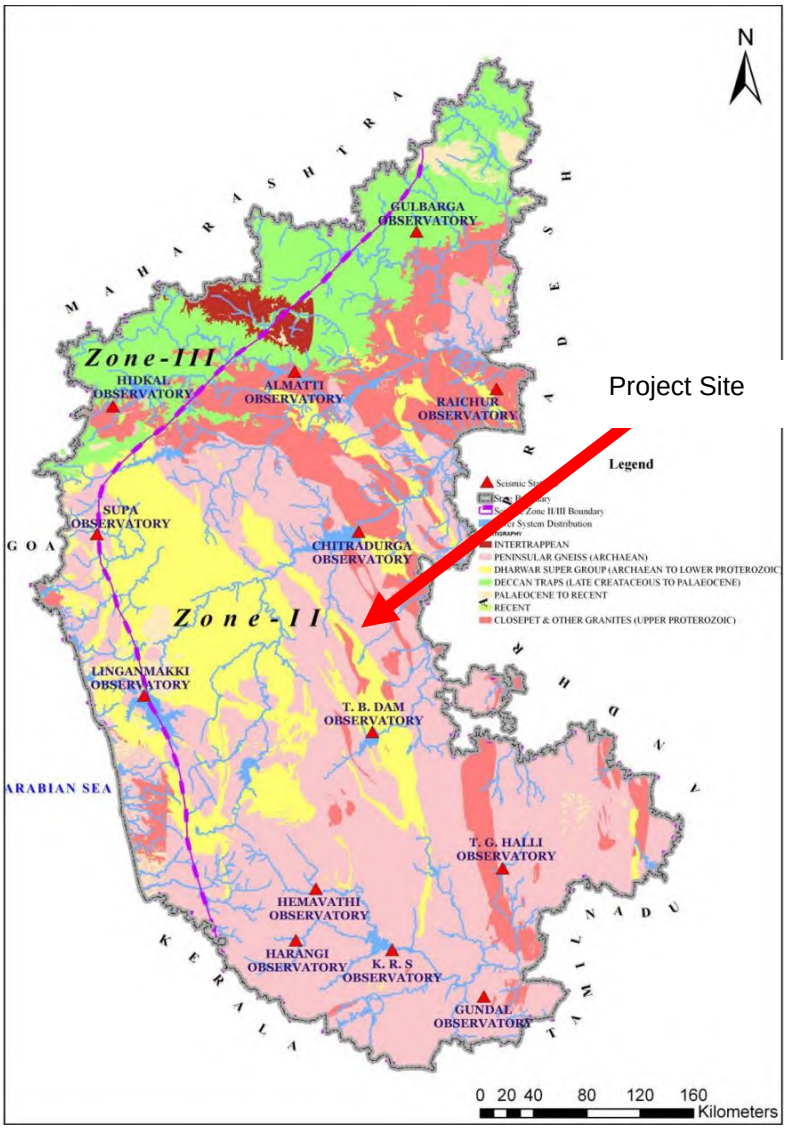


Figure 4-20: Geological Map of Karnataka State with Seismic Zonation showing Project Site

4.7.10.2 Drought

The Govt. of Karnataka has declared 100 of the 177 talukas as affected by the drought. The study area lies in drought affected taluka. The area is facing drought since past 4 years. As

per Karnataka State Natural Disaster Monitoring Centre, the Bellary district is catergorized under the highly drought vulnerable class. The map showing 100 drought affected talukas as on September 2018 is presented below as **Figure 4-21**[7].

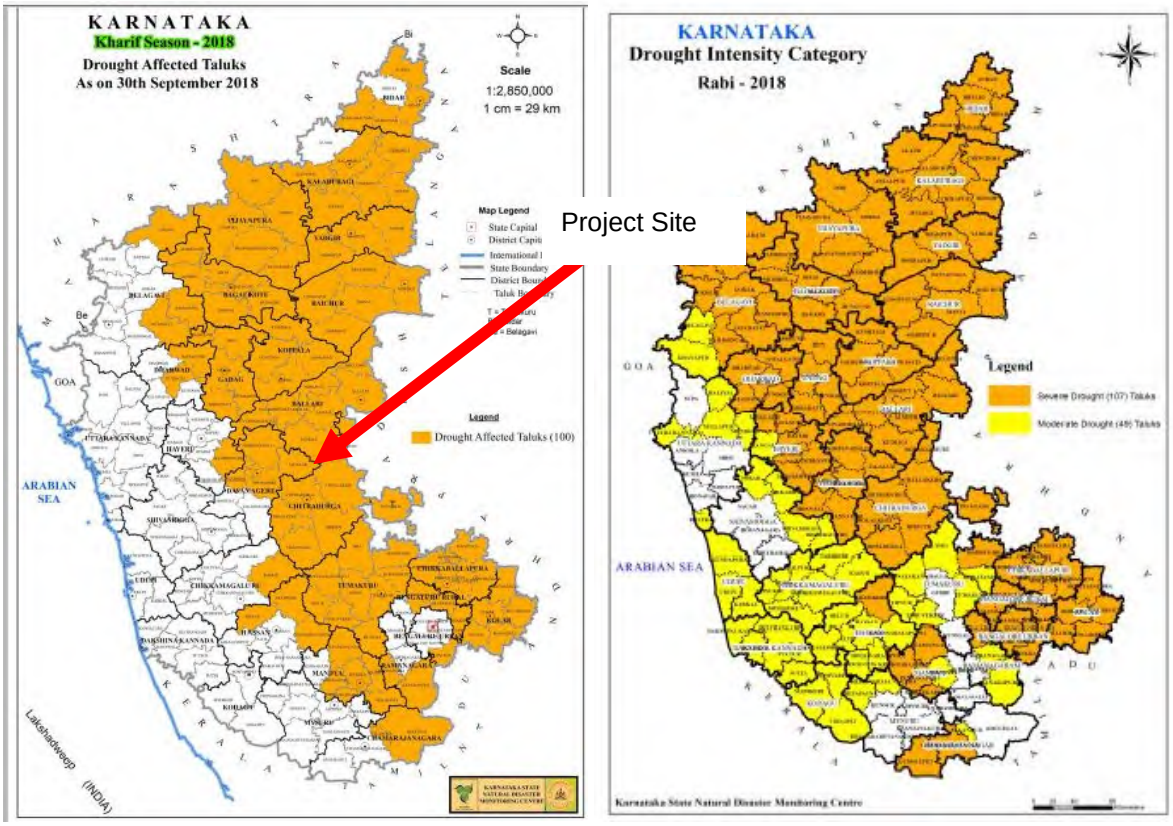


Figure 4-21: Drought Vulnerability Map of Karnataka State showing proposed project site in 2018

4.7.11 FLOOD

Major part of the all the three district lies in Krishna basin and is drained by perennial river Tungabhadra which forms major drainage system and river Chikka Hagari and Hagari/Vedavathi are its tributaries runs south to north from the southern tip of the district. There are 3 village lakes and chinna hagari stream present within the study area. Chinna Hagari river is 2.4 km from SGJA 43 WTG location, Jagalur lake is 4.1 km from SGJA 77 WTG location, Sangenahalli lake is 9.7 km from SGJA 108 WTG location and Katlalu lake is

[7] *Report of National Disaster Risk Reduction Portal made by NIDM (National Institute of Disaster Management)*

9.8 km from SGJA 118 WTG location. These water bodies are seasonal and do not retain water for longer duration. Water from these water bodies is extracted by farmers to fulfill their irrigation needs during and after monsoon. Further, as per Flood Zone Maps of India; the area doesn't fall in Flood Risk. Therefore, the project site area is not prone to flood risk.

4.7.12 ARCHAEOLOGY AND CULTURAL HERITAGE RESOURCES

There are no structures of archaeological importance within WTG zone; Area of Influence (AoI) and within study area.

4.8 BASELINE ENVIRONMENTAL MONITORING

The baseline Environmental Monitoring was carried out in October, 2021 for analysis of Ambient Air Quality, Ambient Noise, Soil Quality, Surface and Groundwater Quality in the Study Area by Devansh Labs, a NABL and MoEF&CC accredited laboratory. The previous environmental monitoring results has been considered for the baseline study due to current COVID 19 pandemic scenario.

4.8.1 AMBIENT AIR QUALITY MONITORING (AAQM)

The monitored parameters, sampling frequency, code of practice and methods of measurement for Ambient Air Quality Monitoring (AAQM) data are given in **Table 4-9** below.

Table 4-10: Monitored Parameter, Sampling Frequency, code of Practice and Method of Measurement

S. No.	Parameter	Sampling Frequency	Code of Practice	Method of Measurement
1.	Particulate Matter (PM10)	24 hours twice a week for 1 month	IS-5182 (PART-23):2006 & CPCB Guidelines	Gravimetric
2.	Particulate Matter (PM2.5)			
3.	Sulphur Dioxide (SO_2)	24 hours twice a week for 1 month	IS-5182 (Part-II):2001 & CPCB Guidelines	Improved West and Geake
4.	Oxides of Nitrogen (NOx)	24 hours twice a week for 1 month	IS-5182 (Part-VI): 2006 & CPCB Guidelines	Modified Jacob & Hochheiser (Na-Arsenite)
5.	Carbon Monoxide (CO)	8 hourly for 24 hours twice a week for 1 month	IS: 5182 (Part-X) & CPCB Guidelines	Non Dispersive Infra-Red (NDIR) spectroscopy

The details of ambient air quality monitoring stations are described in **Table 4-10** below

Table 4-11: Details of Ambient Air Quality Monitoring Locations

S.No.	Monitoring Location	Geographical Coordinates	Reasons for selecting location
1	AQ1 Channapura	636150.83 m E 1605174.68 m N	Downwind direction
2	AQ2 Issamudra	631846.50 m E 1591708.42 m N	Downwind direction
3	AQ3 School at Guttidurga	634338.00 m E 1598980.00 m N	Upwind direction
4	AQ4 Kanamadagu	655244.04 m E 1614296.72 m N	Upwind direction
5	AQ5 Kenchamallanahalli	659692.14 m E 1612047.92 m N	Crosswind direction
6	AQ6 Lokikere	661603.53 m E 1617165.09 m N	Upwind direction
7	AQ7 Nallikatte	636173.48 m E 1593412.65 m N	Upwind direction
8	AQ8 Rastemachikere	639690.68 m E 1604462.18 m N	Cross wind direction

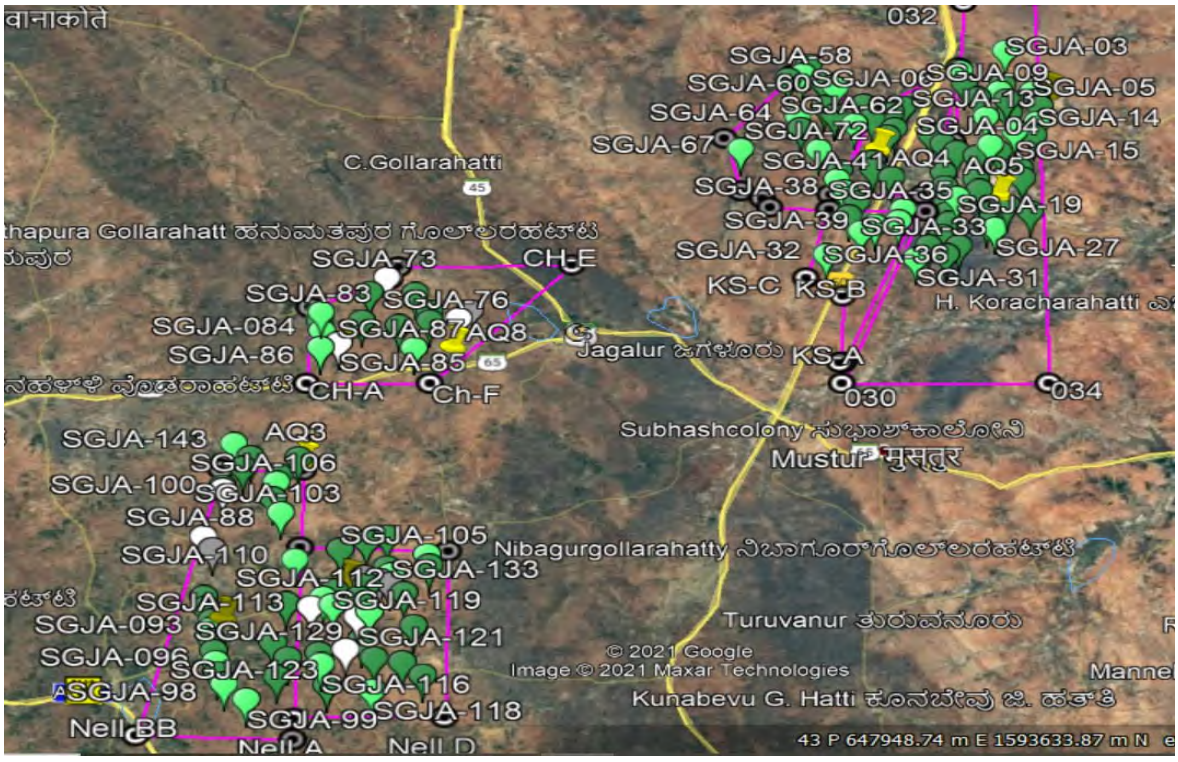


Figure 4-22: Ambient Air Quality Monitoring Locations

The results of ambient air quality monitoring in the study area are presented in **Table 4-11** below.

Table 4-12: Ambient Air Quality Monitoring Results

AAQ Monitoring Stations	Location	PM_{10}	$PM_{2.5}$	SO_2	NO_2	CO
		µg/m³				mg/m³
AQ1	Channapura	73.5	44.5	24.6	14.6	1.15
AQ2	Issamudra	74	42	25	15.5	1.102
AQ3	School at Guttidurga	76.5	45.5	24.7	15.4	1.252
AQ4	Kanamadagu	70.5	41	24.9	14.5	1.152
AQ5	Kenchamallanahalli	75.5	42.5	24.5	15.2	1.128
AQ6	Lokikere	73.5	43.5	25.4	16.2	1.213
AQ7	Nallikatte	69.5	45.5	25.6	14.5	1.108
AQ8	Rastemachikere	70.5	41	24	14.6	1.152

Source: Primary Environmental Montoring, October 2021

AQ1

AQ2

	
AQ3	AQ4
	
AQ5	AQ6
	
AQ7	AQ8

Particulate Matter (PM_{10})

The Particulate Matter (PM10) concentrations varied from 69.5 µg/m^3 to 76.5 µg/m^3 in all the eight monitoring locations. The highest concentration of 76.5 µg/m^3 was observed at the Guttidurga village school in the upwind direction and the lowest concentration of 69.5 µg/m^3 was observed in upwind direction in Nallikatte village. However, the PM10 concentrations at most of the monitoring locations were found to be around permissible limits of CPCB.

Particulate Matter ($PM_{2.5}$)

The Particulate Matter ($PM_{2.5}$) concentrations varied from 41 µg/m^3 to 45.5 µg/m^3 in all the eight monitoring locations. The highest concentration of 45.5 µg/m^3 was observed at Guttidurga village school in the upwind direction and the lowest concentration of 41 µg/m^3 was observed at Rastemachikere Village in crosswind direction and Kanamadagu in upwind direction.

Sulphur Dioxide (SO_2)

The Sulphur Dioxide (SO_2) concentrations varied from 24 µg/m^3 to 25.6 µg/m^3 in all the eight monitoring locations. The highest concentration of 25.6 µg/m^3 was observed at Nallikatte village and the lowest concentration of 24 µg/m^3 was observed at Rastemachikere. However, the SO_2 concentrations at all the monitoring locations were found to be below permissible limits of CPCB.

Oxides of Nitrogen (NO2)

The concentrations of oxides of Nitrogen (NOx) concentrations varied from 14.5 µg/m^3 to 16.2 µg/m^3 in all the eight monitoring locations. The highest concentration of 16.2 µg/m^3 was observed at the Kanamadagu Village and the lowest concentration of 14.5 µg/m^3 was observed at Lokikere village. The NOx concentrations at all the monitoring locations were found to be below permissible limits of CPCB.

Carbon Monoxide (CO)

The Carbon monoxide (CO) concentrations at all locations were found to be below 1.5 mg/m^3 at all locations.

Inferences:

The ambient air quality observed in the area is good as all the parameters observed are considerably below National Ambient Air Quality Standards (NAAQS). The site and surrounding is predominantly rural with no identified major sources of pollution in the area. The movement of traffic was also observed to be limited in the area.

4.8.2 WATER QUALITY

Ground Water Quality in the district is generally potable and suitable for irrigation and domestic purposes. Based on the annual ground water availability for future irrigation use, it is proposed that the ground water development structure viz, dug well, dug cum bore wells and bore wells can be constructed in those areas falling under safe & semi critical category.

The ground water samples in the Study Area were analyzed for parameters as mentioned in IS: 10500:2012 standards and the analysis was undertaken as per IS 3025 and relevant American Public Health Association (APHA) standard methods.

The monitoring locations selected for analysis of the ground water samples are presented in **Table 4-13** and monitoring analysis results are provided in **Table 4-14**.

Table 4-13: Ground water sampling locations

S.No.	Monitoring Location	Geographical Coordinates	Distance and Direction	Reasons for selecting location
1	GW1 Kanamadagu	655251.25 m E 1614255.54 m N	595 m NE	The nearest settlement from project site at 562 m NE
2	GW2 Kenchamanallahalli	660160.26 m E 1612199.76 m N	625 m ENE	The nearest settlement from project site at 625 m ENE
3	GW3 Channapura	636115.99 m E 1605158.42 m N	483.5 m NE	The nearest settlement from project site at 449 m NE
4	GW4 Nallikatte	636113.45 m E 1593574.61 m N	804 m N	The nearest settlement from project site at 700 m N.

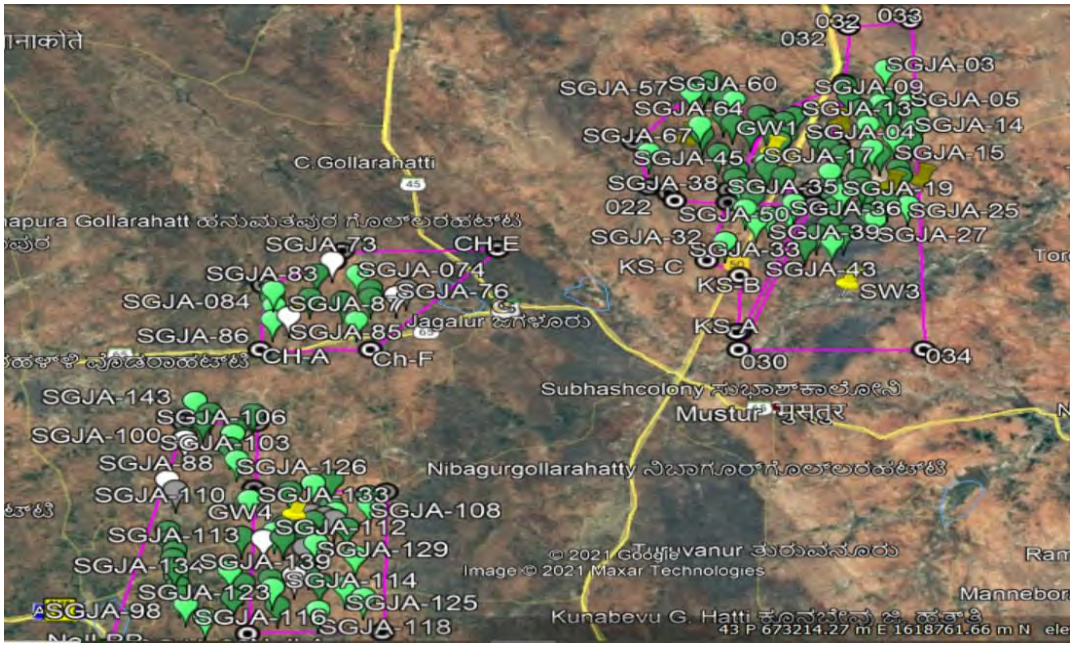


Figure 4-23: Groundwater Quality Monitoring Locations

Table 4-14: Ground Water Quality Monitoring Results

Sr. No.	Parameter	IS: 10500 (Drinking Water Standards), 2012*	Unit	Ground Water			
				GW-1	GW-2	GW-3	GW-4
1.	Electrical Conductivity	-	µS/cm	812	796	796	796
2.	Colour	--	Hazen	<5	<5	<5	<5
3.	Turbidity	1 (5)	NTU	<0.6	<0.7	<0.7	<0.5
4.	pH	--	–	7.79	7.83	7.84	7.78
5.	Total Dissolved Solids	500 (2000)	mg/lit	546	556	568	534
6.	Total Hardness	200 (600)	mg/lit	352	362	356	337
7.	Calcium	0.01	mg/lit	142	130	144.2	138
8.	Magnesium	0.2 (1)	mg/lit	51	53.7	54	48
9.	Chloride	200 (600)	mg/lit	78	76.8	83.8	68
10.	Sulphate	1 (1.5)	mg/lit	25.8	25.4	24.7	25.4
11.	Iron	0.01 (0.03)	mg/lit	0.013	0.016	0.017	0.011

12.	Residual Free Chlorine	200 (400)	mg/lit	Not detected	Not detected	Not detected	Not detected
13.	Copper	5 (15)	mg/lit	Not detected	Not detected	Not detected	Not detected
14.	Manganese	75 (200)	mg/lit	Not detected	Not detected	Not detected	Not detected
15.	Fluoride	0.5 (1)	mg/lit	Not detected	Not detected	Not detected	Not detected
16.	Cadmium	30 (100)	mg/lit	Not detected	Not detected	Not detected	Not detected
17.	Selenium	0.3	mg/lit	Not detected	Not detected	Not detected	Not detected
18.	Arsenic	0.003	mg/lit	Not detected	Not detected	Not detected	Not detected
19.	Zinc	0.01	mg/lit	1.6	1.7	1.9	1.7
20.	Hexavalent Chromium (Cr^{6+})	0.05 (1.5)	mg/lit	Not detected	Not detected	Not detected	Not detected
21.	Total Alkalinity	200 (600)	mg/lit	376	382	363	346
22.	Boron	--	mg/lit	Not detected	Not detected	Not detected	Not detected
23.	Lead	0.001 (0.05)	mg/lit	Not detected	Not detected	Not detected	Not detected
24.	Total Coliform	Shall not be detectable in any 100 ml sample	MPN/100ml	Absent/100 ml	Absent/100 ml	Absent/100 ml	Absent/100 ml

Source: Primary Environmental Monitoring, October 2021

GW1

GW2

	
GW3	GW4

Inferences:

- The pH of groundwater samples is highly alkaline and varies from 7.79-7.84
- The alkalinity observed in all 4 locations were found to be slightly higher than permissible limits
- The concentrations of Arsenic, Residual Chlorine, Cadmium, Lead, Copper, Selenium, and Hexavalent Chromium were not detectable in all groundwater samples
- The total Coliform content was absent in all groundwater samples which negates any biological contamination

Surface Water Analysis

The surface water sample was analyzed from three locations for parameters as mentioned in IS: 2296-1982 standards and the analysis was undertaken as per IS 2296 and relevant American Public Health Association (APHA) standard methods. The surface water quality monitoring locations are given in **Table 4-15** and analysis results are given below in **Table 4-16**.

Table 4-15: Surface water collection locations

S.No.	Monitoring Location	Geographical Coordinates	Distance and Direction	Reasons for selecting location
1	SW1 Anabur	651703.46 m E 1614940.71 m N	900 m NE	Waterbody located 900 m to the project site
2	SW2 Hulikere	658115.32 m E 1615888.57 m N	1 km NE	Waterbody located 1 km to the project site

3	SW3 Halehalli	658297.72 m E 1606580.03 m N	2 km N	Waterbody located 2 km to the project site
4	SW4 Kenchamanallahalli	661430.93 m E 1612579.53 m N	644 m SW	Waterbody located 644 m to the project site

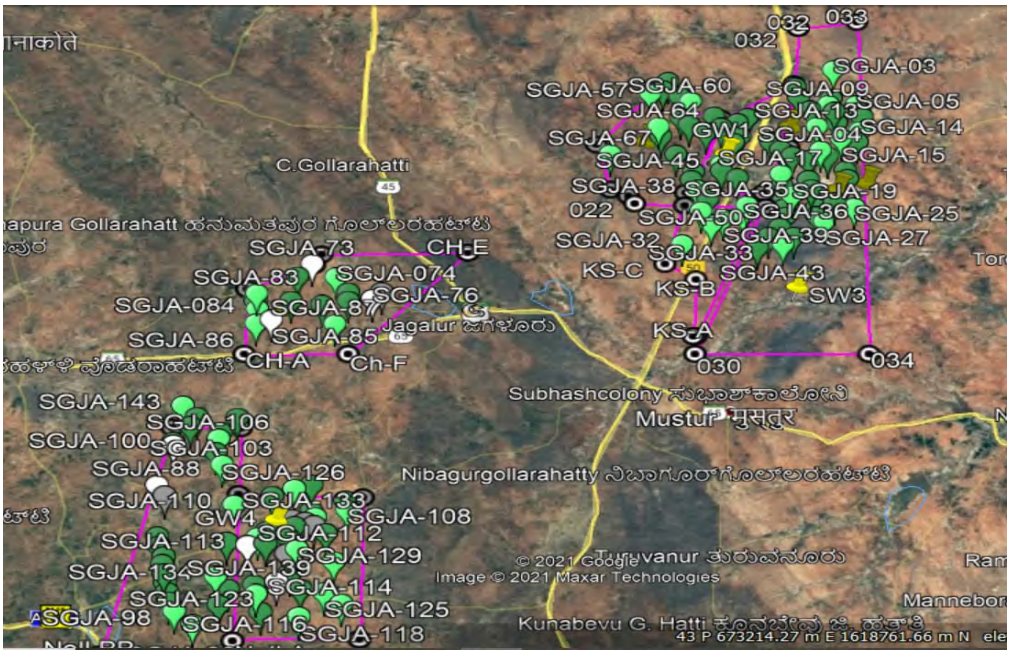


Figure 4-24: Surface Water Quality Monitoring Locations

Table 4-16: Surface Water Quality Monitoring Results

Sr. No.	Parameter	IS: 2296 (Class C)	Unit	Surface Water			
				SW1	SW2	SW3	SW4
1.	Colour	300	Hazen	10	10	9	10
2.	pH	6.5-8.5	---	7.64	7.61	7.59	7.67
3.	Electrical Conductivity	--	µs/cm	984	1011	994	984
4.	Total Hardness	200 (600)	mg/lit	228	224	216	232
5.	Chloride	600	mg/lit	76	82	74	84.7
6.	Sulphate	200 (400)	mg/lit	21.6	22.4	19.8	23.8
7.	Nitrate	50	mg/lit	6.2	6	5.8	6.4
8.	Sodium		mg/lit	2.0	2.3	2.4	1.9
9.	Potassium		mg/lit	Not detected	Not detected	Not detected	Not detected

10.	Magnesium	30 (100)	mg/lit	21	18	32.8	21
11.	Dissolved Oxygen	4.0	mg/lit	4.9	4.7	4.8	4.9
12.	BOD	5.0	mg/lit	13	12.5	12	10.5
13.	Arsenic	0.001 (0.05)	mg/lit	Not detected	Not detected	Not detected	Not detected
14.	Total Chromium (as Cr)		mg/lit	Not detected	Not detected	Not detected	Not detected
15.	Selenium	0.01	mg/lit	Not detected	Not detected	Not detected	Not detected
16.	Copper	0.05 (1.5)	mg/lit	Not detected	Not detected	Not detected	Not detected
17.	Mercury		mg/lit	Not detected	Not detected	Not detected	Not detected
18.	Total Alkalinity	200 (600)	mg/lit	184	192	196	184
19.	Aluminium		mg/lit	0.331	0.339	0.342	0.332
20.	Phenolic Compounds		mg/lit	Not detected	Not detected	Not detected	Not detected
21.	Sodium Absorption Ratio		---	0.038	0.042	0.038	0.038
22.	Total Coliform	5000	MPN/100 ml	Absent/100 ml	Absent/100 ml	Absent/100 ml	Absent/100 ml
23.	Calcium	75 (200)	mg/lit	81	84	72	72
24.	Cadmium	0.01	mg/lit	Not detected	Not detected	Not detected	Not detected
25.	Cyanide	0.05	mg/lit	Not detected	Not detected	Not detected	Not detected
26.	Anionic Detergents	1.0	mg/lit	Not detected	Not detected	Not detected	Not detected
27.	Oil & Grease		mg/lit	<3	<5	<3	<3

** Values in () indicate permissible limits*
ND: Not Detected
BDL: Below Detectable Limit
Source: Primary Environmental Monitoring, October 2021

	
SW1	SW2
	
SW3	SW4

Inferences:

The summary of the analysis of water samples results is as follows:

- pH of SW-1 to SW-4 was found to be varying between 7.59 to 7.67 which indicates slightly alkaline nature;
- DO was found to be varying between 4.7-4.9 while BOD was observed to be varying between 10.5-13.0 mg/l.
- The hardness values were found to be exceeding permissible limits in all water samples
- The Magnesium concentration was observed to be varying between 18-32.8 mg/l which is higher than permissible limits
- The concentration of heavy metals like mercury, chromium, cadmium, and cyanide was not detected in the samples.

- The coliform count in SW-1 to SW-4 was observed as Absent which indicates no fecal contamination of the water samples.

4.8.3 SOIL QUALITY

The Red soil are the major type of soil in the district, found mainly at elevated places especially at fringes of hills due to decomposition of rocks and surrounding granitic and gneissic hills. These soils are with high permeability and neutral PH. The Black soil is found in the prolonged submerged areas and canal command areas having low Permeability. It is calcareous and mildly alkaline in nature. The site area is majorly surrounded by red soils.

The soil quality of the project area was evaluated and samples from four locations were collected and analyzed to determine the same. Details of soil sampling locations are presented in **Table 4-17**. Soil samples have been collected using auger up to a depth of 60 cm below ground level. The monitoring analysis results are given in **Table 4-18**.

Table 4-17: Soil sampling collection locations

S.No.	Monitoring Location	Geographical Coordinates	Reasons for selecting location
1	S1 Kanamadagu	655681.08 m E 1614860.31 m N	The nearest settlement from project site at 425 m NE.
2	S2 Kenchamanallahalli	660216.56 m E 1612222.60 m N	The nearest settlement from project site at 611 m NE.
3	S3 Channapura	636147.67 m E 1605143.60 m N	The nearest settlement from project site at 453 m NE.
4	S4 Nallikatte	636108.90 m E 1593602.25 m N	The nearest settlement from project site at 763 m NE.

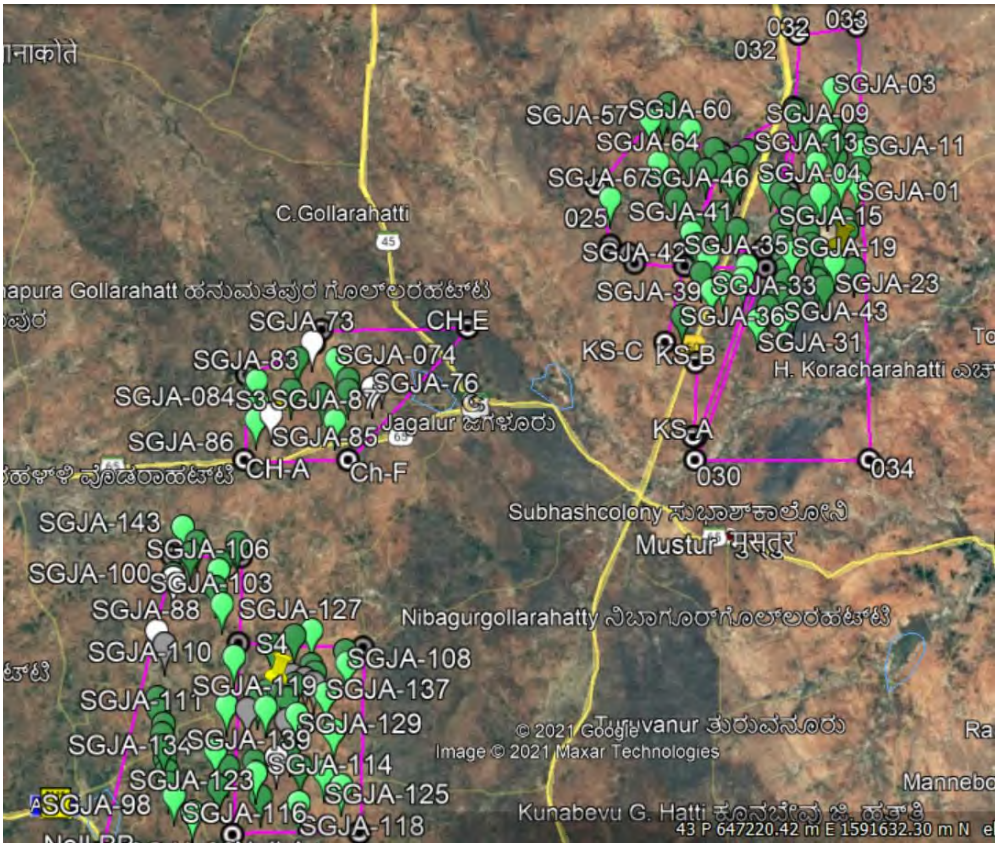


Figure 4-25: Soil Quality Monitoring Locations

Table 4-18: Results of Soil Quality Analysis

S. No.	Parameter	Unit	Soil Quality			
			S1	S2	S3	S4
1	pH	–	7.18	7.14	7.18	7.21
2	Electrical Conductivity	uS/cm	452	436	441	461
3	Moisture	%	9.2	9.7	9.1	9.0
4	Sodium	mg/kg	33.6	32.4	32.8	37
5	Potassium	mg/kg	17.9	17.4	16.8	19.4
6	Carbonate	mg/kg	24	21	23	27
7	Chloride	mg/kg	0.16	0.13	0.15	0.19
8	Total Kjeldhal Nitrogen	mg/kg	104	108	112	114.8
9	Phosphorous	mg/kg	29.8	28	24	36
10	Organic Matter	%	1.68	1.72	1.68	1.82
11	Sulphate	mg/kg	57	54	55.7	49
12	Bulk Density	g/cm³	1.36	1.28	1.31	1.28
13	Sodium Absorption Ratio	–	4.7	4.4	4.1	4.3
14	Zinc	mg/kg	25.8	24.1	24.8	24.1

15	Iron	mg/kg	39	36	39	33
16	Copper	mg/kg	1.9	1.7	1.9	1.4
17	Boron	mg/kg	0.078	0.071	0.068	0.079

Source: Primary Environmental Monitoring, October 2021

The results of the soil quality analysis were compared with the standard soil classification provided by the Indian Council of Agricultural Research (ICAR) and as given in Table 4.19 below.

Table 4-19: Standard Soil Classification

Soil Parameters	Classification	
pH	Normal to saline	6.0 to 8.5
	Tending to become alkaline	8.5-9.0
	Alkaline	Above 9.0
Electrical conductivity (mmhos/cm)	Up to 1.00 – Normal	
	1.01- 2.00 - Critical to germination	
	2.01-4.00 - Critical for growth of the sensitive crops	
	Above 4.00 – Injurious to most crops	

Source: Indian Council of Agricultural Research, New Delhi

S1

S2

	
S3	S4

Inference

- pH of the soils samples ranged from 7.14-7.21, showing saline in nature;
- Electrical conductivity of soil samples was observed to be varying from 436-461 uS/cm which indicates normal soil conditions

4.8.4 AMBIENT NOISE MONITORING

Primary noise monitoring was carried out for continuous 24 hours at the eight (8) identified receptor locations to evaluate the baseline noise levels at the project site. The ambient noise monitoring has been undertaken, taking into consideration factors like wind induced noise and human activities such as movement of vehicles. The baseline ambient noise levels represent the background noise levels that would be present in the absence of the proposed wind power plant.

Ambient noise level was monitored continuously for 24 hours using Sound Level Meter. Sound pressure levels were recorded at every 10 minutes to calculate the Leq (hourly) values. The relevant statistic measured was the LA90 (10min) (The A-weighted sound pressure level exceeded for 90 % of the 10-minute interval. The noise levels obtained were analyzed to arrive at the equivalent continuous noise level (Leq) for day and night time. The day and night time hours ranged from 06:00 to 22:00 hrs and 22:00 to 06:00 hrs respectively. The noise monitoring locations are given below in **Table 4-20**.

For noise levels measured over a given period of time, it is possible to describe important features of noise using statistical quantities. This is calculated using the percent of the time

certain noise levels exceeds the time interval. The notation for the statistical quantities of noise levels is described below:

- Hourly Leq values have been computed by integrating sound level meter.
- Lday: As per the CPCB guidelines the day time limit is between 06:00 hours to 22.00 hours as outlined in Ministry of Environment and Forest Notification S.O. 123 (E) dated 14/02/2000.
- Lnight: As per the CPCB guidelines the night time limit is between 22:00 hours to 06.00 hours as outlined in Ministry of Environment and Forest Notification S.O. 123 (E) dated 14/02/2000.

Table 4-20: Details of Noise Monitoring Locations

S.No.	Monitoring Location	Geographical Coordinates	Distance and Direction	Reasons for selecting location
1	N1 Alur	656154.19 m E 1613685.01 m N	802 m NW from WTG 47	Village road connecting Highway (Solapur Mangalore Highway)
2	N2 Basavapura	634232.36 m E 1604866.57 m N	871 m NE from WTG 82	Village road connecting Highway (SH 65)
3	N3 Issmudra	631934.26 m E 1591568.45 m N	470 m NW from WTG 91	WTG SGJA 91 & 92 site approaching road connecting Village road
4.	N4 Huchavvananahalli	655023.79 m E 1609088.38 m N	608 m NW from WTG 33	Village road connecting Highway (Solapur Mangalore Highway)
5.	N5 Guttidurga	634393.58 m E 1599308.48 m N	707 m S from WTG 141	WTG SGJA 141 site approaching road connecting Village road and Highway SH 65
6.	N6 Yelagodu	639876.93 m E 1589852.20 m N	1.5 km from the WTG125	WTG 125 and WTG 114 site approach road connecting Village road
7.	N7 Hulikere	656061.29 m E 1616745.89 m N	926 m SE from the WTG 70	WTG 70 site approach road connecting Village road
8.	N8 Giddanakatte	640678.62 m E 1606152.73 m N	494 m S from the WTG 77	WTG 77 site approach road connecting Village road

Source: Primary Environmental Monitoring, October 2021

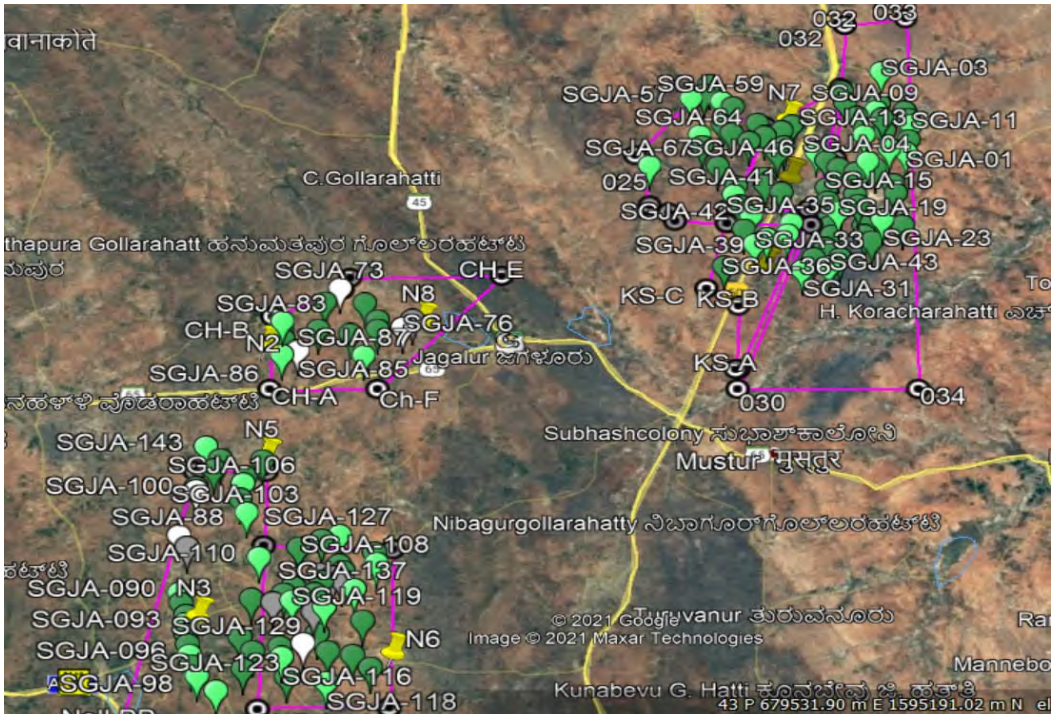


Figure 4-26: Noise Quality Monitoring Locations

The noise monitoring analysis results are given in **Table 4-21**. As normal, the night time noise levels are lower compared to the day time values. The average difference between day and night time levels in the area is of the order of only 8.1 dB(A), reflecting the urban nature of the study area.

The noise levels were observed to be within the prescribed CPCB standards for day time and night time except at location N8 where noise decibel is slightly exceeding beyond the standard limits which can be attributed to factors like wind induced noise and human activities such as movement of vehicles.

Table 4-21: Results of Noise Level Monitoring

	Location	Alur	Basavapura	Issmudra	Huchavvananahalli	Guttidurga
Hourly L_{eq}	06:00 - 07:00	42.7	42.2	43.0	43.7	39.7
	07:00 - 08:00	47.1	43.8	44.6	46.1	43.8
	08:00 - 09:00	48.6	45.3	46.1	47.6	45.3
	09:00 - 10:00	50.6	47.3	48.1	49.6	47.3
	10:00 - 11:00	51.4	48.1	48.9	50.4	48.1
	11:00 - 12:00	54.2	50.9	51.7	53.2	50.7
	12:00 - 13:00	55.0	51.7	52.5	54.0	52.7
	13:00 - 14:00	55.5	52.2	53.0	54.5	52.2

	14:00 - 15:00	54.7	51.4	52.2	53.7	51.4
	15:00 - 16:00	54.5	51.2	52.0	53.5	51.2
	16:00 - 17:00	55.7	52.4	53.2	54.7	52.4
	17:00 - 18:00	54.1	50.8	51.6	53.5	50.8
	18:00 - 19:00	53.3	50.0	50.8	52.3	50.0
	19:00 - 20:00	52.4	49.1	46.9	51.4	49.1
	20:00 - 21:00	51.3	48.0	45.2	50.3	45.2
	21:00 - 22:00	45.9	46.4	44.6	48.7	44.5
	22:00 - 23:00	40.8	44.5	40.5	43.5	44.5
	23:00 - 00:00	40.0	41.9	39.2	38.8	39.3
	00:00 - 01:00	39.5	40.3	38.2	39.9	39.0
	01:00 - 02:00	38.8	39.8	37.5	39.4	38.9
	02:00 - 03:00	38.5	39.6	37.5	36.2	36.6
	03:00 - 04:00	37.7	39.3	37.6	36.2	36.9
	04:00 - 05:00	39.8	39.0	39.2	39.4	37.9
	05:00 - 06:00	40.5	41.8	39.4	41.2	39.1
Leq	$L_{eq\ (day)}$	52.9	49.6	50.2	52.0	49.6
	$L_{eq\ (night)}$	39.6	41.1	38.8	39.9	39.8
	L_{10}	55.2	51.9	52.7	54.2	52.3
	L_{50}	49.6	46.8	45.6	49.1	45.2
	L_{90}	38.6	39.4	37.6	37.5	37.4
	L_{max}	55.7	52.4	53.2	54.7	52.7
	L_{min}	37.7	39.0	37.5	36.2	36.6
	$L_{eq\ (24\ hrs)}$					

	Location	Yelagodu	Hulikere	Giddanakatte
Hourly L_{eq}	06:00 - 07:00	50.0	50.0	54.9
	07:00 - 08:00	49.1	49.1	55.3
	08:00 - 09:00	48.0	48.0	56.2
	09:00 - 10:00	46.4	46.4	58.4
	10:00 - 11:00	44.5	44.5	56.5
	11:00 - 12:00	41.9	41.9	57.0
	12:00 - 13:00	40.3	46.7	58.8
	13:00 - 14:00	39.8	48.5	58.4
	14:00 - 15:00	39.6	44.4	56.4
	15:00 - 16:00	51.2	51.2	56.8
	16:00 - 17:00	52.4	52.4	56.4
	17:00 - 18:00	50.8	50.8	56.4
	18:00 - 19:00	50.0	50.0	54.7
	19:00 - 20:00	49.1	49.1	54.2
	20:00 - 21:00	45.2	45.2	52.5

	21:00 - 22:00	44.5	44.5	52.8
	22:00 - 23:00	44.5	40.3	50.2
	23:00 - 00:00	39.3	39.8	48.3
	00:00 - 01:00	39.0	39.6	48.4
	01:00 - 02:00	38.9	38.9	46.9
	02:00 - 03:00	36.6	36.6	45.5
	03:00 - 04:00	36.9	36.9	44.7
	04:00 - 05:00	37.9	37.9	43.7
	05:00 - 06:00	39.1	39.1	42.9
Leq	$L_{eq\ (day)}$	48.1	48.5	56.3
	$L_{eq\ (night)}$	39.8	38.8	47.0
	L_{10}	51.0	51.0	58.4
	L_{50}	44.5	44.8	54.8
	L_{90}	37.4	37.4	44.2
	L_{max}	52.4	52.4	58.8
	L_{min}	36.6	36.6	42.9
	$L_{eq\ (24\ hrs)}$			

Source: Primary Environmental Monitoring, October 2021

N1

N2

	
N3	N4
	
N5	N6

	
N7	N8

4.9 ECOLOGY

Ecological studies are one of the important aspects of Environmental and Social Impact Assessment (ESIA) with a view to conserve biodiversity. Ecological systems show complex inter-relationships between biotic and abiotic components including dependence, competition and mutualism. Biotic components comprise of both plant and animal communities, which interact not only within and between themselves but also with the biotic components viz. physical and chemical components of the environment. Generally, biological communities are good indicators of climatic and edaphic factors. Studies on biological aspects of ecosystems are important for safety of flora and fauna. The biological environment includes terrestrial and aquatic ecosystems.

The observations and assessment of overall ecological scenario presented in this chapter include details of flora, fauna, natural habitats, protected areas, wildlife species and their migration corridors etc. Such baseline information provides better understanding of the situation and overall ecological importance of the area. This baseline information viewed against industrial activities help in predicting their impacts on the wildlife and their habitats in the region.

This section of report describes, the methodology adopted for secondary data collection, diversity of higher flora and fauna recorded through primary field studies and the secondary data sourced from published scientific literature, habitat profile and ecosystem services profile and nearest designated areas of the project site.

4.9.1 Scope and Objectives

The project area is classified into two major groups (Core and Buffer zone)

a) **Core zone of the Project** which is area around 500m from each WTG location and 50 m on either side of the proposed Transmission line.
b) **Buffer zone** is defined as Study Area of 15 km radius from the outermost boundary of WTG zone

Based upon the study and findings, impacts were predicted/assessed and subsequently mitigation measures were recommended so that many impacts would be mitigated as well as managed properly. Main objectives for Ecological surveys:

- Review and analyse the available literature data related to habitats, flora and fauna of the site around proposed project (Core Zone) and surrounding areas till 15 km radius (Buffer Zone)
- Identification of critical habitats, wildlife corridors, National Parks, Wildlife Sanctuary, any other areas of ecological significance.
- Identification of native, alien, exotic, rare, threatened and endangered species (if any).
- Assessment of impacts of the project on ecology during construction and operation phase.
- Identification of any notified area under international conventions, national or local legislation for their ecological, landscape, cultural or other related values within the study site.
- Suggestion of mitigation measures to minimize/avoid adverse impacts on ecology during construction and operation phase.

Primary data collection was carried out to identify the ecological features of the area with particular reference to identify the distance and direction of any sensitive habitats as well as conservation priority species of flora and fauna in the study area. The relevant, observations noted in that assessment have been included in the current assessment and referenced accordingly.

The ecological surveys focussed on the following:

- Determination of sensitive habitats, if any related to migratory bird based on Site Assessment

- Assessment of sensitivity of the region vis-à-vis project site and surroundings to determine probable impact of project, if any on sensitive habitats, nesting, breeding, foraging grounds due to project and its associated facilities
- Determination of critical/endangered/threatened/migratory bird species sighting, species inventory, critical habitats, congregation sites, roosting sites, protected areas, IBAs etc.
- Identification of the principal habitats and their classification, vegetation types (Trees, Shrubs, Herbs and Climbers) and fauna in the study area including avifauna. The floral assessment separately carried out shall further help in drawing significant conclusions about important habitats if any in the area and impact of upcoming project on breeding/nesting grounds of the endangered bird species
- Identification of critical habitats in the study area and buffer area; also, study of critical habitat/ecologically sensitive zone closest to the study area boundary
- Identification of fauna associated (based on visual encounter studies) with the vegetation types and habitats in the study area
- Listing fauna with their RET status and conservation status as per IUCN 3.1 and Wildlife Act, 1972 (Schedule of species); also migratory and congregatory species.
- Preparing an inventory of all available biodiversity information (floral and faunal species) in the study area.
- To identify the native species, endemic species, invasive species in the study area.
- To calculate phytosociology indicators for flora (Abundance, Frequency and Density)
- Study impacts of construction and operation on local ecology and biodiversity
- Suggest mitigation measures to reduce the construction and operational impacts, if any

Secondary Data collection: Literature surveys were conducted on local floral and faunal species, Data on Medicinal plants, ethnobotanical studies, Endemic plants, Seasonal or migratory birds, Rare, Endangered, Endemic and Threatened species (REET) and vulnerable habitats within the study area.

The approach and methodology adopted for undertaking this assessment is as follows:

A. Terrestrial Survey

The approach taken was through stratified random sampling. The study area was divided using grids. Factors such as type of natural or semi-natural habitats observed in the region, anthropogenic disturbances (if any), accessibility, and social issues (if any) were considered.

The design of transects observed the following principles:

- transects will cross a river or stream rather than be located parallel to it
- transects will cross contours rather than run parallel to them

- transects will be orientated in such a direction that each transect samples as much as possible of the total variability of the area

Floral Survey

For floral analysis transects were considered for following reasons:

- obtain an understanding of the vegetation communities in the area
- identify community boundaries
- record species present
- identify locations for plot-based surveys
- determine the potential distribution of threatened species

The study involved the following:

- As per IFC- GN17 natural and critical habitats in the study area were studied; checked for presence of critical areas such as national park, sanctuaries, biosphere reserves, IBAs, etc. from study area boundary
- Assessment of biodiversity at Ecosystem and species level.
- Qualitative and quantitative analysis of flora using systematic quadrat plots laid along ecosystem gradient. Trees, shrubs, climbers and herbs will be surveyed through quadrat-based approach (10m by 10m quadrats for trees, 5m by 5m quadrat size for shrubs and climbers and 1m by 1m quadrat size for herbs). The size of quadrats may vary depending on site conditions.

All the species were checked for their national and global conservation status as per Wildlife Protection act, 1972 and IUCN, 3.1.

A social survey was further conducted for the study to understand the floral species used by locals as fuel, timber, medicinal purpose, etc. Also, the status of its past and present availability were understood during the survey.

Faunal Survey

Faunal Survey was done using visual encounter technique and indirect sighting. Visual encounter survey for fauna through direct observation is a simple and quick survey method. In case of indirect sighting, scat, droppings, pugmarks, bird calls, nests, roosting sites, amphibian calls, road-kills, feathers, bones, burrows, etc. were observed.

a. **Mammals**: Mammal Survey was done through line transect method in particular habitats. Linear Transect Method was used in which a known distance traversed and observed faunal species along the length was noted. The species were recorded on both the sides of the transect up to a visible distance through binoculars. The transects were laid in

different habitats along the gradient. They can be also be observation through indirect signs such as calls, scat, pug marks and road kills.

b. **Birds**: Bird surveys were conducted in the period of optimal activity. during post-dawn and before dusk. Birds were also identified through their nests, feathers and calls.

c. **Reptiles:** Survey techniques for the detection of reptiles, including, diurnal hand searching (opportunistic and systematic). Searching particular microhabitats and may include turning over rocks and logs, splitting fallen timber, raking soil and leaf litter, peeling off bark and searching soil cracks around water bodies and holes in fence posts

d. **Amphibians**: Surveys are to target specific amphibian habitats and breeding sites, including headwaters of catchments, ephemeral and permanent streams, soaks, ponds, swamps, underground burrows, rock outcrops and arboreal habitats. Searching particular microhabitats and may include turning over rocks and logs, splitting fallen timber, raking soil and leaf litter, peeling off bark and searching soil cracks around water bodies and holes in fence posts.

All the species were assessed using IFC's guideline note 6, IUCN 3.1 criteria and Wildlife Protection Act, 1972 (IUCN, 3.1 Enlisted species as Near Threatened, Vulnerable, Endangered, Critically Endangered and Rare. Also, checking of any Schedule of species as per Wildlife Protection Act, 1972.) Calculating Biodiversity Indices will be done for avifaunal species. Identification of Congregatory species, migratory species and their critical habitats were noted during the study

(Source: Sutherland_2006: Ecological Census Techniques)

Social Survey for Faunal Assessment

A social survey was conducted to understand the faunal species observed in the study area, human- animal conflicts, seasonal sighting, etc. A Perception Survey was also conducted to understand the people's attitude towards the surrounding biodiversity and its importance. One-to-one interaction, focus group studies for fauna sightings with local residents were conducted, who were also shown photographs of species to ascertain local sighting. As per IFC GN18, the ecosystem approach has been used for the management plan.

During the Ecological Assessment Studies conducted at Site, series of consultations were made with Forest and Wildlife Department, NGOs, local communities near project site and in Study Area to gain a better understanding of ecological regime and sensitivity in the core zone and buffer zone habitats. In order to know more about the seasonal presence of several

faunal species and their movement, Ecological team of TUV SUD conducted consultations with local people, from the villages, herders and farmers who inhabit close to the proposed project area.

4.9.2 BIOGEOGRAPHIC DESCRIPTION OF THE STUDY AREA

According to the Biogeographic provinces of India published by Wildlife Institute of India (Rodgers, Panwar and Mathur, 2002), the project site falls under the Biogeographic Province of Deccan Peninsula (Figure 4-27). The site survey also included understanding of important habitats in the area.

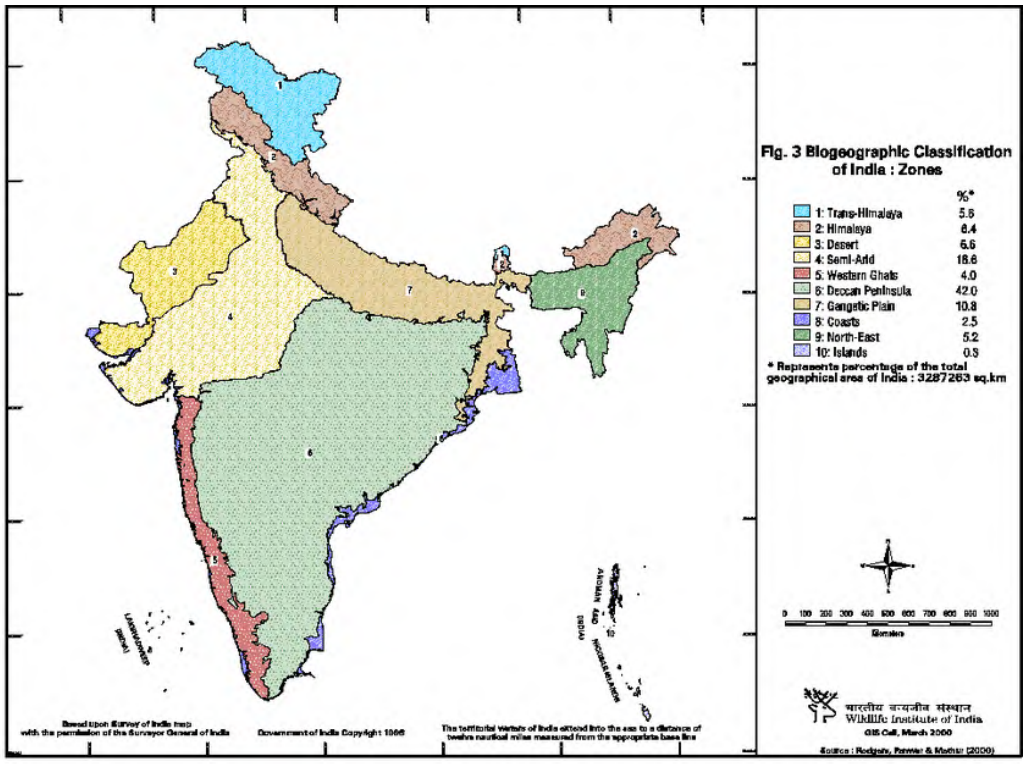


Figure 4-27: Biogeographic Zones of India

A “Habitat” according to IFC is defined as a terrestrial, freshwater or marine geographical unit or airway that supports assemblage of living organisms and their interactions with the non-living environment. As per IFC, habitats are divided into - Natural, Modified or Critical, the purpose of implementation of IFC Performance Standard-6 (Biodiversity Conservation and Sustainable Management of Living Natural Resources). Critical habitats are subsets of Natural habitats. No Critical habitats were observed in the study area. Mostly modified habitats were observed in the study area. The project will be developed in a “Modified Habitat” and in this connection dry agricultural lands have been procured.

4.9.3 TYPES OF HABITATS IN THE STUDY AREA

Forests

According to the Champion and Seth Classification of Indian Forests, the natural vegetation of the study area represents the dry deciduous scrub [5DS1] and southern thorn forests [6A/DS1], and the vegetation comprises of species of *Albizzia amara*, *Azadirachta indica*, *Anogoessis latifolia*, *Emblica officinalis*, *Zizyphus jujuba*, *Hardiwicki binata*, etc. The terrain is not uniform throughout forest area characterized by vast stretches of undulating plains with intermittent parallel chains of hills, mostly bare and stony. The trees have very short stems and are usually crooked, unsound and hollow. Thorny shrubs are also of common occurrence in these forests. Acacia species were predominantly found in these forests. Table.4-22 and Figure 4-28 shows the forest blocks in 15 km radius map of the project site.

Table 4-22: Details of Reserve Forest blocks in study area

Sl. No	Name of the location	Distance from WTG Location (in km)	Nearest WTG Location	Direction from WTG Location	Distance from Transmission Line
1	Niruthadi Reserved Forest	9.3	SGJA-98	SW	16
2	Bevinahalli Reserved Forest	5.5	SGJA-090	W	11.4
3	Guheswara Gudda Reserved Forest	3.6	SGJA-108	E	2.8
4	Jagalur Reserve Forest	2.4	SGJA-77	ESE	8.4
5	Anabur Reserve Forest	0.3	SGJA-67	WSW	3.3
6	Nimbalagiri Reserve Forest	6.0	SGJA-57	NW	8.9
7	Hosahalli Reserve Forest	1.0	SGJA-03	NNE	9.3
8	Jummobanahalli Reserve Forest	3.7	SGJA-05	NE	12
9	Mallurahalli Reserve Forest	9.7	SGJA-20	ENE	17.5
10	Sunkadakallu Reserve Forest	10.5	SGJA-55	NNW	14.3
11	Banivikallu Reserved Forest	11.3	SGJA-55	N	15.7
12	Kamarakaval Reserved Forest	14.2	SGJA-11	ENE	22.1

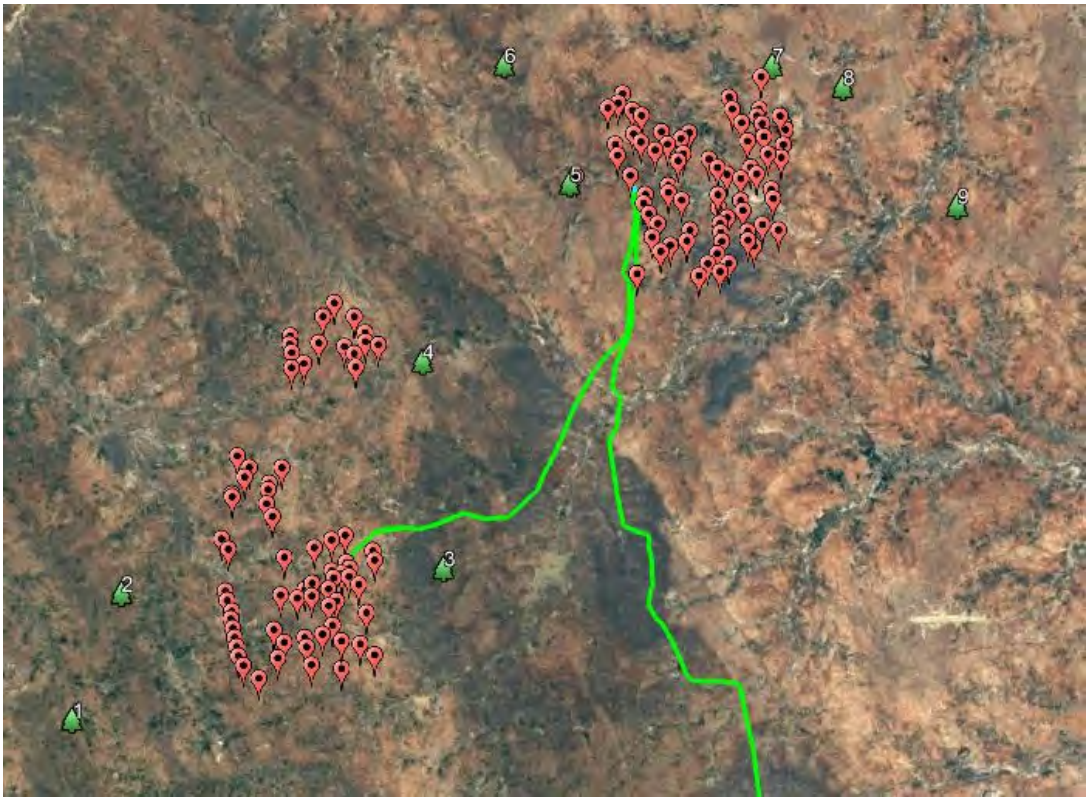


Figure 4-28: Forest Blocks in the Study Area

Jagalur Reserve Forest

Hosahalli Reserve Forest

Anabur Reserve Forest

Nimbalagiri Reserve Forest

Scrub Land

This type of vegetation is extensively found in non-cultivated lands, particularly revenue lands/grazing land located within the study area. These type of land gets grown by *Prosopis Juliflora* and local villagers make charcoal by burning the well grown logs of these plants. Tall trees were generally found absent or sparsely distributed. Solid wood thorny trees like *Acacia nilotica, Prosopis juliflora, Lantana camara, Acacia catechu, Opuntia sp, Cassia auriculata, Capparis decidua* etc. were commonly observed in the natural scrublands.

Cropping pattern of the study area

Agriculture was found as the major livelihood of the people living around the study area. The topography of the entire study area is characterized by a mix of plains environment and few hillocks.

Among the crops grown here are Arecanut (*Areca catechu*), Cotton (*Gossypium hirsutum*), Bajra (*Pennisetum glaucum*), Sorgham (*Sorghum vulgare*), Red gram (*Cajanus cajan*), Ground Nut (*Arachis hypogaea*) farming activities in the study area begin with the arrival of rains. Thereafter the choice of the crop depends on the availability of the ground water.

Fruits crops like Mango (*Mangifera indica*), and Papaya (*Carica papaya*), Banana (*Musa paradisiaca*), and Vegetables crops like Onion (*Allium cepa*), Tomato (*Lycopersicum esculentum*), Red chilli (*Capsicum annuum*),), Brinjal (*Solanum melongena*), and in Pulses Red gram (*Cajanus cajan*), Chickpea (*Cicer arietinum*) etc.

Arecanut

Cotton

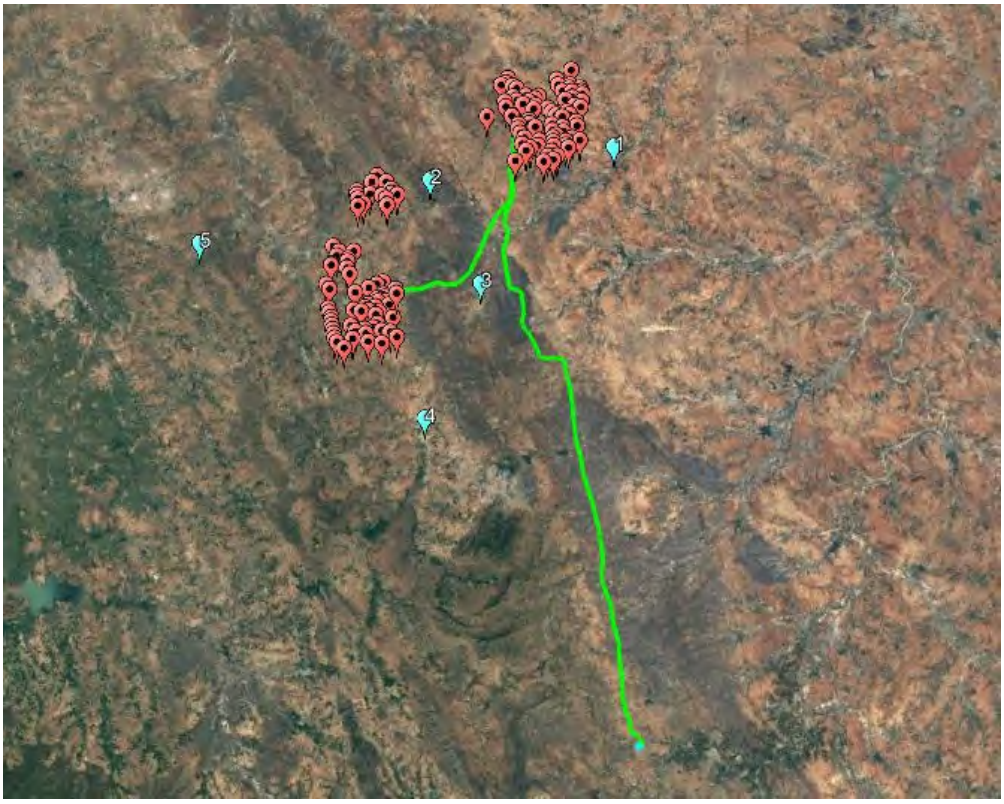
Water Bodies

There are 4 village lakes and chinna hagari stream present within the study area. These water bodies are seasonal and do not retain water for longer duration. Water from these water bodies is extracted by farmers to fulfill their irrigation needs during and after monsoon. By the onset of winter majority of the water bodies are dry and therefore less likely to support large populations of birds and migratory birds. Table 4-23 and Figure 4-29 shows the water bodies in 15 km radius map of the project area.

Table 4-23: Details of Water Bodies in Study Area

Sl. No	Name of the location	Distance from WTG Location (in km)	Nearest WTG Location	Direction from WTG Location	Distance from Transmission Line
1	Chinna Hagari River	2.4	SGJA-43	S	Adjecent
2	Jagalur Lake	4.1	SGJA-77	ENE	7.9

3	Sangenahalli Lake	9.7	SGJA-108	W	3.3
4	Katlalu Lake	9.8	SGJA-118	SE	16.5
5	Anaji Lake	14.5	SGJA-102	WNW	21.0



WTG Location Transmission Line Water Bodies

Figure 4-29: Minor and Major Water Bodies present within the Study Area

Sangenahalli Lake

Jagalur Lake

4.9.4 PROTECTED AREA AND ECO-SENSITIVE ZONES

The study area comprising of core and buffer zone was assessed for the presence of important wildlife habitats and protected areas, mangroves, breeding and nesting habitats of fauna, coastal habitats, important wetlands, and grassland area from WTG Locations and transmission line of core and buffer zones. These important areas such as Protected areas (National Park, Wildlife Sanctuaries, Conservation Reserves etc.), Wetlands of national importance, Ramsar sites, Important Bird Areas (IBAs), classified by the Birdlife International and Bombay Natural History Society etc. Data collected and information gathered from primary and secondary sources on flora, fauna, protected area, natural habitats, wildlife species etc., were analysed and results are presented below in Table 4-24.

Table 4-24: Details of protected areas, forests & ecologically sensitive areas in Study Area

Ecological sensitive habitat	Description
National Parks/ Wildlife Sanctuary/ Biosphere reserves/ Elephant Reserve/ Any Other Reserve	Rangayyanadurga Four Horned Antelope Wildlife Sanctuary boundary is located at 1.4 km of project area (WTG - SGJA-73; WTG-SGJA-78) and Eco-sensitive zone of Rangayyanadurga Four Horned Antelope Wildlife Sanctuary falls partially within the project area. The 2 WTG locations (SGJA-78 and SGJA-73) fall within the ESZ area. Further, Rangayyanadurga Four Horned Antelope Wildlife Sanctuary Eco-sensitive zone is located at 11.8 km distance from transmission line. The Eco sensitive zone notification is attached as **Annexure VI.** The peacock corridor is located at a distance of 1.63 km in NE direction from SGJA 06; 1.57 km in NNE direction from SG JA-07; 1.28 km in SW direction from SG JA-70 and at a distance of 4.68 km in SW direction from PSS Phase I
Important Bird Areas (IBAs)	NIL within in 15 km study area Nearest Important Bird Area is Jogimatti Wildlife Sanctuary is located at 21 km distance from the WTG Locations and 7.1 km transmission line
Wetlands / Water bodies	Chinna Hagari Stream 2.2 km Jagalur Lake 4.0 km Sangenahalli Lake 9.7 km Katralu Lake 9.5 km

Reserved Forests	Niruthadi Reserved Forest - 9.3 km Bevinahalli Reserved Forest - 5.5 km Guheswara Gudda Reserved Forest - 3.6 km Jagalur Reserve Forest - 2.4 km Anabur Reserve Forest - 0.3 km Nimbalagiri Reserve Forest - 6.0 km Hosahalli Reserve Forest - 1.0 km Jummobanahalli Reserve Forest - 3.7 km Mallurahalli Reserve Forest - 9.7 km
Ramsar Site	NIL
Wildlife Corridors & Routes	Peafowl Corridor at Hulikere Village
Breeding/nesting areas of endangered species	NIL
Mangroves	NIL

Sources:

- *Working plan Vol II (Forest Department)*
- *BirdLife International*
- *Karnataka forest department website*
- *http://wiienvis.nic.in*

The project core zone does not encounter with any kind of forest types like reserve forest or un-classed Forest (declared Protected under “The Indian Forest Act, 1927”) and “Forest (Conservation) Act, 1980 with Amendments Made in 1988”. No Forest Clearance is required for the proposed project.

Rangayyanadurga Four Horned Antelope Wildlife Sanctuary buffer zone boundary is located at 1.4 km of project area (turbine location-SGJA-73) and Eco-sensitive zone of Rangayyanadurga Four Horned Antelope Wildlife Sanctuary falls partially within the project area as shown in **Figure 4.30.** 2 WTG locations (SGJA-78 and SGJA-73) fall within the ESZ area of Rangayyanadurga Four Horned Antelope Wildlife Sanctuary as shown in Figure 4.30.

As per the Wildlife Act 1972, project falls under Eco sensitive zone (ESZ) (by default 10 km). However, renewable energy projects are considered as permitted and recommended to be promoted, even within the ESZ area. However it is recommended to obtain formal approval from office of Principle Chief Conservator of Forests (PCCF) cum Chief Wildlife Warden (CWW).

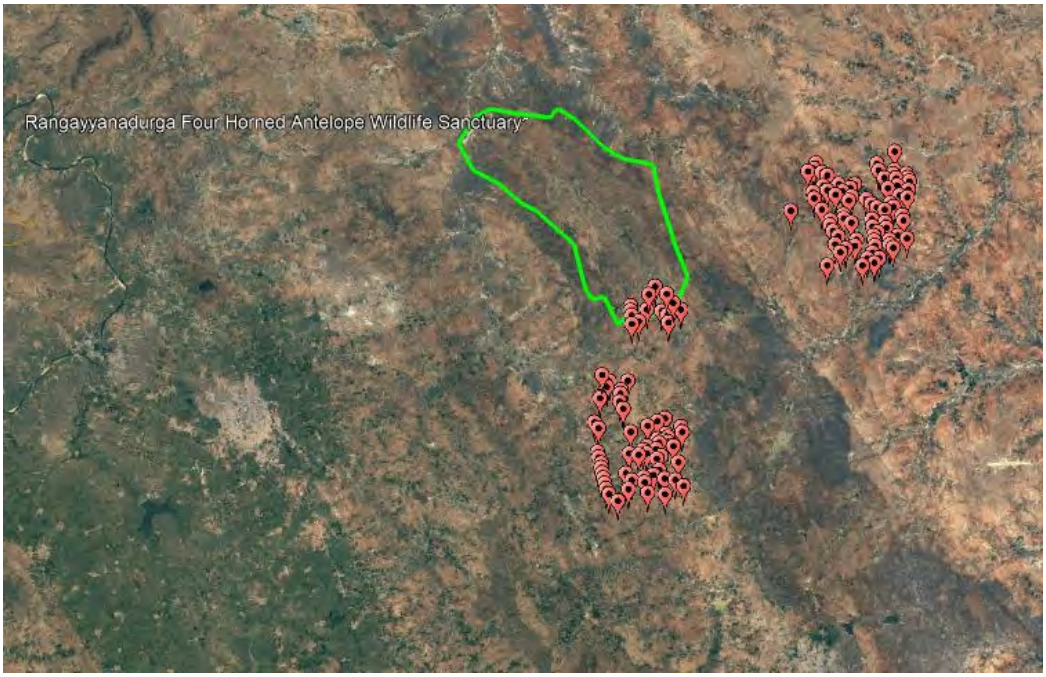


Figure 4-30 Rangayyanadurga Four Horned Antelope Wildlife Sanctuary Eco sensitive zone (ESZ) and Project Area

4.9.5 BIRD MIGRATORY ROUTES

No Important Bird Area (IBA) is located within 15 km radius of the project site. The project study area is very likely to be situated in the flight-path of the various winter, summer and passage visitor-birds migrating either to or through the region. The migratory species sighted during the primary survey are listed in below table.

Table 4-25 Migratory birds observed in study area

S.No	Scientific Name	Common Name	IWPA Status	IUCN Status
1	*Falco tinnunculus*	Common Kestrel	IV	Least Concern
2	*Saxicola torquatus*	Common Stonechat	IV	Least Concern

Indian Peafowl corridor was observed near Hulikere village and nearest WTG location is SGJA-70. This is movement path Hosahalli Reserve Forest to Anabur Reserve Forest as shown in **Figure 4.31.**

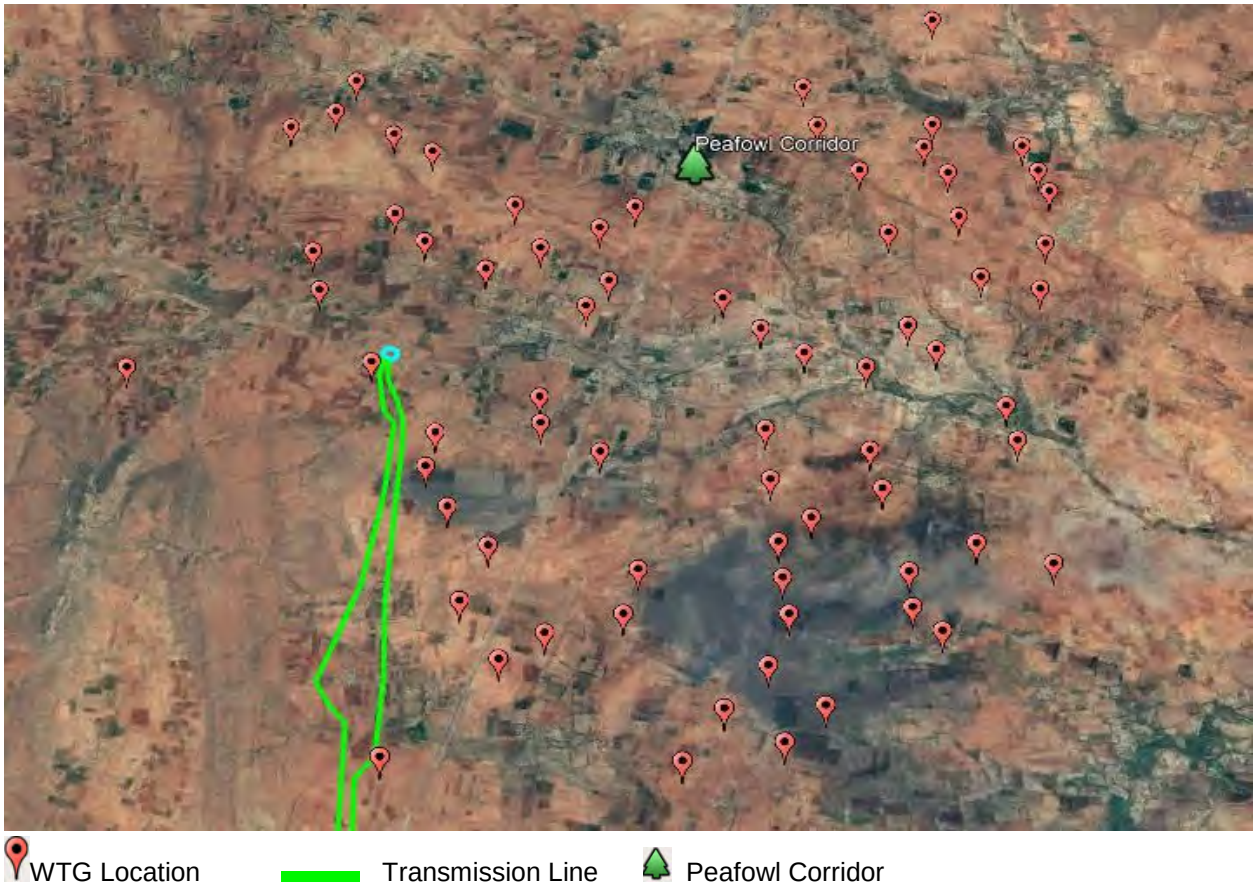


Figure 4-31 Indian Peafowl corridor

4.9.6 METHODOLOGIES FOR ECOLOGICAL SURVEYS

Desktop Review

A desktop review was conducted to determine the land use and land cover (Toposheet, Satellite imagery), Forest type (Champion and Seth, 1962), Bio-geographic Provinces and Zones (Rodgers, Panwar and Mathur 2000) and floral & faunal assemblage in the study area from published documents/papers etc. To provide representative ecological status for the project, existing critical habitats, scrubs/vegetative cover and water bodies around the project area and other factors were searched/collected and selected for ecological survey in and around of such habitats.

Baseline Survey

Secondary data collection and primary on-site survey were two components of the baseline survey. The primary baseline survey was carried out to determine the existing ecological conditions and was designed to fill any data gaps, and to facilitate an adequate assessment of the project impacts upon local ecology and the development of appropriate mitigation measures. Prior to that secondary data regarding sensitive ecological habitat (National Park, Sanctuary, Ecological Sensitive Area, Migratory Corridor, habitat of endangered, vulnerable and range restricted species etc.), flora & fauna in the project area was recorded through undertaking primary baseline and referring other published and unpublished documents. Stakeholder consultations (Forest Department, Local People etc.) were also carried out to understand the major flora & fauna in the study area, assemblage of birds in the water bodies during peak winter in India, pressure on the local natural resources, presence of any Schedule I species in the project area.

Flora Survey

Floral studies were carried out by using quadrate method in core and buffer zone of study area. At each sampling location the protocol adopted to collect primary data were trees-5 quadrates of 10 x 10 m, Shrubs-5 Quadrates 5 x 5 m and herbs-5 quadrates of 1 x 1 m. Seven sampling locations were identified in study area and details are presented in the following Table-4.26 and Figure 4-32 shows the sampling locations of the study area.

Table 4-26 Vegetational Sampling Locations in Project Area

Sl. No	Location code	Co-ordinates
1	T1	14°30'27.22"N 76°19'11.06"E
2	T2	14°35'7.64"N 76°23'29.66"E

3	T3	14°39'11.20"N 76°29'30.72"E
4	T4	14°23'20.08"N 76°13'48.45"E
5	T5	14°35'43.27"N 76°27'34.20"E
6	T6	14° 9'52.11"N 76°30'1.28"E
7	T7	13°59'42.65"N 76°31'5.39"E

Figure 4-32 : Map Showing Vegetational Survey Locations

Faunal Survey

To assess the presence of fauna in the project site, a walk-through survey was carried out. WTG locations, transmission line and buffer zone were visited to find out the presence of faunal species in around 15 km of study area. The faunal survey focused mainly on three groups viz. mammals, herpetofauna, avifauna and Butterflies of the project area.

Mammals

Since the presence of mammalian species is low affecting probability of their sightings, in the study area, it was difficult to estimate their population using line transect method. More importantly, it was difficult to accommodate the sightings of nocturnal and diurnal animals in the study. Therefore, we prepared a qualitative check list of mammals based on their presence and absence using indirect evidences and signs such as footprints, droppings, diggings, scrap marks, etc. in the study area (core and buffer) area.

Herpetofauna (Amphibians and Reptiles)

During our surveys with great difficulties we encountered a few herpetofauna species. Therefore, such low detection probability was a limitation for not conducting quantitative sampling of these classes. Therefore, with given low detection probability, we carried out simple surveys i.e. presence absence surveys to inventories the herpetofauna of the study area, following methodology was used during survey. Direct Search Method: In this method, randomly and intensively searched for amphibians and reptiles in core and buffer areas, dry trees, dense dry bushes, below the stones, small holes etc. in the study area.

Avi-fauna

For creating baseline data on birds, we carried out bird surveys in different habitats as differential habitat preferences are seen in birds. In order to study species richness of birds in core and buffer areas, we employed Area Search Method or extensive search within core and buffer areas. We carried out observations on bird species in small ponds, open areas, scrubland, isolated trees, village peripheries, agriculture areas etc. Extensive Search Method is a qualitative method being used for improving the total species richness for each site in totality. In this method we slowly and randomly walked in the core and buffer areas and looked for birds and their calls.

Vantage Point Survey:

Vantage point (VP) watches are a means of quantifying flight activity of bird species that take place within the wind farm envelope, with the principal aim of determining the likely collision risk. In this Vantage Point study, flight behaviour of birds and their flying movement pattern within the core study area and identifying birds at collision risk were analysed. The VP survey was undertaken in the early morning, and prior to the sunset to keep a record on the bird species. In general, the movement of birds are high in the early morning and before the sunset.

Vantage point (VP) surveys were conducted at 9 locations covering the entire project WTG locations including the transmission route. During each session of study, two field observers

were involved in collecting the data. At each vantage point survey was carried out for 120 mins.

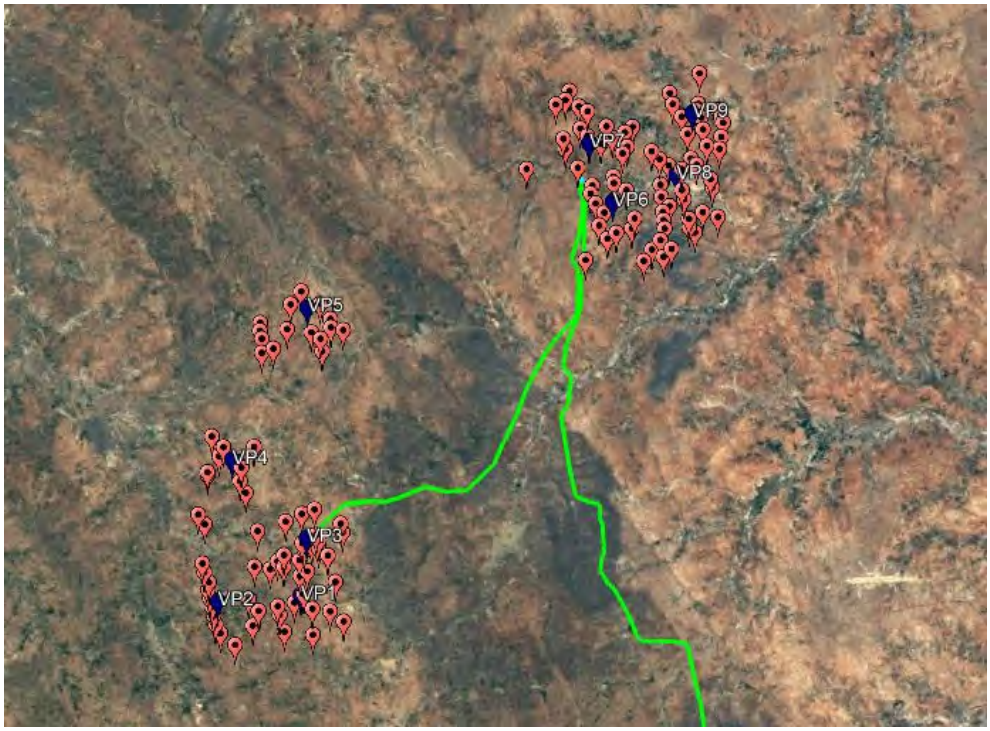
Data like species in flight, direction of flight, distance of bird from observer, direction of bird from observer, flying height of that particular bird from the ground, other activity and general description of flight were recorded. A total of about 9 Vantage points (coordinates are presented in Table 4.27 and VP locations map locations shown in Figure 4.33.

Table 4-27: Coordinates for Vantage Point Survey

S.No.	Vantage point	Latitude	Longitude
1	VP-01	14°22'35.15"N	76°16'14.22"E
2	VP-02	14°22'54.05"N	76°13'25.30"E
3	VP-03	14°24'26.93"N	76°16'23.70"E
4	VP-04	14°27'10.10"N	76°14'8.98"E
5	VP-05	14°31'12.15"N	76°16'31.32"E
6	VP-06	14°34'2.57"N	76°26'33.74"E
7	VP-07	14°36'31.95"N	76°25'54.96"E
8	VP-08	14°35'4.57"N	76°28'30.68"E
9	VP-09	14°36'57.72"N	76°29'4.16"E

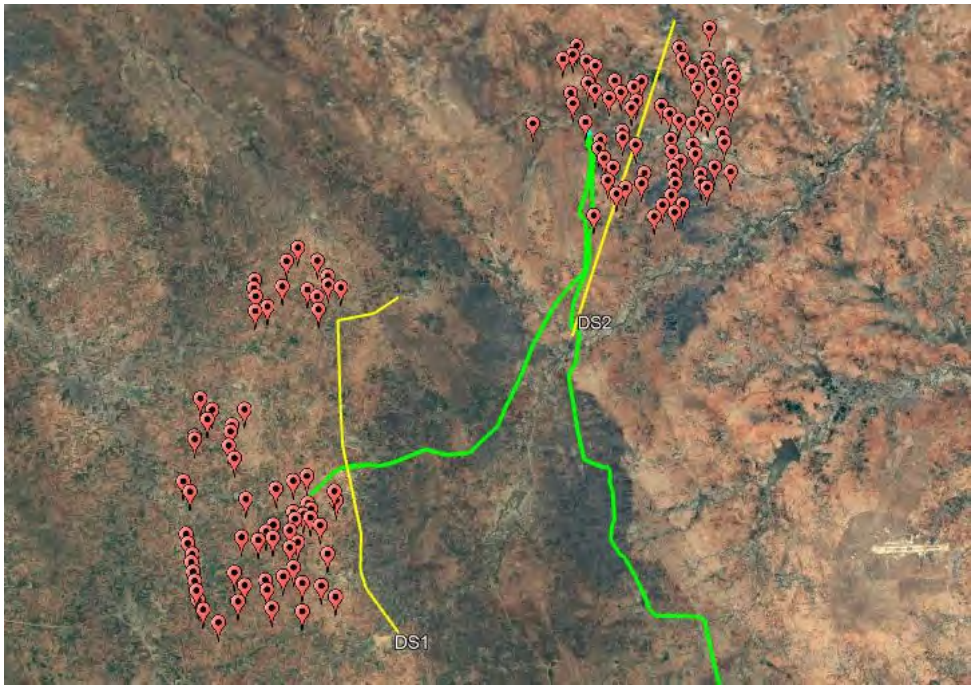
Driving Surveys: Driven Transects were used for sampling and assessment of abundances of large terrestrial birds and raptors. Accordingly, two driven transect routes were conducted within Study Area. D1 transect was conducted from Muddapura to Jagalur which is 20.9 km distance, D2 transect was conducted from Donnehalli to Hosahalli with distance of 19.3 km. The driving survey transects routes are given below in **Figure 4-34**. Species were observed by driving slowly (+- 25 km/h) with all windows open, and stopping occasionally to listen and scan the surrounding environment. When a species was located, a GPS co-ordinate was recorded along with the distance and direction from the vehicle to the observed bird and additional information such as weather conditions and habitat type.

Line Transect Method: This method involves recording varied species of birds as well as their respective number along a definite length of a habitat. A single route that follows a natural path is the simplest and most convenient way to sample birds in the study area. Small transects of about 1 km length were undertaken to record birds, 50m on both side of the transect line is considered as the survey area for each transect. A total of about 9 line transects were randomly selected in the entire study area. Birds cited both the sides of the transect path were recorded and birds flying over the area were also noted. Instruments like binoculars and camera were used to identify the species.

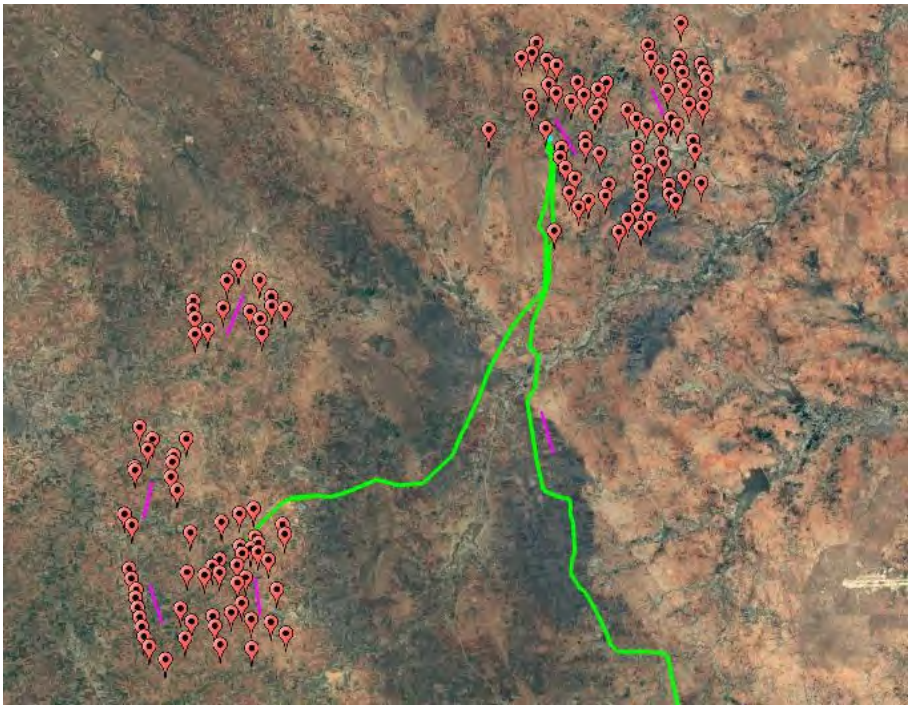


WTG Location — Transmission Line — Vantage Point Survey Locations

Figure 4-33 : Shows Avifauna Survey Locations in Study Area



WTG Location — Transmission Line — Driving Transect Survey Locations



WTG Location — Transmission Line — Line Transect Survey Locations

Figure 4-34 Driving survey transects routes

Consultations

During the study, series of consultations were made with both technical and non-technical stakeholders to get better picture on the project area/core area and buffer zone habitats. In order to know more about the seasonal presence of several faunal species and their movement, study team informally consulted and discussed with forest department, local peoples from the villages, herders and farmers who inhabit close to the proposed project area.

The following stakeholders were contacted during the Ecological Survey conducted at Site:

- Local peoples and shepherds from 5 villages (Mudhapura, Siddavanadurga, Resthimachikere, Jagalur, Anaburu)
- Forest and Wildlife department, Davanagere District

Flora Assessment Results

The present study revealed that 226 plant species were present within both core zone and buffer zone area upto 15 km radius**.** Secondary data was also considered while listing the species for validation. The present study revealed higher number of trees compared to other life forms in the region. Since agri ecosystem is predominant in Study Area, this region support low plant diversity and therefore, not many large trees with sizable canopies were observed.

Core zone habitat:

The core zone of WTG locations and transmission route dominated with agricultural species like *Sorghum vulgare*, *Zea mays*, *Gossypium hirsutum* and covered with grass species like *Apluda mutica*, *Cynodon dactylon*, *Heteropogon contortus*, *Chloris barbata.* Forest blocks, water bodies, perennial rivers and streams are absent in core zone.

Core Zone of WTG locations

Core Zone of Transmission Line

Buffer zone habitat:

The buffer area comprises vegetation adjoining to WTG locations and transmission line. The commonly seen floral species observed are *Acacia catechu*, *Acacia pennata*, *Ficus benghalensis, Agave Americana*, *Lantana camara*, *Cassia auriculata*, *Calotropis procera, Acacia nilotica, Azadiracta indica, Pongamia pinnata, Ziziphus jujuba etc.* Buffer zone vegetation also includes forest areas, roadside plantation, village woodlot, naturally growing or planted trees on community/private land, pond side vegetation, agriculture and aquatic ecosystems.

A detailed study in both project area and study area has been carried out to assess the present floristic composition in the region. The present study documented 226 plant species for both core zone and buffer zone area of study area up to 15 km radius. The details of vegetation in study area are presented in below **Table 4.28.**

Table 4-28: List of Flora Observed and Reported In the Study Area

S.No.	Botanical Name	Family	Habit	IUCN Status
1	*Abelmoschus esculentus*	Malvaceae	Herb	Not Evaluated
2	*Abrus precatorius*	Fabaceae	Climber	Not Evaluated
3	*Abutilon indicum*	Malvaceae	Shrub	Not Evaluated
4	*Acacia auriculiformis*	Fabaceae	Tree	Least Concern
5	*Acacia catechu*	Fabaceae	Tree	Not Evaluated
6	*Acacia chundra*	Mimosaceae	Tree	Not Evaluated
7	*Acacia leucophloea*	Fabaceae	Tree	Least Concern
8	*Acacia nilotica*	Fabaceae	Tree	Least Concern
9	*Acacia pennata*	Fabaceae	Tree	Least Concern
10	*Acacia torta*	Mimosaceae	Tree	Not Evaluated
11	*Acalypha indica*	Euphorbiaceae	Herb	Not Evaluated

12	*Acanthospermum hispidum*	Asteraceae	Herb	Not Evaluated
13	*Achyranthes aspera*	Amaranthaceae	Herb	Not Evaluated
14	*Adina cordifolia*	Rubiaceae	Tree	Not Evaluated
15	*Aegle marmelos*	Rutaceae	Tree	Near Threatened
16	*Aerva lanata*	Amaranthaceae	Herb	Not Evaluated
17	*Agave americana*	Asparagaceae	Herb	Least Concern
18	*Ageratum conyzoides*	Asteraceae	Herb	Not Evaluated
19	*Ailanthus excelsa*	Simaroubaceae	Tree	Not Evaluated
20	*Alangium salvifolium*	Cornaceae	Shrub	Not Evaluated
21	*Albizia amara*	Fabaceae	Tree	Least Concern
22	*Albizia lebbeck*	Fabaceae	Tree	Not Evaluated
23	*Albizia odoratissima*	Fabaceae	Tree	Least Concern
24	*Aloe barbedensis*	Asphodelaceae	Herb	Least Concern
25	*Amaranthus viridis*	Amaranthaceae	Herb	Not Evaluated
26	*Annona reticulata*	Anonaceae	Tree	Least Concern
27	*Annona squamosa*	Anonaceae	Tree	Least Concern
28	*Anogeissus latifolia*	Combretaceae	Tree	Not Evaluated
29	*Apluda mutica*	Poaceae	Grass	Not Evaluated
30	*Argyreia cuneata*	Convolvulaceae	Herb	Not Evaluated
31	*Argyreia pilosa*	Convolvulaceae	Herb	Not Evaluated
32	*Argyreia sericea*	Convolvulaceae	Climber	Not Evaluated
33	*Aristolochia indica*	Aristolochiaceae	Climber	Not Evaluated
34	*Asparagus racemosus*	Liliaceae	Climber	Not Evaluated
35	*Azadiracta indica*	Meliaceae	Tree	Least Concern
36	*Balanites aegyptiaca*	Zygophyllaceae	Tree	Least Concern
37	*Bambusa arundinacea*	Poaceae	Grass	Not Evaluated
38	*Bambusa vulgaris*	Poaceae	Grass	Not Evaluated
39	*Barleria prionitis*	Acanthaceae	Herb	Least Concern
40	*Bauhinia acuminata*	Mimosaceae	Tree	Least Concern
41	*Bauhinia racemosa*	Fabaceae	Tree	Not Evaluated
42	*Boerhavia diffusa*	Nyctaginaceae	Herb	Not Evaluated
43	*Bombax ceiba*	Malvaceae	Tree	Least Concern
44	*Boswellia serrata*	Burseraceae	Tree	Not Evaluated
45	*Bridelia retusa*	Phyllanthaceae	Tree	Least Concern
46	*Buchanania lanzan*	Anacardiaceae	Tree	Not Evaluated
47	*Butea monosperma*	Fabaceae	Tree	Least Concern
48	*Caesalpinia sappan*	Fabaceae	Tree	Least Concern
49	*Calotropis gigantea*	Asclepiadaceae	Shrub	Not Evaluated
50	*Capparis zeylanica*	Capparaceae	Climber	Not Evaluated
51	*Careya arborea*	Lecythidaceae	Tree	Not Evaluated
52	*Carissa carandas*	Apocynaceae	Tree	Not Evaluated
53	*Carissa spinarum*	Apocynaceae	Shrub	Least Concern

54	*Cassia auriculata*	Fabaceae	Herb	Not Evaluated
55	*Cassia fistula*	Caesalpiniaceae	Tree	Least Concern
56	*Cassia occidentalis*	Caesalpiniaceae	Herb	Not Evaluated
57	*Cassia siamea*	Caesalpiniaceae	Tree	Not Evaluated
58	*Cassia tora*	Caesalpiniaceae	Herb	Not Evaluated
59	*Celosia argentea*	Amaranthaceae	Herb	Least Concern
60	*Centella asiatica*	Apiaceae	Herb	Least Concern
61	*Chloris barbata*	Poaceae	Grass	Not Evaluated
62	*Cissus qundrangularis*	Vitaceae	Climber	Least Concern
63	*Citrus limon*	Rutaceae	Shrub	Not Evaluated
64	*Cleome viscosa*	Cleomaceae	Herb	Not Evaluated
65	*Cocculus hirsutus*	Menispermaceae	Climber	Not Evaluated
66	*Cochlospermum religiosum*	Bixaceae	Tree	Not Evaluated
67	*Cocos nucifera*	Arecaceae	Tree	Data Deficient
68	*Commelina diffusa*	Commelinaceae	Herb	Least Concern
69	*Convolvulus rottlerianus*	Convolvulaceae	Herb	Not Evaluated
70	*Conyza stricta*	Asteraceae	Herb	Not Evaluated
71	*Cordia dichotoma*	Boraginaceae	Tree	Least Concern
72	*Cordia monoica*	Boraginaceae	Tree	Least Concern
73	*Crotalaria albida*	Fabaceae	Herb	Least Concern
74	*Croton bonplandianus*	Euphorbiaceae	Herb	Not Evaluated
75	*Cryptolepis buchanani*	Apocynaceae	Climber	Not Evaluated
76	*Cryptostegia grandiflora*	Apocynaceae	Climber	Not Evaluated
77	*Curculigo orchioides*	Hypoxidaceae	Herb	Not Evaluated
78	*Cuscuta reflexa*	Convolvulaceae	Climber	Not Evaluated
79	*Cyathocline purpurea*	Asteraceae	Herb	Least Concern
80	*Cymbopogon martinii*	Poaceae	Grass	Not Evaluated
81	*Cynodon dactylon*	Poaceae	Grass	Not Evaluated
82	*Cyperus articulatus*	Cyperaceae	Herb	Least Concern
83	*Cyperus iria*	Cyperaceae	Herb	Least Concern
84	*Cyperus rotundus*	Cyperaceae	Herb	Least Concern
85	*Dalbergia lanceolaria*	Fabaceae	Tree	Least Concern
86	*Dalbergia latifolia*	Fabaceae	Tree	Vulnerable
87	*Dalbergia paniculata*	Fabaceae	Tree	Not Evaluated
88	*Datura innoxia*	Solanaceae	Shrub	Not Evaluated
89	*Datura stramonium*	Solanaceae	Herb	Not Evaluated
90	*Delonix regia*	Caesalpinioideae	Tree	Least Concern
91	*Dendrocalamus strictus*	Poaceae	Shrub	Not Evaluated
92	*Dichrostachys cinerea*	Fabaceae	Tree	Least Concern
93	*Digera muricata*	Amaranthaceae	Herb	Not Evaluated
94	*Dioscorea oppositifolia*	dioscoreaceae	Climber	Not Evaluated
95	*Dioscorea pentaphylla*	dioscoreaceae	Climber	Not Evaluated

96	*Diospyros melanoxylon*	Ebenaceae	Tree	Not Evaluated
97	*Dodonaea viscosa*	Sapindaceae	Shrub	Least Concern
98	*Dolichandrone atrovirens*	Bignoniaceae	Tree	Not Evaluated
99	*Echinops echinatus*	Asteraceae	Herb	Not Evaluated
100	*Eclipta alba*	Asteraceae	Herb	Least Concern
101	*Ehretia laevis*	Boraginaceae	Tree	Not Evaluated
102	*Emblica officinalis*	Phyllanthaceae	Tree	Least Concern
103	*Emilia sonchifolia*	Asteraceae	Herb	Not Evaluated
104	*Epipremnum aureum*	Araceae	Climber	Not Evaluated
105	*Eragrostis tenella*	Poaceae	Grass	Least Concern
106	*Erythroxylum monogynum*	Erythroxylaceae	Tree	Not Evaluated
107	*Eucalyptus globulus*	Myrtaceae	Tree	Least Concern
108	*Euphorbia antiquorum*	Euphorbiaceae	Shrub	Not Evaluated
109	*Euphorbia hirta*	Euphorbiaceae	Herb	Not Evaluated
110	*Euphorbia neriifolia*	Euphorbiaceae	Shrub	Least Concern
111	*Evolvulus alsinoides*	Convolvulaceae	Climber	Not Evaluated
112	*Ficus benghalensis*	Moraceae	Tree	Not Evaluated
113	*Ficus hispida*	Moraceae	Tree	Least Concern
114	*Ficus microcarpa*	Moraceae	Tree	Least Concern
115	*Ficus racemosa*	Moraceae	Tree	Least Concern
116	*Ficus religiosa*	Moraceae	Tree	Not Evaluated
117	*Ficus virens*	Moraceae	Tree	Least Concern
118	*Galinsoga parviflora*	Asteraceae	Herb	Not Evaluated
119	*Garuga pinnata*	Burseraceae	Tree	Not Evaluated
120	*Gloriosa superba*	Colchicaceae	Climber	Least Concern
121	*Gmelina arborea*	Verbenaceae	Tree	Least Concern
122	*Grangea maderaspatana*	Asteraceae	Herb	Least Concern
123	*Grewia damine*	Tiliaceae	Shrub	Not Evaluated
124	*Grewia orbiculata*	Tiliaceae	Tree	Not Evaluated
125	*Grewia tenax*	Tiliaceae	Shrub	Least Concern
126	*Grewia tiliifolia*	Malvaceae	Tree	Not Evaluated
127	*Grewia villosa*	Tiliaceae	Shrub	Least Concern
128	*Gymnosporia montana*	Celastraceae	Shrub	Not Evaluated
129	*Hardwickia binata*	Fabaceae	Tree	Least Concern
130	*Helicteres isora*	Malvaceae	Tree	Not Evaluated
131	*Heliotropium indicum*	Boraginaceae	Herb	Not Evaluated
132	*Heteropogon contortus*	Poaceae	Grass	Not Evaluated
133	*Hibiscus lobatus*	Malvaceae	Herb	Not Evaluated
134	*Hibiscus ovalifolius*	Malvaceae	Herb	Not Evaluated
135	*Hibiscus rosa-sinensis*	Malvaceae	Herb	Not Evaluated
136	*Hyptis suaveolens*	Lamiaceae	Herb	Not Evaluated
137	*Impatiens balsamina*	Balsaminaceae	Herb	Not Evaluated

138	*Indigofera wightii*	Fabaceae	Shrub	Not Evaluated
139	*Ipomaea carnea*	Convolvulaceae	Herb	Not Evaluated
140	*Ipomoea obscura*	Convolvulaceae	Climber	Not Evaluated
141	*Ipomoea staphylina*	Convolvulaceae	Climber	Not Evaluated
142	*Jasminum cuspidatum*	Oleaceae	Shrub	Not Evaluated
143	*Jatropha curcas*	Euphorbiaceae	Shrub	Least Concern
144	*Jatropha gossypifolia*	Euphorbiaceae	Shrub	Not Evaluated
145	*Justicia prostrata*	Acanthaceae	Herb	Not Evaluated
146	*Justicia simplex*	Acanthaceae	Herb	Not Evaluated
147	*Knoxia sumatrensis*	Rubiaceae	Herb	Not Evaluated
148	*Lagerstroemia parviflora*	Lythraceae	Tree	Not Evaluated
149	*Lannea coromandelica*	Anacardiaceae	Tree	Not Evaluated
150	*Lantana camara*	Verbenaceae	Shrub	Not Evaluated
151	*Lawsonia inermis*	Lythraceae	Shrub	Not Evaluated
152	*Leonotis nepetifolia*	Lamiaceae	Herb	Not Evaluated
153	*Leptadenia reticulata*	Apocynaceae	Shrub	Not Evaluated
154	*Leucaena leucocephala*	Fabaceae	Tree	Not Evaluated
155	*Leucas aspera*	Lamiaceae	Herb	Not Evaluated
156	*Limonia acidissima*	Rutaceae	Tree	Not Evaluated
157	*Linum mysorense*	Linaceae	Herb	Not Evaluated
158	*Ludwigia octovalvis*	Onagraceae	Herb	Least Concern
159	*Madhuca longifolia*	Sapotaceae	Tree	Not Evaluated
160	*Maerua oblongifolia*	Capparaceae	Climber	Not Evaluated
161	*Mallotus philippensis*	Euphorbiaceae	Tree	Least Concern
162	*Malvastrum coromandelianum*	Malvaceae	Herb	Not Evaluated
163	*Mangifera indica*	Anacardiaceae	Tree	Data Deficient
164	*Mimosa pudica*	Fabaceae	Herb	Least Concern
165	*Mitragyna parvifolia*	Rubiaceae	Tree	Not Evaluated
166	*Moringa oleifera*	Moringaceae	Tree	Data Deficient
167	*Musa paradisiaca*	Musacae	Shrub	Data Deficient
168	*Naringi crenulata*	Rutaceae	Tree	Not Evaluated
169	*Nerium indicum*	Apocynaceae	Shrub	Not Evaluated
170	*Ocimum americanum*	Lamiaceae	Herb	Not Evaluated
171	*Ocimum basilicum*	Lamiaceae	Herb	Least Concern
172	*Ocimum canum*	Lamiaceae	Herb	Least Concern
173	*Ocimum sanctum*	Lamiaceae	Shrub	Least Concern
174	*Oldenlandia corymbosa*	Rubiaceae	Herb	Not Evaluated
175	*Opuntia dillenii*	Cactaceae	Shrub	Least Concern
176	*Parkinsonia aculeata*	Caesalpiniaceae	Shrub	Least Concern
177	*Parthenium hysterophorus*	Asteraceae	Herb	Not Evaluated
178	*Passiflora foetida*	passifloraceae	Climber	Not Evaluated
179	*Phoenix acaulis*	Arecaceae	Shrub	Not Evaluated

180	*Phoenix sylvestris*	Arecaceae	Tree	Not Evaluated
181	*Phyllanthus emblica*	Phyllanthaceae	Tree	Least Concern
182	*Phyllanthus virgatus*	Phyllanthaceae	Herb	Not Evaluated
183	*Physalis minima*	Solanaceae	Herb	Not Evaluated
184	*Pithecellobium dulce*	Fabaceae	Tree	Least Concern
185	*Plectranthus barbatus*	Lamiaceae	Herb	Not Evaluated
186	*Polyalthia longifolia*	Annonaceae	Tree	Not Evaluated
187	*Polycarpaea corymbosa*	Caryophyllaceae	Herb	Not Evaluated
188	*Pongamia pinnata*	Fabaceae	Tree	Least Concern
189	*Portulaca pilosa*	Portulacaceae	Herb	Not Evaluated
190	*Prosopis cineraria*	Mimosoideae	Shrub	Not Evaluated
191	*Prosopis juliflora*	Mimosoideae	Shrub	Not Evaluated
192	*Psidium guajava*	Myrtaceae	Tree	Data Deficient
193	*Pterocarpus marsupium*	Faboideae	Tree	Near Threatened
194	*Pterolobium hexapetalum*	Caesalpiniaceae	Shrub	Not Evaluated
195	*Punica granatum*	Lythraceae	Shrub	Least Concern
196	*Pupalia lappacea*	Amaranthaceae	Herb	Least Concern
197	*Rhynchosia hirta*	Fabaceae	Climber	Not Evaluated
198	*Rivea hypocrateriformis*	Convolvulaceae	Climber	Not Evaluated
199	*Samanea saman*	Mimosaceae	Tree	Least Concern
200	*Sapindus emarginatus*	sapindaceae	Tree	Not Evaluated
201	*Schleichera oleosa*	Sapindaceae	Tree	Not Evaluated
202	*Semecarpus anacardium*	Anacardiaceae	Tree	Not Evaluated
203	*Sida cordifolia*	Malvaceae	Herb	Not Evaluated
204	*Sida spinosa*	Malvaceae	Herb	Not Evaluated
205	*Solanum nigrum*	Solanaceae	Herb	Not Evaluated
206	*Solanum xanthocarpum*	Solanaceae	Shrub	Not Evaluated
207	*Sterculia urens*	Malvaceae	Tree	Not Evaluated
208	*Synedrella nodiflora*	Asteraceae	Herb	Not Evaluated
209	*Syzygium cumini*	Myrtaceae	Tree	Data Deficient
210	*Tamarindus indica*	Casalpinaceae	Tree	Data Deficient
211	*Tecoma stans*	Bignoniaceae	Shrub	Least Concern
212	*Tectona grandis*	Lamiaceae	Tree	Not Evaluated
213	*Terminalia arjuna*	Combretaceae	Tree	Not Evaluated
214	*Terminalia bellirica*	Combretaceae	Tree	Not Evaluated
215	*Terminalia catappa*	Combretaceae	Tree	Least Concern
216	*Terminalia chebula*	Combretaceae	Tree	Not Evaluated
217	*Terminalia tomentosa*	Combretaceae	Tree	Not Evaluated
218	*Trianthema portulacastrum*	Aizoaceae	Herb	Not Evaluated
219	*Typha domingensis*	Typhaceae	Herb	Least Concern
220	*Ximenia americana*	Olacaceae	Tree	Least Concern
221	*Xylia xylocarpa*	Fabaceae	Shrub	Least Concern

222	*Ziziphus jujuba*	Rhamnaceae	Tree	Not Evaluated
223	*Ziziphus oenopolia*	Rhamnaceae	Climber	Least Concern
224	*Ziziphus rugosa*	Rhamnaceae	Shrub	Not Evaluated
225	*Ziziphus xylopyrus*	Rhamnaceae	Tree	Not Evaluated
226	*Zyziphus mauritiana*	Rhamnaceae	Tree	Not Evaluated

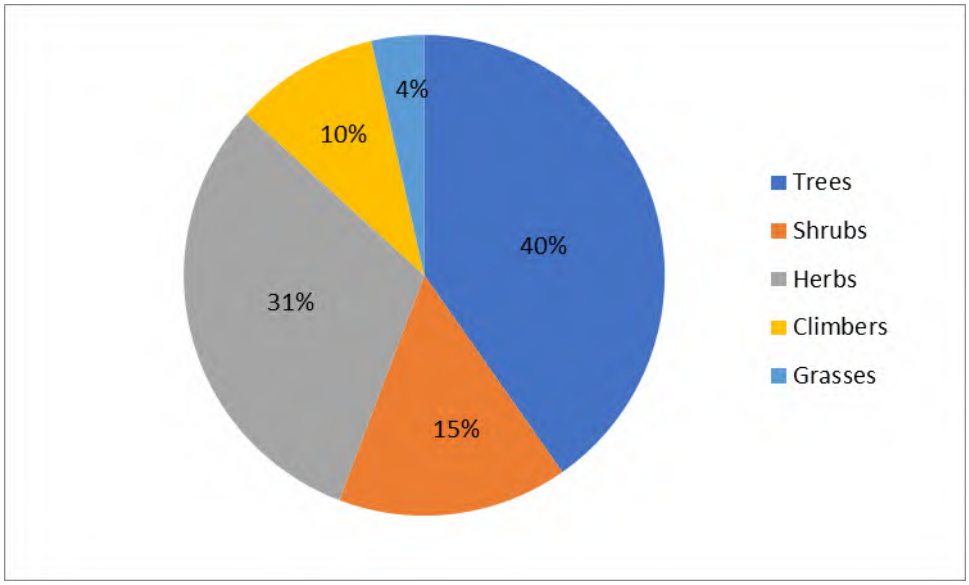


Figure 4-35 : Graph Showing Habit Wise Number of Species Recorded In the Study Area

Table 4-29: Phytosociological Analysis Dominated Floral Species

S.No	Botanical name	Relative Frequency	Relative Density	Relative Abundance	Importance Value Index (IVI)
1	*Acacia catechu*	15.4	14.8	9.5	**39.7**
2	*Acacia nilotica*	11.5	11.1	9.5	**32.2**
3	*Azadiracta indica*	7.7	0.0	9.5	**17.2**
4	*Cassia auriculata*	11.5	11.1	9.5	**32.2**
5	*Dodonaea viscosa*	7.7	7.4	9.5	**24.6**
6	*Jatropha gossypifolia*	3.8	3.7	9.5	**17.1**
7	*Lantana camara*	15.4	14.8	9.5	**39.7**
8	*Pongamia pinnata*	3.8	3.7	9.5	**17.1**
9	*Prosopis juliflora*	15.4	14.8	9.5	**39.7**
10	*Ziziphus jujuba*	7.7	11.1	14.3	**33.1**

Table 4-30: Shannon and Simpson Diversity Index of Different Locations

Sl. No	Location code	Co-ordinates	Shannon H	Simpson 1-D
1	T1	14°30'27.22"N 76°19'11.06"E	2.12	0.92
2	T2	14°35'7.64"N 76°23'29.66"E	1.88	0.86
3	T3	14°39'11.20"N 76°29'30.72"E	2.01	0.88
4	T4	14°23'20.08"N 76°13'48.45"E	1.46	0.72
5	T5	14°35'43.27"N 76°27'34.20"E	1.05	0.68
6	T6	14° 9'52.11"N 76°30'1.28"E	1.22	0.71
7	T7	13°59'42.65"N 76°31'5.39"E	1.57	0.79

Among the floral species, the highest Importance Value Index recorded is *Acacia catechu*, followed by *Lantana camara*, *Prosopis juliflora* and *Acacia nilotica* etc.

Diversity of species is highest in location T1 with Shannon diversity index value 2.12 followed by T3 (2.01) and T2 (1.88). Diversity of species is highest in location T1 with Simpson diversity index value 0.92 followed by T3 (0.88) and T2 (0.86).

	
Pongamia pinnata	*Cassia auriculata*
	
Calotropis gigantea	*Acacia nilotica*
	
Dodonaea viscosa	*Prosopis juliflora*

Endangered floral species

With reference to of literature survey from Red data books of Indian plants, detailed list rare and endangered plant genera of Davanagere district of Karnataka reveals that there are no endangered plant species observed or reported during study period and this plant species is quite commonly present in thorn and dry deciduous forest type.

Fauna Assessment Results

In this study area a total of 183 faunal species were observed or reported in which 16 species of Mammals, 133 Birds, 13 Reptiles, 8 Amphibians and 13 Butterflies.

Mammals

The mammals are occupying higher tropic levels in many ecosystems and respond quickly to the changes in their habitats therefore, serves as best indicators of the ecosystem health. Hence, the baseline information on distribution and abundance of mammals is prepared. A qualitative check list of mammals based on their presences and absence using indirect evidences and signs such as footprints, dens, droppings, diggings, scrap marks, etc. in the study area was prepared. Mammalian species like Three-striped Palm Squirrel (*Funambulus palmarum*), Indian Flying Fox (*Pteropus giganteus*), Common Langur (*Presbytis entellus*), House Mouse (*Mus musculus*), Black-naped Hare (*Lepus nigricollis*) and Common Mongoose (*Herpestes edwardsii*) were directly sighted from the study area. The details of mammalian species are in study area given below in **Table 4-32.**

Intensive searches were conducted to locate the roosting-sites of different bat species in the study area. Two roosting site of Indian Flying Fox Bat were identified. Apart from these, no other bat roosting sites could be found in the area during the study period. None of the bat species observed during the surveys falls under Schedule I category species as per Indian, Wildlife Protection Act or IUCN species of conservation category “Critically endangered”, “Endangered” species. However, bat roosting trees were also identified near the Kanamadagu village (Nearest WTG SGJA-47) and Muddapura village (Nearest WTG SGJA-114). The details of bat species roosting sites recorded during primary survey is given in **Table 4-31** and shown in **Figure 4-36.**

Table 4-31: Details of bat species roosting sites observed during Primary survey

S.No	Common Name	Location	Coordinates	No of Individuals
1	Indian Flying Fox	Muddapura - *Tamarindus indica*	14°21'47.44"N 76°18'52.76"E	50
2	Indian Flying Fox	Kanamadagu - *Tamarindus indica*	14°35'45.44"N 76°26'31.30"E	20

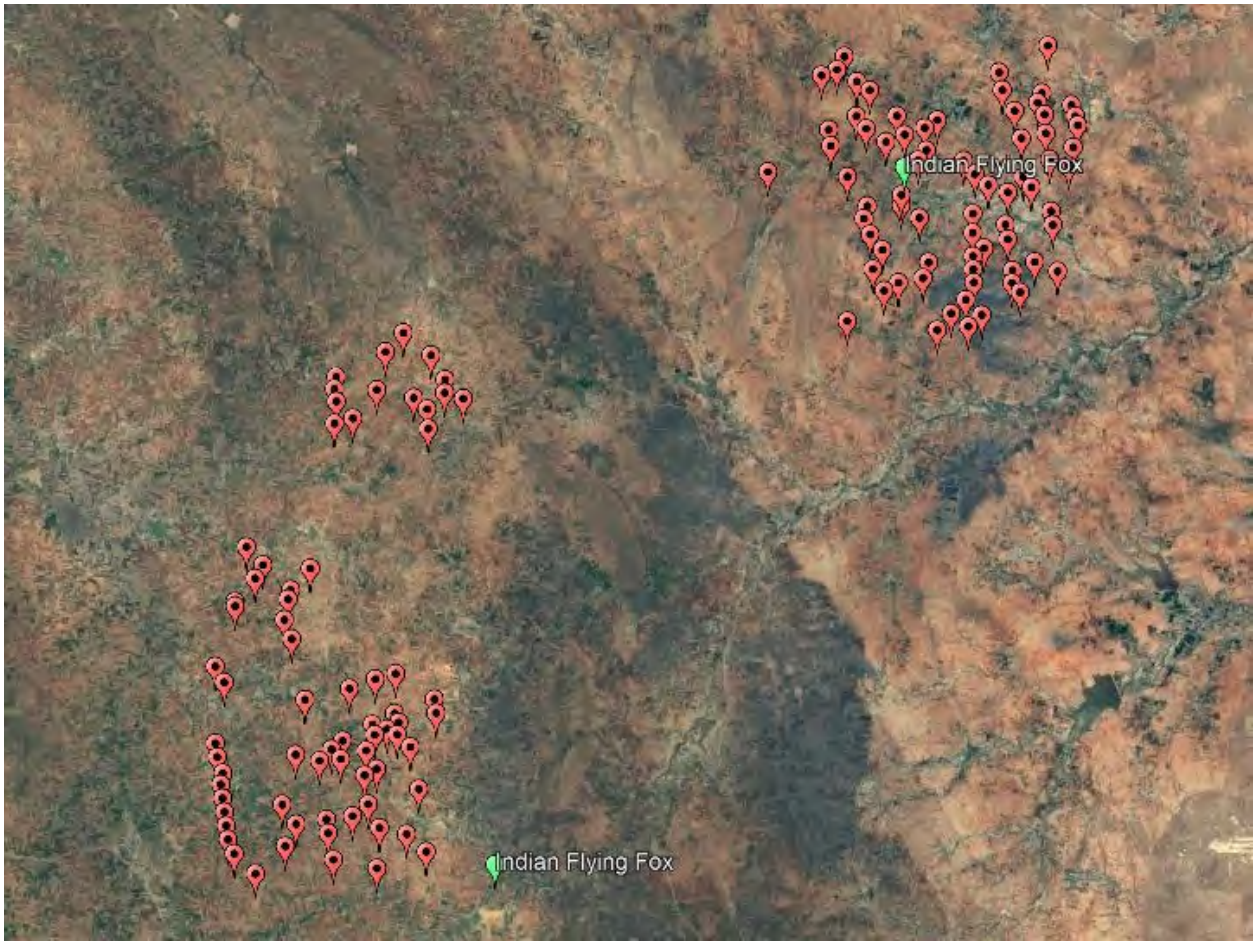


Figure 4-36: Bat species roosting sites recorded during Primary survey


Muddapura Village


Kanamadagu Village

Table 4-32: **Mammalian Species Found in the Study Area**

S.No	Scientific Name	Common Name	IWPA	IUCN	Observed / Reported
1	*Bandicota bengalensis*	Lesser Bandicoot Rat	V	Least Concern	Reported
2	*Canis aureus*	Jackal	II	Least Concern	Reported
3	*Cynopterus brachyotis*	Lesser Short-nosed Fruit Bat	V	Least Concern	Reported
4	*Funambulus palmarum*	Three-striped Palm Squirrel	IV	Least Concern	Observed
5	*Herpestes edwardsii*	Common Mongoose	II	Least Concern	Observed
6	*Hipposideros speoris*	Schneider's Leaf-nosed Bat	IV	Least Concern	Reported
7	*Hyaena hyaena*	Striped Hyena	III	Near Threatened	Reported
8	*Hystrix indica*	Indian Porcupine	IV	Least Concern	Reported

9	*Lepus nigricollis*	Black-naped Hare	IV	Least Concern	Observed
10	*Melursus ursinus*	Sloth Bear	I	Vulnerable	Reported
11	*Mus musculus*	House Mouse	V	Least Concern	Observed
12	*Panthera pardus*	Leopard	I	Near Threatened	Reported
13	*Presbytis entellus*	Common Langur	II	Least Concern	Observed
14	*Pteropus giganteus*	Indian Flying Fox	IV	Least Concern	Observed
15	*Sus scrofa*	Wild Boar	III	Least Concern	Reported
16	*Tetraceros quadricornis*	Four-horned Antelope	I	Vulnerable	Reported

Observed- Directly sighted during Survey
Reported-Data recorded based on secondary literature

Sources:

- Working plan (Forest Department)
- Vivek Menon (2014), *Indian Mammals: A Field Guide.* Hachette Book Publishing India Pvt. Ltd., Gurgaon, India, pp 1-522;
- IUCN (2015). *The IUCN Red List of Threatened Species.* Version 2015-4;
- *Schedules I to VI: Indian Wildlife (Protection) Act, 1972.*

Herpeto-fauna

Species like Oriental Garden Lizard (*Calotes versicolor*), Indian Chameleon (*Chamaeleo zeylanicus*), Fan-throated Lizard (*Sitana ponticeriana*), Monitor Lizard (*Varanus bengalensis*), Indian Bull Frog (*Hoplobatrachus tigerinus*) and Common Indian Toad (*Duttaphrynus melanostictus*) were sighted during the primary survey. No endangered species reported from the core and buffer area of the project site. A list of herpeto-faunal species observed/reported from the study area is given in below **Table 4-33.**

Table 4-33: List of Herpeto-Fauna Found in Study Area

S.No	Scientific Name	Common Name	IWPA	IUCN	Observed / Reported
	Reptiles				
1	*Bungarus caeruleus*	Common Krait	IV	Least Concern	Reported
2	*Calotes versicolor*	Oriental Garden Lizard	IV	Least Concern	Observed
3	*Chamaeleo zeylanicus*	Indian Chameleon	IV	Least Concern	Observed
4	*Daboia russelli*	Russell's Viper	II	Least Concern	Reported
5	*Eryx conicus*	Russell's Earth Boa	IV	Least Concern	Reported
6	*Geochelone elegans*	Indian Star Tortoise	IV	Vulnerable	Reported
7	*Lampropholis guichenoti*	Common Skink	IV	Least Concern	Reported
8	*Lycodon aulicus*	Indian Wolf Snake	IV	Least Concern	Reported

9	*Naja naja*	Indian cobra	II	Least Concern	Reported
10	*Psammophilus dorsalis*	South India Rock Agama	IV	Least Concern	Reported
11	*Ptyas mucosus*	Common Rat snake	II	Least Concern	Reported
12	*Sitana ponticeriana*	Fan-throated Lizard	IV	Least Concern	Observed
13	*Varanus bengalensis*	Monitor Lizard	I	Least Concern	Observed
	Amphibians				
14	*Duttaphrynus melanostictus*	Common Indian Toad	IV	Least Concern	Observed
15	*Duttaphrynus scaber*	Ferguson's Toad	IV	Least Concern	Reported
16	*Euphlyctis cyanophlyctis*	Indian Skipper Frog	IV	Least Concern	Reported
17	*Euphlyctis hexadactylus*	Green Pond Frog	IV	Least Concern	Reported
18	*Hoplobatrachus tigerinus*	Indian Bull Frog	IV	Least Concern	Observed
19	*Limnonectus limnocharis*	Indian Cricket Frog	IV	Least Concern	Reported
20	*Microhyla ornata*	Ornate Narrow-mouthed Frog	IV	Least Concern	Reported
21	*Polypedates maculates*	Common Indian Tree Frog	IV	Least Concern	Reported

Observed- Directly sighted during Survey
Reported-Data recorded based on secondary literature

Sources:

- Working plan (Forest Department)
- Indraneil Das (2002). *Snakes & other Reptiles of India.* New Holland Publishers (UK) Ltd pp. 1-144;
- Romulus Whitaker & Ashok Captain (2006). *Snakes of India; Dreko Books, Chennai, pp 1-146;*
- IUCN (2015); *The IUCN Red List of Threatened Species.* Version 2015-4;
- *Schedules I to VI: Indian Wildlife (Protection) Act, 1972.*

Avifauna

A total of 133 bird species were observed or reported in the study area. Among the 133 bird species 77 species were directly sighted during the primary survey. None of the species observed during the primary survey falls under IUCN species of conservation category “Critically endangered” and “Endangered” species.

Among 77 observed species 76 are listed as Least Concern as per IUCN category, Painted Stork (Near Threatened) species. Indian Peafowl (*Pavo cristatus*) species are listed under Schedule I category species as per Indian Wildlife Protection Act, 1972. Out of 77 species 59 local terrestrial, 18 are aquatic species and 2 migratory and 65 species are local resident species. Also, there is no Important Bird Area (IBA), Bird migratory paths and congregatory birds locations were observed in study area. The list of avifauna observed or reported in study area is presented in **Table 4.34.**

Table 4-34:Terrestrial & Wetland Associated Birds in the Project Area

S.No	Scientific Name	Common Name	Migration Status	IWPA Status	IUCN Status	Observed / Reported
1	*Accipiter badius*	Shikra	Resident	IV	Least Concern	Observed
2	*Accipiter nisus*	Eurasian Sparrowhawk	Winter Migrant	IV	Least Concern	Reported
3	*Acridotheres fuscus*	Jungle Myna	Resident	IV	Least Concern	Observed
4	*Acridotheres tristis*	Common Myna	Resident	IV	Least Concern	Observed
5	*Acrocephalus dumetorum*	Blyth's Reed Warbler	Winter Migrant	IV	Least Concern	Reported
6	*Actitis hypoleucos*	Common Sandpiper	Resident	IV	Least Concern	Observed
7	*Aegithina tiphia*	Common Iora	Resident	IV	Least Concern	Observed
8	*Alauda gulgula*	Oriental Skylark	Resident	IV	Least Concern	Reported
9	*Amaurornis phoenicurus*	White-breasted Waterhen	Resident	IV	Least Concern	Observed
10	*Ammomanes phoenicura*	Rufous-tailed Lark	Resident	IV	Least Concern	Reported
11	*Anas poecilorhyncha*	Indian Spot-Billed Duck	Resident	IV	Least Concern	Observed
12	*Anastomus oscitans*	Asian Open Bill-Stork	Resident	IV	Least Concern	Observed
13	*Anthus rufulus*	Paddyfield Pipit	Resident	IV	Least Concern	Observed
14	*Apus affinis*	Little Swift	Resident	IV	Least Concern	Observed
15	*Aquila fasciata*	Bonelli's Eagle	Resident	IV	Least Concern	Reported
16	*Ardea cinerea*	Grey Heron	Resident	IV	Least Concern	Observed
17	*Ardea intermedia*	Intermediate Egret	Resident	IV	Least Concern	Observed
18	*Ardeola grayii*	Indian Pond Heron	Resident	IV	Least Concern	Observed
19	*Argya malcolmi*	Large Grey Babbler	Resident	IV	Least Concern	Observed
20	*Athene brama*	Spotted Owlet	Resident	IV	Least Concern	Observed
21	*Bubulcus ibis*	Cattle Egret	Resident	IV	Least Concern	Observed
22	*Butastur teesa*	White-eyed Buzzard	Resident	IV	Least Concern	Reported
23	*Cacomantis passerinus*	Grey-bellied Cuckoo	Resident	IV	Least Concern	Reported
24	*Caprimulgus asiaticus*	Indian Nightjar	Resident	IV	Least Concern	Reported
25	*Cecropis daurica*	Red-rumped Swallow	Resident	IV	Least Concern	Observed
26	*Centropus sinensis*	Greater Coucal	Resident	IV	Least Concern	Observed
27	*Ceryle rudis*	Pied Kingfisher	Resident	IV	Least Concern	Observed
28	*Chrysocolaptes festivus*	White-naped Woodpecker	Resident	IV	Least Concern	Reported
29	*Cinnyris asiaticus*	Purple Sunbird	Resident	IV	Least Concern	Observed
30	*Cinnyris lotenius*	Loten's Sunbird	Resident	IV	Least Concern	Reported

31	*Circaetus gallicus*	Short-toed Snake Eagle	Winter Migrant	IV	Least Concern	Reported
32	*Circus pygargus*	Montagu's Harrier	Winter Migrant	IV	Least Concern	Reported
33	*Columba livia*	Blue Rock Pigeon	Resident	IV	Least Concern	Reported
34	*Copsychus malabaricus*	White-rumped Shama	Resident	IV	Least Concern	Reported
35	*Copsychus saularis*	Oriental Magpie Robin	Resident	IV	Least Concern	Observed
36	*Coracias benghalensis*	Indian Roller	Resident	IV	Least Concern	Observed
37	*Corvus macrorhynchos*	Large-billed Crow	Resident	IV	Least Concern	Observed
38	*Corvus splendens*	House Crow	Resident	V	Least Concern	Reported
39	*Cuculus canorus*	Common Cuckoo	Resident	IV	Least Concern	Reported
40	*Cyornis tickelliae*	Tickell,s Blue Flycatcher	Resident	IV	Least Concern	Reported
41	*Cypsiurus balasiensis*	Asian Palm Swift	Resident	IV	Least Concern	Reported
42	*Dendrocitta vagabunda*	Rufous Treepie	Resident	IV	Least Concern	Reported
43	*Dendrocopos mahrattensis*	Yellow-crowned Woodpecker	Resident	IV	Least Concern	Reported
44	*Dendrocygna javanica*	Lesser whistling Duck	Resident	IV	Least Concern	Reported
45	*Dicaeum agile*	Thick-billed Flowerpecker	Resident	IV	Least Concern	Reported
46	*Dicaeum erythrorhynchos*	Pale-billed Flowerpecker	Resident	IV	Least Concern	Reported
47	*Dicrurus leucophaeus*	Ashy Drongo	Resident	IV	Least Concern	Reported
48	*Dicrurus macrocercus*	Black Drongo	Resident	IV	Least Concern	Observed
49	*Dinopium benghalense*	Lesser Golden-backed Woodpecker	Resident	IV	Least Concern	Reported
50	*Dumetia hyperythra*	Tawny-bellied Babbler	Resident	IV	Least Concern	Reported
51	*Egretta garzetta*	Little Egret	Resident	IV	Least Concern	Observed
52	*Elanus caeruleus*	Black-shouldered Kite	Resident	IV	Least Concern	Observed
53	*Eremopterix griseus*	Ashy-crowned Sparrow Lark	Resident	IV	Least Concern	Observed
54	*Eudynamys scolopaceus*	Asian Koel	Resident	IV	Least Concern	Observed
55	*Eumyias thalassinus*	Verditer Flycatcher	Resident	IV	Least Concern	Observed
56	*Euodice malabarica*	Indian Silverbill	Resident	IV	Least Concern	Observed
57	*Falco tinnunculus*	Common Kestrel	Winter	IV	Least Concern	Observed

			Migrant			
58	*Francolinus pondicerianus*	Grey Francolin	Resident	IV	Least Concern	Reported
59	*Halcyon smyrnensis*	White-Breasted Kingfisher	Resident	IV	Least Concern	Observed
60	*Haliastur indus*	Brahminy Kite	Resident	IV	Least Concern	Observed
61	*Hierococcyx varius*	Common Hawk Cuckoo	Resident	IV	Least Concern	Reported
62	*Himantopus himantopus*	Black-winged Stilt	Resident	IV	Least Concern	Observed
63	*Hirundo fluvicola*	Streak Throated Swallow	Resident	IV	Least Concern	Observed
64	*Hirundo rustica*	Barn Swallow	Winter Migrant	IV	Least Concern	Reported
65	*Hirundo smithii*	Wire-Tailed Swallow	Resident	IV	Least Concern	Observed
66	*Iduna caligata*	Booted Warbler	Winter Migrant	IV	Least Concern	Reported
67	*Iduna rama*	Sykes's Warbler	Winter Migrant	IV	Least Concern	Reported
68	*Lanius schach*	Long-tailed Shrike	Resident	IV	Least Concern	Observed
69	*Lanius vittatus*	Bay-backed Shrike	Resident	IV	Least Concern	Observed
70	*Leptocoma zeylonica*	Purple Rumped Sunbird	Resident	IV	Least Concern	Observed
71	*Lochura striata*	White rumped Munia	Resident	IV	Least Concern	Observed
72	*Lonchura kelaarti*	Black-throated Munia	Resident	IV	Least Concern	Observed
73	*Lonchura punctulata*	Scaly-breasted Munia	Resident	IV	Least Concern	Observed
74	*Megalaima haemacephala*	Coppersmith Barbet	Resident	IV	Least Concern	Observed
75	*Merops orientalis*	Green Bee-eater	Resident	IV	Least Concern	Observed
76	*Merops philippinus*	Blue-tailed Bee-eater	Summer Migrant	IV	Least Concern	Reported
77	*Microcarbo niger*	Little Cormorant	Resident	IV	Least Concern	Observed
78	*Milvus migrans*	Black Kite	Resident	IV	Least Concern	Observed
79	*Mirafra erythroptera*	Indian Bush Lark	Resident	IV	Least Concern	Reported
80	*Monticola Solitarius*	Blue Rock Thrush	Resident	IV	Least Concern	Reported
81	*Motacilla cinerea*	Grey Wagtail	Winter Migrant	IV	Least Concern	Reported
82	*Motacilla maderaspatensis*	White-browed Wagtail	Resident	IV	Least Concern	Observed
83	*Mycteria leucocephala*	Painted Stork	Resident	IV	Near Threatened	Observed
84	*Nectarinia zeylonica*	Purple-Rumped	Resident	IV	Least Concern	Observed

		Sunbird				
85	*Ocyceros birostris*	Indian Grey Hornbill	Resident	IV	Least Concern	Observed
86	*Orthotomus sutorius*	Tailor Bird	Resident	IV	Least Concern	Observed
87	*Pandion haliaetus*	Osprey	Winter Migrant	I	Least Concern	Reported
88	*Parus cinereus*	Cinereous Tit	Resident	IV	Least Concern	Reported
89	*Parus major*	Great Tit	Resident	IV	Least Concern	Reported
90	*Passer domesticus*	House Sparrow	Resident	V	Least Concern	Observed
91	*Pastor roseus*	Rosy Starling	Summer Migrant	IV	Least Concern	Reported
92	*Pavo cristatus*	Indian Peafowl	Resident	I	Least Concern	Observed
93	*Perdicula argoondah*	Rock Bush Quail	Resident	IV	Least Concern	Reported
94	*Perdicula asiatica*	Jungle Bush Quail	Resident	IV	Least Concern	Observed
95	*Pericrocotus cinnamomeus*	Small Minivet	Resident	IV	Least Concern	Reported
96	*Phaenicophaeus leschenaultii*	Sirkeer Malkoha	Resident	IV	Least Concern	Reported
97	*Phaenicophaeus viridirostris*	Blue-faced Malkoha	Resident	IV	Least Concern	Reported
98	*Phalacrocorax carbo*	Great Cormorant	Resident	IV	Least Concern	Observed
99	*Phalacrocorax fuscicollis*	Indian Cormorant	Resident	IV	Least Concern	Observed
100	*Phylloscopus griseolus*	Sulfur-bellied Warbler	Resident	IV	Least Concern	Reported
101	*Phylloscopus trochiloides*	Greenish Warbler	Winter Migrant	IV	Least Concern	Reported
102	*Ploceus philippinus*	Baya Weaver	Resident	IV	Least Concern	Observed
103	*Prinia buchanani*	Rufous-fronted Prinia	Resident	IV	Least Concern	Reported
104	*Prinia inornata*	Plain Prinia	Resident	IV	Least Concern	Observed
105	*Prinia socialis*	Ashy Prinia	Resident	IV	Least Concern	Observed
106	*Prinia sylvatica*	Jungle Prinia	Resident	IV	Least Concern	Reported
107	*Pseudibis papillosa*	Red-naped Ibis	Resident	IV	Least Concern	Reported
108	*Psittacula krameri*	Rose-ringed Parakeet	Resident	IV	Least Concern	Observed
109	*Pycnonotus cafer*	Red-vented Bulbul	Resident	IV	Least Concern	Observed
110	*Pycnonotus jocosus*	Red-whiskered Bulbul	Resident	IV	Least Concern	Reported
111	*Pycnonotus luteolus*	White-browed Bulbul	Resident	IV	Least Concern	Observed
112	*Pycnonotus xantholaemus*	Yellow-throated Bulbul	Resident	IV	Vulnerable	Reported

113	*Saxicola caprata*	Pied Bushchat	Resident	IV	Least Concern	Observed
114	*Saxicola torquatus*	Common Stonechat	Winter Migrant	IV	Least Concern	Observed
115	*Saxicoloides fulicata*	Indian Robin	Resident	IV	Least Concern	Observed
116	*Seicercus occipitalis*	Western Crowned Leaf Warbler	Resident	IV	Least Concern	Reported
117	*Stigmatopelia senegalensis*	Laughing Dove	Resident	IV	Least Concern	Observed
118	*Streptopelia chinensis*	Spotted Dove	Resident	IV	Least Concern	Observed
119	*Streptopelia decaocto*	Eurasian Collared Dove	Resident	IV	Least Concern	Observed
120	*Sturnus pagodarum*	Brahminy Starling	Resident	IV	Least Concern	Observed
121	*Sylvia curruca*	Lesser Whitethroat	Winter Migrant	IV	Least Concern	Reported
122	*Tachybaptus ruficollis*	Little Grebe	Resident	IV	Least Concern	Observed
123	*Tephrodornis pondicerianus*	Common Woodshrike	Resident	IV	Least Concern	Reported
124	*Terpsiphone paradisi*	Indian Paradise Flycatcher	Resident	IV	Least Concern	Observed
125	*Threskiornis melanocephalus*	Black-headed Ibis	Resident	IV	Near Threatened	Reported
126	*Turdoides affinis*	Yellow-billed Babbler	Resident	IV	Least Concern	Observed
127	*Turdoides caudatus*	Common Babbler	Resident	IV	Least Concern	Observed
128	*Turdoides striatus*	Jungle Babbler	Resident	IV	Least Concern	Reported
129	*Turnix suscitator*	Barred Buttonquail	Resident	IV	Least Concern	Reported
130	*Tyto alba*	Barn Owl	Resident	IV	Least Concern	Observed
131	*Upupa epops*	Eurasian Hoopoe	Resident	IV	Least Concern	Observed
132	*Vanellus indicus*	Red-wattled Lapwing	Resident	IV	Least Concern	Observed
133	*Vanellus malabaricus*	Yellow-wattled Lapwing	Resident	IV	Least Concern	Observed

Observed- Directly sighted during Survey
Reported-Data recorded based on secondary literature

Sources:

- Working plan (Forest Department)
- *Ali, S and Ripley, S.D. 1969.Handbook of the Birds of India and Pakistan together with those of Nepal, Sikkim, Bhutan and Ceylon,3. Stone Curlews to Owls. Oxford University Press, Bombay, 327pp.*
- *IUCN 2019. The IUCN Red List of Threatened Species. Version 2018-2. <http://www.iucnredlist.org>*
- *Grimmett, R., Inskipp, C and T. Inskipp, 2001. Pocket Guides to the Birds of the Indian Subcontinent. Cristopher Helm Publishers, Oxford University Press, 384pp.*

Vantage Survey Observations

The flight-height was recorded in terms of flight zone of the species with respect to WTG height. Flight zones were divided into, Potential Risk Zone (PRZ); which is the lowest point in the turbine rotor-swept area up to the highest point in the turbine rotor-swept area, the other two zones were area below Potential Risk Zone and area above Potential Risk Zone. Flight movement of the bird-species have been analysed to identify if they occur within Potential Risk Zone, below Potential Risk Zone or above Potential Risk Zone. The flight zones determined correspond to the turbine specifications are detailed below.

Flight Zone 1: Below Potential Risk Zone (extending from ground-level to approximately edge of the blade of the wind-turbine)
Flight Zone 2: Within the Potential Risk Zone (extending from the approximate base-level to tip-level of the wind-turbine-blade)

Flight Zone 3: Above the Potential Risk Zone (beyond the approximate height of the tip-level of the wind-turbine-rotor and blades)

A total of 32 bird species, comprising three (7) target species and 25 secondary or non-targeted species was recorded during the vantage point surveys. The most recorded targeted species were raptors. It was observed that, Shikra, Red-rumped Swallow, Black-shouldered Kite, Common Kestrel, Wire-Tailed Swallow, Rose-ringed Parakeet and Eurasian Collared Dove has higher risk of turbine collision as they have more sightings as well as occurrence percentage and fly frequently through flight zone-2. The most frequently recorded non-targeted species were Laughing Dove, Green Bee-eater, Green Bee-eater and Ashy-crowned Sparrow Lark. The details regarding these bird-species are given in the following **Table 4.35.**

Table 4-35: Species observed during vantage survey

S.No	Common Name	Habitat Type	Migration Status	Total Sightings	Flight Zone	Vantage point
1	Shikra	Terrestrial	Resident	2	2	VP 4, VP7
2	Common Myna	Terrestrial	Resident	4	1	VP1, VP8, VP9
3	Paddyfield Pipit	Terrestrial	Resident	1	1	VP2
4	Large Grey Babbler	Terrestrial	Resident	2	1	VP3
5	Cattle Egret	Aquatic Habitat	Resident	1	1	VP1
6	Red-rumped Swallow	Terrestrial	Resident	2	2, 3	VP2, VP5
7	Greater Coucal	Terrestrial	Resident	1	1	VP8
8	Purple Sunbird	Terrestrial	Resident	1	1	VP3
9	Oriental Magpie Robin	Terrestrial	Resident	1	1	VP1

10	Indian Roller	Terrestrial	Resident	5	1	VP4, VP8, VP9
11	Large-billed Crow	Terrestrial	Resident	2	1	VP4
12	Black Drongo	Terrestrial	Resident	9	1	VP2, VP3, VP7, VP8, VP9
13	Black-shouldered Kite	Terrestrial	Resident	2	2, 3	VP5, VP7
14	Ashy-crowned Sparrow Lark	Terrestrial	Resident	11	1	VP1, VP2, VP3, VP6, VP7
15	Asian Koel	Terrestrial	Resident	2	1	VP5, VP8
16	Indian Silverbill	Terrestrial	Resident	3	1	VP1, VP3
17	Common Kestrel	Terrestrial	Winter Migrant	1	2	VP4
18	Wire-Tailed Swallow	Terrestrial	Resident	10	2, 3	VP2, VP4, VP5, VP6
19	Long-tailed Shrike	Terrestrial	Resident	1	1	VP3
20	Scaly-breasted Munia	Terrestrial	Resident	6	1	VP6, VP8, VP9
21	Coppersmith Barbet	Terrestrial	Resident	1	1	VP9
22	Green Bee-eater	Terrestrial	Resident	22	1	VP1, VP2, VP3, VP5, VP7, VP8
23	Tailor Bird	Terrestrial	Resident	1	1	VP3
24	House Sparrow	Terrestrial	Resident	2	1	VP4
25	Baya Weaver	Terrestrial	Resident	7	1	VP4, VP7, VP9
26	Rose-ringed Parakeet	Terrestrial	Resident	4	1, 2	VP5, VP7
27	Red-vented Bulbul	Terrestrial	Resident	18	1	VP2, VP3, VP5, VP6, VP7, VP8, VP9
28	Indian Robin	Terrestrial	Resident	2	1	VP2
29	Laughing Dove	Terrestrial	Resident	25	1	VP1, VP2, VP3, VP4, VP5, VP6, VP7, VP8, VP9
30	Eurasian Collared Dove	Terrestrial	Resident	14	1, 2	VP2, VP4, VP5, VP8, VP9
31	Brahminy Starling	Terrestrial	Resident	2	1	VP4, VP7
32	Common Babbler	Terrestrial	Resident	17	1	VP3, VP4, VP6, VP7, VP8

Butterflies

The list of butterflies in the study area presented in below Table 4-36.

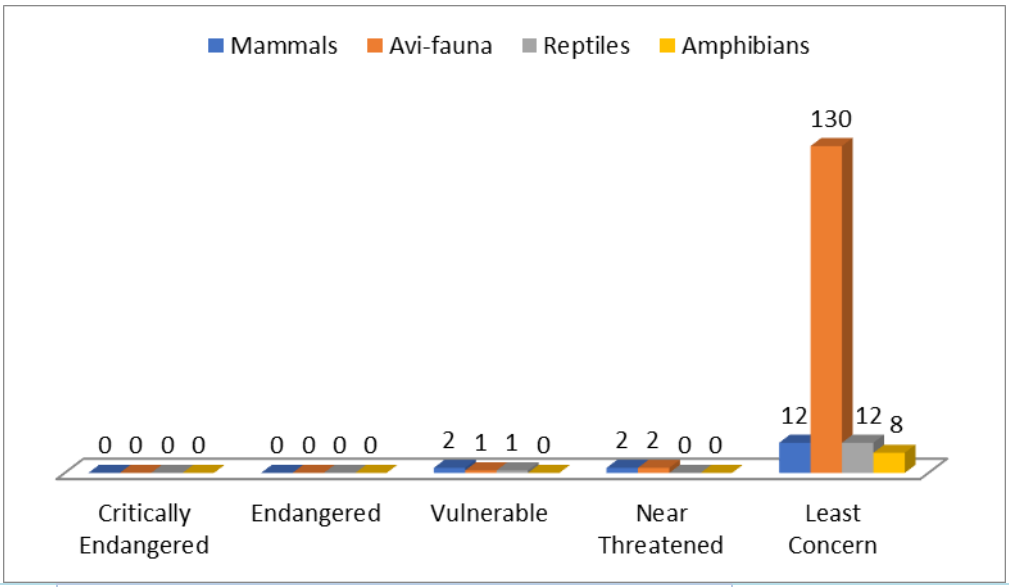
Table 4-36: Butterfly Species Observed in the Study area

S.No	Scientific Name	Common Name
1	*Acraea violae*	Tawny Coaster
2	*Castalius rosimon*	Common Pierrot
3	*Catopsilia pomona*	Common Emigrant
4	*Euploea core*	Common Crow
5	*Eurema hecabe*	Common Grass Yellow
6	*Freyeria trochylus*	Grass Jewel
7	*Graphium Agamemnon*	Tailed Jay
8	*Hypolimnas bolina*	Blue Moon Butterfly
9	*Hypolimnas misippus*	Danaid Eggfly
10	*Junonia lemonias*	Lemon Pansy
11	*Lampides boeticus*	Pea Blue
12	*Pachliopta hector*	Crimson Rose
13	*Papilio polytes*	Common Mormon
14	*Phalanta phalantha*	Common Leopard
15	*Talicada nyseres*	Red Pierrot
16	*Tirumala linniace*	Blue Tiger
17	*Ypthima baldus*	Common Four Ring

Endangered Fauna

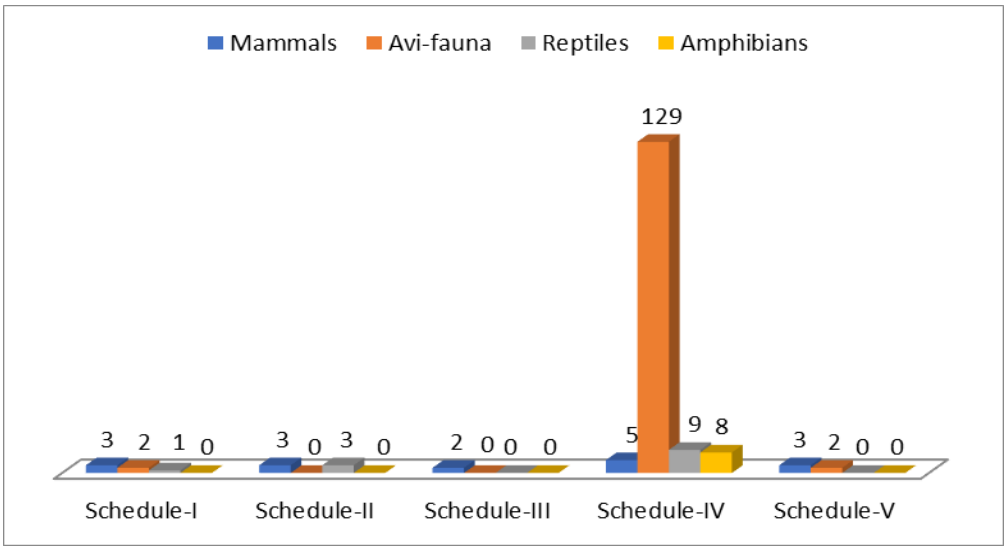
As per IUCN Red List Categories there are no critically endangered and endangered species present in study. IUCN Status of species showing in below graph.

IUCN Status of Faunal Species in Study Area



Schedule-I Species

A comprehensive Central Legislation namely Wild Life (Protection) Act was enforced in 1972. This law is enacted to provide protection to wild animals and for all matters related to their ancillary or incidental death. This Act contains the list of Schedule-I of species Sloth Bear (*Melursus ursinus*), Leopard (*Panthera pardus*), Four-horned Antelope (*Tetraceros quadricornis*), Monitor Lizard (*Varanus bengalensis*), Osprey (*Pandion haliaetus*) and Indian Peafowl (*Pavo cristatus*) around the proposed project site. The rest belong to schedule-II, III, IV and V. The observed or reported list of wild animals and their conservation status as per Wild Life Act (1972) showing in below graph



Wild Life (Protection) Act 1972 Schedule Species in Study Area

4.10 SOCIO-ECONOMIC PROFILE

This section provides an understanding of the administrative setup of the district, the demographic profile of the villages/towns in the study area, the social groups present, the land use pattern in the area, the livelihood profile of the community, the common property resources, the social and physical infrastructure available in terms of the education and health infrastructure, the water supply for irrigation and drinking purposes, sanitation facilities and connectivity. The purpose of this section is to allow for evaluating Social impacts, the key issues identified as well as identify areas of intervention in future scenarios and preparing a Social Management Plan. The data from secondary sources like the Primary Census Abstract of 2011 and has been utilized to establish the socio-economic conditions of the local community.

Study Approach and Methodology

The delineated area for the study has been identified giving significance to the area where the land has been acquired i.e. Jagalur, Kudligi and Chitradurga Talukas falling in Davangere, Chitradurga and Bellary districts, Karnataka and the impact of the project on the surrounding areas within 15 km radius of the project site.

Literature Review of Secondary Data: The study included review of secondary information obtained from Census Report of India 2011 along with District Socio Economic Reports, Economic Census, and District websites which were compiled to give an overview of the socio-economic baseline.

Legislative Review: The study incorporated relevant social legislation, regulations, guidelines and standards which were reviewed and compiled.

Baseline Data Collection: A focus group discussion to gather the primary data was conducted to ensure establishment of proper baseline information.

Identification of potential social impacts: The information collected through the focus group discussion was primarily collected to identify the potential social issues and this was supplemented by guidelines of IFC Performance Standards.

Impact Assessment: The socio - economic and project information were collected to assess the potential impacts of the proposed activities. The assessment covered the following aspects:

- The present baseline conditions and consultations with the local communities
- The potential changes in the social parameters likely to be affected by project related activities
- The identification ion of potential impacts
- The evaluation of the likelihood and significance of potential impacts
- The defining of mitigation measures to reduce impacts to as low as practicable

Methodology

A meeting with the project proponent was initially conducted to develop a common understanding of the project activities, land acquisition and status of payment of compensation to the affected PAP, and to identify a continuous point of contact for all future correspondence.

The baseline information included aspects like demographic information, economic activities, literacy profile, land use, infrastructure resource, economic facilities, cultural heritage, life style and other value system.

The following methods were used as a benchmark to collate the baseline information:

- Stakeholders consultation meeting which included the Project Influenced Population in the villages of Jagalur, Kudligi and Chitradurga Taluka;
- Consultations with Sarpanch in Jagalur, Kudligi and Chitradurga Taluka to understand the socio-economic status, education facilities and the literacy levels.
- Consultations with locals to understand the socio-economic status, education facilities and the literacy levels. Due to ongoing COVID-19 situations, most of the interactions regarding the school, and Anganwadi were done with the locals.

The delineation of Preliminary Stakeholders were based on the following points,

- The type of stakeholders, and;
- Their connection and influence levels on the project.

An open-ended questionnaire was prepared for the focus group discussions prior to the start of the consultation process to obtain the information from the population. Different stakeholder groups were consulted to understand the concerns/ issues, expectations/ benefits and other advantages that they have on the project.

4.10.1 JAGALUR TALUKA PROFILE

Jagalur is a Town Panchayat city in district of Davanagere, Karnataka. The Jagalur city is divided into 15 wards for which elections are held every 5 years. The Jagalur Town Panchayat has population of 17,257 of which 8,693 are males while 8,564 are females as per report released by Census India 2011.

Jagalur Town Panchayat has total administration over 3,682 houses to which it supplies basic amenities like water and sewerage. It is also authorize to build roads within Town Panchayat limits and impose taxes on properties coming under its jurisdiction.

4.10.2 KUDLIGI TALUKA PROFILE

Kudligi is a Town Panchayat city in district of Bellary, Karnataka. The Kudligi city is divided into 20 wards for which elections are held every 5 years. The Kudligi Town Panchayat has population of 26,680 of which 13,428 are males while 13,252 are females as per report released by Census India 2011.

Kudligi Town Panchayat has total administration over 5,042 houses to which it supplies basic amenities like water and sewerage. It is also authorizing to build roads within Town Panchayat limits and impose taxes on properties coming under its jurisdiction.

4.10.3 CHITRADURGA TALUKA PROFILE

Chitradurga is a Taluka located in Chitradurga district of Karnataka. It is one of 6 Talukas of Chitradurga district. There are 195 villages and 3 towns in Chitradurga Taluka. As per the Census India 2011, Chitradurga Taluka Panchayat has population of 423879 of which 214563 are males and 209316 are females.
Chitradurga Town Panchayat has total administration over 90256 houses to which it supplies basic amenities like water and sewerage. It is also authorizing to build roads within Town Panchayat limits and impose taxes on properties coming under its jurisdiction.

4.10.4 VILLAGES FALLING UNDER STUDY AREA

The study area within 15 km radius covers (56) villages in three talukas i.e Jagalur, Kudligi and Chitradurga Talukas including the villages in these Talukas from where few land patch has already been acquired and few land patch is under land acquisition process. The list of villages in the study area is given below in **Table 4-37**.

Table 4-37: List of villages in Study Area

Sr. No.	Name of Village	Taluka	District
1.	Yerrahalli	Jagalur	Davangere
2.	Bangarakkan gudda	Jagalur	Davangere
3.	Huchavanahalli	Jagalur	Davangere
4.	Anabur	Jagalur	Davangere
5.	Mugichukkanahalli	Jagalur	Davangere
6.	Chikamalanahalli	Jagalur	Davangere
7.	Chennapura	Jagalur	Davangere
8.	Matadhavvannahalli	Jagalur	Davangere
9.	Sagalagatte	Jagalur	Davangere
10.	Guttidurga	Jagalur	Davangere
11.	Titony	Jagalur	Davangere
12.	Madamuttenahalli	Jagalur	Davangere
13.	Rastamachekere	Jagalur	Davangere
14.	Kotadagudda	Jagalur	Davangere
15.	Medaginakere	Jagalur	Davangere
16.	Dibbadahatty	Jagalur	Davangere
17.	Byranaikanahalli	Jagalur	Davangere
18.	Basavapura	Jagalur	Davangere

19.	Allur	Jagalur	Davangere
20.	Giddanakatte	Jagalur	Davangere
21.	Hiremallanahole	Jagalur	Davangere
22.	Salahalli	Jagalur	Davangere
23.	Kamandalagondi	Jagalur	Davangere
24.	Settigondanahalli	Jagalur	Davangere
25.	Chikkammanahatti	Jagalur	Davangere
26.	Baggenahalli	Jagalur	Davangere
27.	Alur	Kudligi	Bellary
28.	Lokikere	Kudligi	Bellary
29.	Hullikere	Kudligi	Bellary
30.	Kenchamalanahalli	Kudligi	Bellary
31.	Hirekumbalakunte	Kudligi	Bellary
32.	Dibbadahalli	Kudligi	Bellary
33.	Kanamadagu	Kudligi	Bellary
34.	Harlakatte	Chitradurga	Chitradurga
35.	Hullehal	Chitradurga	Chitradurga
36.	Nellikatti	Chitradurga	Chitradurga
37.	Yalagodu	Chitradurga	Chitradurga
38.	Issamudra	Chitradurga	Chitradurga
39.	Ajjanppnahalli	Chitradurga	Chitradurga
40.	Kalagere	Chitradurga	Chitradurga
41.	Gollarahalli	Chitradurga	Chitradurga
42.	Nagathihalli	Chitradurga	Chitradurga
43.	Adavigollarahalli	Chitradurga	Chitradurga
44.	Sagalgatte	Chitradurga	Chitradurga
45.	Guttidurga	Chitradurga	Chitradurga
46.	Karinamanahalli	Chitradurga	Chitradurga
47.	Rangavvanahalli	Chitradurga	Chitradurga
48.	Kakabalu	Chitradurga	Chitradurga
49.	Heggadehallu	Chitradurga	Chitradurga
50.	Kasavanahalli	Chitradurga	Chitradurga
51.	Pamarahalli	Chitradurga	Chitradurga
52.	Kakabalu	Chitradurga	Chitradurga
53.	Kariyannanahalli	Chitradurga	Chitradurga
54.	Kenchavvanagatiha	Davanagere	Davanagere
55.	Siddihalli	Shikarpur	Shimoga
56.	Hosapete	Hosapet	Bellary

4.10.5 DEMOGRAPHIC DETAILS

Population of Children with age of 0-6 is 1830 which is 10.60 % of total population of Jagalur (TP). In Jagalur Town Panchayat, Female Sex Ratio is of 985 against state average of 973. Moreover, Child Sex Ratio in Jagalur is around 945 compared to Karnataka state average of 948. Literacy rate of Jagalur city is 87.74 % higher than state average of 75.36 %. In Jagalur, Male literacy is around 92.93 % while female literacy rate is 82.49 %.

Population of Children with age of 0-6 is 3,439 which is 12.89 % of total population of Kudligi (TP). In Kudligi Town Panchayat, Female Sex Ratio is of 987 against state average of 973. Moreover, Child Sex Ratio in Kudligi is around 987 compared to Karnataka state average of 948. Literacy rate of Kudligi (TP) is 67.5 % lower than state average of 75.36 %. In Kudligi, Male literacy is around 55 % while female literacy rate is 45 %.

The population of children between age 0-6 is 46679 which is 11.01% of total population of Chitradurga(TP). The sex-ratio of Chitradurga Taluka is around 976 compared to 973 which is average of Karnataka state. The literacy rate of Chitradurga Taluka is 70.3% out of which 75.8% males are literate and 64.66% females are literate. The total area of Chitradurga is 1383 sq.km with population density of 306 per sq.km.

Scheduled Caste and Scheduled Tribes

Schedule Caste (SC) constitutes 18.97 % while Schedule Tribe (ST) were 14.08 % of total population in Jagalur.
Schedule Caste (SC) constitutes 19.85 % while Schedule Tribe (ST) were 32.2 % of total population in Kudligi.
There are 23.95% Scheduled Caste (SC) and 16.43% Scheduled Tribe (ST) of total population in Chitradurga Taluka.

Literacy Rate

Literacy rate of Jagalur city is 87.74 % higher than state average of 75.36 %. In Jagalur, Male literacy is around 92.93 % while female literacy rate is 82.49 %.
Literacy rate of Kudligi is 67.5 % higher than state average of 75.36 %. In Kudligi, Male literacy is around 55 % while female literacy rate is 45 %.
The literacy rate of Chitradurga Taluka is 70.3% out of which 75.8% males are literate and 64.66% females are literate.

Religion wise Demography details

In Jagalur, the religion-wise demography profile indicates that maximum population belongs to Hindus nearly (78.30%) followed by Muslims (21.34%). Most part of the study area has been occupied by Hindus and they play a vital role in making cultural and religious activities.

In Kudligi, the religion-wise demography profile indicates that maximum population belongs to Hindus nearly (83.57%) followed by Muslims (16.02%). Most part of the study area has been occupied by Hindus and they play a vital role in making cultural and religious activities.

In Chitradurga, the religion-wise demography profile indicates that maximum population belongs to Hindus nearly (85.87%) followed by Muslims (13.07%). Most part of the study area has been occupied by Hindus and they play a vital role in making cultural and religious activities.

Table 4-38: Religion-wise demographic Profile as per Census data, 2011

Religion	Jagalur Percentage	Kudligi Percentage	Chitradurga Percentage
Hindu	78.30%	83.57%	85.87
Muslim	21.34%	16.02%	13.07
Christian	0.17%	0.20%	0.3
Sikh	0.02%	0.06%	0.02%
Buddhist	0.00%	0.00%	0.01%
Jain	0.09%	0.04%	0.44
Other Religion	0.01%	0.01%	0.01%
No Religion Specified	0.08%	0.10%	0.27%

Working Population

In Jagalur, out of total population, 5,878 were engaged in work or business activity. Of this 4,517 were males while 1,361 were females. In census survey, worker is defined as person who does business, job, service, and cultivator and labour activity. Of total 5878 working population, 75.89 % were engaged in Main Work while 24.11 % of total workers were engaged in Marginal Work.

In Kudligi, out of total population, 10,358 were engaged in work or business activity. Of this 6,923 were males while 3,435 were females. In census survey, worker is defined as person who does business, job, service, and cultivator and labour activity. Of total 10,358 working population, 83.17 % were engaged in Main Work while 16.8 % of total workers were engaged in Marginal Work.

n Chitradurga Taluka out of total population, 198,794 were engaged in work activities. 82.5% of workers describe their work as Main Work (Employment or Earning more than 6 Months) while 17.5% were involved in Marginal activity providing livelihood for less than 6 months. Of

198,794 workers engaged in Main Work, 48,015 were cultivators (owner or co-owner) while 42,172 were Agricultural labourer.

House Types:
Houses in the study area are generally semi-pacca. There are pacca and temporary types of structures have also been observed. The houses are generally made by bricks and stones.

Occupation and Economy:
The main occupation of the study area is agriculture which is primarily rainfed (80%) and the rest dependent on borewells. The main crops grown in the study area are Toor (Pigeon Peas), Moong, Urad, Jowar and Split Chickpeas (Chana Dal). The primary occupation is agriculture. The average land holding size of the study area is 2-7 acres per family.

Infrastructure Facilities

Roads:
The site (Phase I) is accessible from the PWD and village road which connects to Solapur-Mangalore National Highway (NH-50) at 280 m from WTG SGJA 33. However, the proposed project site (Phase II) is connected to Jagalur Taluka via State Highway (SH-65) which further connects to SH-50 located at 9 km in the South-East direction. The wind site can be approached by black top PWD road that on north and south side for both Phase I & Phase II. This road in turn leads to the individual WTGs with many kuccha village roads.

Education:
Considering the educational facilities in the study area, Govt. Primary School, High School, is available in the study area in the villages. The secondary school and Government Degree Colleges are available in the study area in Jagalur, Kudligi and Chitradurga Taluka.

Health:
There are Primary Health Center in Jagalur Taluka, Davangere district, Kudligi Taluka, Bellary District and Chitradurga Taluka, Chitradurga district. The Government CHC Hospital is located in all the three Talukas in the study area. There is no any epidemic or chronic disease have been reported in the study area during consultation with local villagers

Drinking Water Facility:
Piped water supply from government borewell in Jagalur, Kudligi and Chitradurga Taluka is the main source of drinking water and other domestic use.

Communication:

The villages in the study area are well connected via mobile, telephone and internet. Government post office is also available in most of the village panchayat of the study area.

Electricity Facility:
The project site and study area received electricity round the clock i.e. for 24 hours.

The implementation of the proposed wind power project will throw opportunities to local people for both direct and indirect employment. Furthermore, direct and indirect employment arising from the project activity during the course of construction and operation of project activity can open up new avenues of employment and source of earning. Thus proposed project will improve socio-economic status of the study area.

4.10.6 OBSERVATIONS AND NEED BASED ASSESSMENT

There are three land parcels procured from ST population belonging to one family which has already been acquired by OKPPL in Kanamadagu (Alur) village for the proposed wind power project. Also, there are villages in the study area which consisits of majority of ST population. However, the project site and study area does not inhabits indigenous communities like ethnic minorities, aboriginals etc. as defined by the IFC Performance Standards 7. Considering the economic status and the equality with relevance to the local community within the village and in consultations with PAPs from ST community, it is observed that the project affected person are in a good status like other persons in the village as one PAP from ST community is also a Gram Panchayat member (Deputy Sarpanch) who has also provided his land for the project. However, it is recommended to provide additional facilities to the PAPs who belongs to ST community by providing employment on priority basis and also consider their needs and basicrequirements as a part of their improvement plan.

On the basis of interpretation made above, primary survey (interaction with stakeholders, FGD, community consultation, consultation with government official and discussion with influential person of the study area) and secondary sources, the major outcomes specify the following need-based gaps in the study area:

- Scarcity of drinking water is a major issue of the study area. Main source of drinking water is piped supply tap water through village panchayat borewell.
- Some villages do not have transport facilities as they are not well connected with the There are fewer opportunities of employment and livelihood in the study area. Youth and people gaining higher education generally migrate for work and job in developing cities like Bengaluru, Hyderabad etc.

- The OKPPL wind power project will hire local people for both direct and indirect employment. During construction phase, labors and security staff are being hired locally. The locals are of the opinion that project will improve the socio-economic status of the study area
- Scarcity of drinking water is a major issue of the study area. Main source of drinking water is piped supply tap water through village panchayat, and borewells
- The area is primarily dependent on rains for cultivation
- There are only few Self Help Groups and NGOs which could further enhance the livelihood potential of the area by encouraging womenfolk to participate in tailoring, handicrafts etc
- There are no chronic or epidemic diseases reported in the study area
- There are no employment opportunities available for the women and this is needs to be done for the villages and study area
- As per the existing condition of the study area, it is recommended that Corporate Social Responsibility (CSR) Plan needs to be formulated for the project
- Vocational training programs and Capacity building and Skill enhancement programs should be organized for locals in the area

5 PUBLIC CONSULTATIONS AND STAKEHOLDER ANALYSIS

Stakeholder Engagement is an important process through which a two-way dialogue is created between the project proponent and the stakeholders. As per survey of the delineated area of the proposed Wind plant site, the project influenced population was identified in undertaking stakeholder consultations.

Stakeholder engagement ensures the continued sharing of project information and building strong, constructive and responsive relationship with stakeholders. It also allows for understanding stakeholder concerns and is a key element for effective project delivery. The stakeholder engagement approach includes stakeholder identification, consultations at the scoping phase and ESIA phase.

Stakeholders in the project were identified as Key Administrative Stakeholders (State Government Agencies, and Local Government Authority), Project Affected Persons (PAPs), Project Affected families (PAFs), vulnerable groups, the local community and service providers. The stakeholder consultation was held with Kanamadagu, Alur, Lokikere, Hullikere, Kenchamalanahalli, Yerrahalli, Huchavanahalli, Anabur, Chikamalanahalli, Nellikatte, Chennapura, Sagalkatte, Guttidurga, Rastamachekere, Kalagere, Kakabalu communities which are in close proximity to the proposed project site. Interviews and focus

group discussions were held with key stakeholders in each community including youth groups, women's groups and other community representatives.

The criteria for identifying these areas were based on the project foot print, the influence of impacts on the households in the area and the socio cultural characteristics of the resident population.

5.1 STAKEHOLDER CONSULTATION AND DISCLOSURE REQUIREMENT FOR THE PROJECT

The project has followed International Finance Corporation (IFC) Performance Standard 1: Social and Environmental Assessment and Management Systems in developing the public participation program for the proposed project. A relevant objective adhered to in designing the public involvement program for the project is:

- To ensure that affected communities are appropriately engaged on issues that could potentially affect them with an opportunity to express their views on the project risks, impacts, and mitigation measures, as well as allow the proponents to consider and respond to them. Free, prior and informed consultation with the affected communities must occur in the consultation process.
- To establish a Grievance Redressal Mechanism procedure, which will allow the affected communities concerns and grievances about the project proponent's environmental and social performance to be received and allow for steps to be taken to resolve the same.
- Broader Stakeholder engagement (local government, NGO, civil society organization, schools, health care centers)

5.2 STAKEHOLDER IDENTIFICATION

The stakeholders for the project were prioritized by identifying the direct and indirect stakeholders. Stakeholders thus vary in terms of degree of interest, influence and control over the project. While those stakeholders who have a direct impact and are directly impacted by the project are known as Primary Stakeholders, those which do not have any direct impact and are indirectly impacted are known as Secondary Stakeholders. So, according to the nature of the project and its setting, the stakeholders have been identified and listed in the table as mentioned below:

Table 5-1: Stakeholder Group Categorization

Stakeholder Groups	Primary Stakeholders	Secondary Stakeholders
Community	• Land aggregators	• Local Community

	• Land Team, OKPPL • Local laborers • Land sellers	• Women's group • Youth group • Vulnerable group including Tribals
Government Agencies	• Sub Registrar Office, Jagalur, Kudligi & Chitradurga • Water Supply Department, Jagalur, Kudligi & Chitradurga • District Forest Office, Davanagere	
Institutional Stakeholders	• Schools • Health Care centers • Anganwadi	• Local NGOs
Other Groups	• Employees • Contractual Laborers	• Other projects in the area

5.3 STAKEHOLDER CONSULTATION

A stakeholder is any group or individual who may affect or be affected by a specific project. They could have a direct as well as an influence on the project. Stakeholders may comprise of local persons/community, government and non-government officials, project proponents etc. related to internal and external matter related to the project. Stakeholder identification is useful to prioritize, analyse and assess stakeholder issues while creating management systems and strategies to address specific concerns.

Stakeholder interactions were conducted by TUV SUD team with the local population in project influenced villages. Besides this, interactions also took place with the representatives of OKPPL and representatives from local regulatory body, Village Panchayat.

Socio economic questionnaire survey was undertaken to understand the overall social and economic impact on the population. This was done to study and evaluate the impact of the operating turbines on the affected population of on the nearby structures and habitations. The stakeholder consultation comprised primarily of a social survey and consultation initiated by TUV SUD. Consultations in the form of Questionnaire (QA) surveys were carried out with selected groups of local residents from the Project influenced villages and settlement cluster.

The process of stakeholder consultation involved:

- Identification of the relevant stakeholders including all those individuals, groups and organizations potentially affected by or interested in the project;

- Imparting information about the project and its potential impacts on their lives in local and simple language;
- Recording of their concerns and aspirations through survey and discussions; and
- Responding to their queries in a neutral manner.

Information was exchanged both ways between the consultants and potentially influenced population residing in the project influenced villages. The following table gives the details of meeting conducted during site visit and the list of participants

5.2.1 METHODOLOGY ADOPTED

The stakeholder consultation comprised primarily of a social survey and consultation initiated by TUV SUD. The findings are based mainly on the use of participatory methods like focus group discussions, key informant interviews and natural interviews. These methods give an in depth and intensity to the discussion and incorporates the locals point of view within a short period of time.

The list of stakeholders consulted during TUV SUD visit in October, 2021 are summarized in Table 5.2.

Table 5-2: Stakeholder Consultation at site

Date	Stakeholder Details	Points Discussed
07.10.2021	Consultation with OKPPL land Team and Land Aggegators	Land Team: Details on acquired land and tentative site coverage of rest of the land to be acquired; details of pre-consultation in villages carried out if any; specific concerns and disputes due to upcoming project; Role of OKPPL during land acquisition; understanding of the land acquisition process, WTGs location, details and overall land status
07.10.2021	Consultation with land aggregators	Understanding of the land identification and acquisition process; criteria of the land rate finalization for the project
07.10.2021	Consultation with PSS Phase I Incharge	Status of Pooling Substation, Details regarding pooling substation, Connection of project site and PSS Phase I & II.
08.10.2021	Consultation with OKPPL Transmission Line site representative (Current status of site and Transmission line route)	Transmission line route details (internal and external), Status of Transmission Line, Status of fixing of poles.
08.10.2021	Consultation with OKPPL Civil Expert	Details regarding foundation of WTGs, Status of construction till date, Water requirement for construction, Source of water for construction,

		details regarding civil contractor and labours.
08.10.2021 – 10.10.2021	Consultation with land sellors in project villages	Understanding of the project area; verification of landlessness due to the land acquisition; landuse of project area prior to land acquisition; reason for selling the land; household size and occupation with economic profile; use of compensation amount; expectations and concerns regarding the upcoming project
08.10.2021 – 10.10.2021	Focused group discussion in project villages	Understanding of the project area; Purview of the local community regarding the upcoming project; discussion about the community profile (demographic, education and economic profile; social and physical infrastructure); vulnerable groups and BPL holders in the project area; tribal groups if any; role of women; self-help groups/NGO; expectations and concerns regarding the upcoming project
08.10.2021 – 10.10.2021	Focused group discussion with women in project villages	Women ratio with education ratio; women work force participation; Marital Age; water supply & sanitation arrangements; health care facilities; understanding of the proposed project; gender based vulnerability; women or self-help groups; expectations and concerns regarding the upcoming project
08.10.2021 – 10.10.2021	Consultation with vulnerable groups including STs groups in project villages	Brief of Demographic, education and economic profile; BPL holders; caste discrimination in villages; understanding of the project; expectations & concerns
08.10.2021 – 10.10.2021	Visit to Anganwadi	Medical and infrastructure facilities; vaccines availability; expectations and concerns
08.10.2021 – 10.10.2021	Visit to Health Care Centre	Treatment and medical facilities; concerns for the villagers opting treatment; concerns and improvement for the health center
07.10.2021 – 11.10.2021	Consultation with Sub-Registrar Office – Jagluru, Kudligi & Chitardurga	Understand the land procurement process; market and government rates with references
08.10.2021 – 10.10.2021	Visit with primary school located in project villages	Facilities and faculties at school; sanitation; sports and water supply facilities; transportation; concerns and improvements in school
07.10.2021 – 11.10.2021	Consultation with Water Supply Department – Jagluru, Kudligi & Chitardurga	Understand the water supply process and water availability for industrial projects

5.4 FOCUSSED GROUP DISCUSSIONS (FGD) WITH LOCAL INHABITANTS/ VILLAGERS

The outcomes of interaction with villagers residing near the project site and with the farmers who have provided their land for setting up theproject is given below and attendance records for stakeholder consultations are enclosed as **Annexure- VII.**

Representatives of OKPPL

OKPPL representatives and other officials contacted at the site for the purpose of site visit and the stakeholder consultations are mentioned below:

Table 5-3: Representatives of OKPPL and other officials contacted

Sr.No.	Name	Project Site/Corporate Office	Department
1.	Mr. Bharat	Project Site	Land Team
2.	Mr. Durga Rao	Project Site	Site Survey Team
3.	Mr. Narendra	Project Site	PSS Phase I Incharge
4.	Mr. Nidhi Ranjan	Project Site	Civil Expert
5.	Mr. Kiran	Project Site	Land aggregator
6.	Mr. Rajesh	Project Site	Land aggregator
7.	Mr. Srinivas DC	Project Site	Land aggregator
8.	Mr. Rajendra	Project Site	Land aggregator
9.	Mr. Lawrence Detelkar	Project Site	Land aggregator
10.	Mr. Venkatesh S Kulkarni	Project Site	Land aggregator

Consultation with PSS Phase I Incharge

Consultation with Land Team of OKPPL and Land Aggregators

Discussions with Local Inhabitants

Community Discussions were done in the presence of representatives of OKPPL. The list of participants attended the project specific consultation in Kanamadagu, Alur, Lokikere, Hullikere, Kenchamalanahalli, Yerrahalli, Huchavanahalli, Anabur, Chikamalanahalli, Nellikatte, Chennapura, Sagalkatte, Guttidurga, Rastamachekere, Kalagere, Kakabalu villages is mentioned below in **Table 5-4.**

Table 5-4: List of Local Inhabitants in Project Villages consulted during Community Consultations

S.No.	Name	Village	Tehsil	District	Occupation
1	Chandan MS	Rastemachikere	Jagalur	Davanagere	Student
2	Sinddhalingappa	Rastemachikere	Jagalur	Davanagere	Farmer
3	Kharibasab	Rastemachikere	Jagalur	Davanagere	Farmer
4	Shivraj	Rastemachikere	Jagalur	Davanagere	Farmer/ Gram Pachayat Member
5	G V Lakshmma	Huchavanhalli	Jagalur	Davanagere	Farmer/Labourer
6	Thippeswamy	Huchavanhalli	Jagalur	Davanagere	Farmer/Labourer
7	Mallikarjun	Huchavanhalli	Jagalur	Davanagere	Farmer/Labourer
8	Yellapa	Huchavanhalli	Jagalur	Davanagere	Farmer/Labourer
9	Parshuram	Huchavanhalli	Jagalur	Davanagere	Farmer/Labourer
10	Manoj	Huchavanhalli	Jagalur	Davanagere	Farmer/Labourer
11	Anubur	Rajappa	Jagalur	Davanagere	Farmer/ Driver
12	Tej Murti	Sagalkatte	Jagalur	Davanagere	Farmer
13	Shranappa	Sagalkatte	Jagalur	Davanagere	Farmer
14	Guruswami	Giddankatti	Jagalur	Davanagere	Shop
15	K S Prakash	Anabur	Jagalur	Davanagere	Job
16	K Shivana	Anabur	Jagalur	Davanagere	Farmer
17	Vaibhav	Huchavanhalli	Jagalur	Davanagere	Student
18	Mohan	Kakabalu	Chitradurga	Chitradurga	Farmer
19	Narsimappa	Kakabalu	Chitradurga	Chitradurga	Farmer
20	Nagendrappa	Kakabalu	Chitradurga	Chitradurga	Farmer
21	Shivanna	Chennapura	Chitradurga	Chitradurga	Farmer
22	Rudresh	Chennapura	Chitradurga	Chitradurga	Farmer
23	Viresh	Chennapura	Chitradurga	Chitradurga	Farmer
24	Erappa	Chennapura	Chitradurga	Chitradurga	Farmer
25	Chaudappa	Nallikatte	Chitradurga	Chitradurga	Farmer
26	Niranjan Murti	Nallikatte	Chitradurga	Chitradurga	Farmer/Panchayat member
27	Hanumantanna	Nallikatte	Chitradurga	Chitradurga	Farmer/Panchayat member
28	Shivraj	Nallikatte	Chitradurga	Chitradurga	Job (Bank)
29	Hanumanth	Nallikatte	Chitradurga	Chitradurga	Farmer
30	Chaudappa	Kalagere	Chitradurga	Chitradurga	Farmer
31	Hanumantappa	Kalagere	Chitradurga	Chitradurga	Farmer
32	Lokanna	Kalagere	Chitradurga	Chitradurga	Farmer
33	Ventakteshwar Poojan	Kalagere	Chitradurga	Chitradurga	Farmer
34	Nagakhushan	Kalagere	Chitradurga	Chitradurga	Welding Worker
35	Rangata	Kalagere	Chitradurga	Chitradurga	Farmer
36	Hanumantappa	Kalagere	Chitradurga	Chitradurga	Farmer
37	Suresh	Kalagere	Chitradurga	Chitradurga	Farmer
38	Chanbasappa	Kalagere	Chitradurga	Chitradurga	Farmer

39	H S Shivamnia	Guttidurga	Chitradurga	Chitradurga	Principal
40	D Kotresha	Guttidurga	Chitradurga	Chitradurga	Senior Assisstant Teacher
41	Mani	Baggenahalli	Jagalur	Davanagere	Panchayat member
42	Laila	Baggenahalli	Jagalur	Davanagere	Homemaker
43	Tarabai	Baggenahalli	Jagalur	Davanagere	Homemaker
44	Kavya	Baggenahalli	Jagalur	Davanagere	Student
45	Lalita Bai	Baggenahalli	Jagalur	Davanagere	Homemaker
46	Hanumakka	Giddanakatti	Jagalur	Davanagere	Homemaker
47	Uma Devi	Huchavanahalli	Jagalur	Davanagere	Homemaker
48	Gowrama	Anabur	Jagalur	Davanagere	Homemaker
49	Khathama	Anabur	Jagalur	Davanagere	Homemaker
50	Geeta	Anabur	Jagalur	Davanagere	Homemaker
51	Shivagangana	Anabur	Jagalur	Davanagere	Homemaker
52	Shrijakala	Kanamadu (Alur)	Kudligi	Bellary	Tailoring
53	Vijayakala	Kanamadu (Alur)	Kudligi	Bellary	Homemaker
54	Soma Manjunath	Kanamadu (Alur)	Kudligi	Bellary	Farmer/ Homemaker
55	Shantala	Kanamadu (Alur)	Kudligi	Bellary	Homemaker
56	Meenakshi	Kanamadu (Alur)	Kudligi	Bellary	Farmer/ Homemaker
57	Lalitama	Kanamadu (Alur)	Kudligi	Bellary	Farmer/ Homemaker
58	Shivnagamma	Kanamadu (Alur)	Kudligi	Bellary	Farmer/ Homemaker
59	Shruti	Kanamadu (Alur)	Kudligi	Bellary	Homemaker
60	Patriamma	Kanamadu (Alur)	Kudligi	Bellary	Grocery Store
61	Lata	Kakabalu	Chitradurga	Chitradurga	Homemaker
62	Manjuna	Kakabalu	Chitradurga	Chitradurga	Anganwadi Helper
63	Nirmala	Kakabalu	Chitradurga	Chitradurga	Farmer/ Homemaker
64	Sushilama	Kakabalu	Chitradurga	Chitradurga	Farmer/ Homemaker
65	Kavita	Kakabalu	Chitradurga	Chitradurga	Farmer/ Homemaker
66	Durgamaa	Kakabalu	Chitradurga	Chitradurga	Anganwadi Helper
67	Devi Rama	Kakabalu	Chitradurga	Chitradurga	Farmer/

					Homemaker
68	Rashmi	Nellikatti	Chitradurga	Chitradurga	Research Scientist
69	Gurusiddama	Nellikatti	Chitradurga	Chitradurga	Homemaker
70	Rashmi .S.	Nellikatti	Chitradurga	Chitradurga	Homemaker
71	Vrundama	Nellikatti	Chitradurga	Chitradurga	Homemaker
72	Suvarnamma	Nellikatti	Chitradurga	Chitradurga	Homemaker
73	Savithra	Nellikatti	Chitradurga	Chitradurga	Homemaker
74	Manjakshama C.	Kalagere	Chitradurga	Chitradurga	Librarian
75	Lavanya Bai	Chennapura	Chitradurga	Chitradurga	Homemaker
76	Jaya Bai	Chennapura	Chitradurga	Chitradurga	Homemaker
77	Bausamma	Chennapura	Chitradurga	Chitradurga	Farmer/ Homemaker
78	Savita	Rastemachikere	Jagalur	Davanagere	Homemaker
79	Durgamaa	Kakabalu	Chitradurga	Chitradurga	Anganwadi Helper
80	Manjauma	Kakabalu	Chitradurga	Chitradurga	Anganwadi Helper
81	G. Chandrama	Lokikere	Kudligi	Bellary	Homemaker
82	Bhagyama	Lokikere	Kudligi	Bellary	Homemaker
83	Hemavati	Lokikere	Kudligi	Bellary	Homemaker
84	Shiamukppa	Rastemachikere	Jagalur	Davanagere	Farmer/Panchayat Member
85	Shahshi Kumar Naik	Chennapura	Chitradurga	Chitradurga	Farmer
86	Mantesh Naik	Chennapura	Chitradurga	Chitradurga	Farmer
87	Jeevan	Nellikatte	Chitradurga	Chitradurga	Student
88	Manjunath	Nellikatte	Chitradurga	Chitradurga	Student
89	Rangappa	Kalagere	Chitradurga	Chitradurga	Farmer

The questions raised during consultations and their responses by the villagers are mentioned below in **Table 5.5**.

Table 5-5: Discussions with Local Inhabitants in Project Villages

	Questions	Alur	Lokikere	Kenchamalanahalli	Hullikere	Anabur
1.	Total population of the area:	Around 4500 (900 houses)	Around 2000 (400 houses)	Around 4000 (800 houses)	Around 3200 (650 houses)	Around 300 (500 houses)
2.	Average Household Size:	4-5 people	4-5 people	4-5 people	4-5 people	5-6 people
3.	Literacy rate:	68.49 % compared to 75.36 % of Karnataka. In Alur Male literacy stands at 74.16 % while female literacy rate was 62.50 %.	52.32 % compared to 75.36 % of Karnataka. In Lokikere Male literacy stands at 62.75 % while female literacy rate was 41.92 %.	60.30 % compared to 75.36 % of Karnataka. In Kenchamalanhalli Male literacy stands at 70.22 % while female literacy rate was 50.25 %.	70.17 % compared to 75.36 % of Karnataka. In Hullikere Male literacy stands at 78.19 % while female literacy rate was 62.26 %.	57.87 % compared to 75.36 % of Karnataka. In Anabur Male literacy stands at 64.31 % while female literacy rate was 50.74 %.
4.	Caste/tribe details:	Schedule Caste (SC) constitutes 24.39 % while Schedule Tribe (ST) were 14.82 % of total population in Alur village.	Schedule Caste (SC) constitutes 34.59 % of total population while Schedule Tribe (ST) were 4.14 % of total population in Lokikere village.	Schedule Caste (SC) constitutes 32 % while Schedule Tribe (ST) were 14.05 % of total population in Kenchamalanhalli village.	Schedule Caste (SC) constitutes 12.02 % while Schedule Tribe (ST) were 38.60 % of total population in Hulikere village.	Schedule Caste (SC) constitutes 16.48 % while Schedule Tribe (ST) were 4.27 % of total population in Anabur village.
5.	Religion:	99% Hindu, 1% Muslim	80% Hindu, 20% Muslim	100% Hindu,	100% Hindu,	99% Hindu, 1% Muslim

6.	Major Occupation:	Agriculture and miscellaneous labour	Agriculture and miscellaneous labour	Agriculture and miscellaneous labour	Agriculture and miscellaneous labour	Agriculture and miscellaneous labour
7.	Crops Grown:	Cotton, Groundnut, Sunflower, Maize	Cotton, Groundnut, Sunflower, Maize	Cotton, Groundnut, Sunflower, Maize	Cotton, Groundnut, Sunflower, Maize	Cotton, Groundnut, Sunflower, Maize
8.	Land Holding details:	5-10 acres per family	4-5 acres per family	10-15 acres per family	5-10 acres per family	3-4 acres per family
9.	Type and number of livestock per household:	Goat, Cow, Hen, Buffalo, Sheep	Goat, Cow, Hen, Buffalo, Sheep	Goat, Cow, Hen, Buffalo, Sheep	Goat, Cow, Hen, Buffalo, Sheep	Goat, Cow, Hen, Buffalo, Sheep
10.	BPL Holders/Other government scheme:	50% BPL Holders, Karnataka Milk Foundation	50% BPL Holders, Karnataka Milk Foundation	50% BPL Holders, Karnataka Milk Foundation	50% BPL Holders, Karnataka Milk Foundation	40% BPL Holders, Karnataka Milk Foundation, 100 days scheme
11.	Educational facilities:	The area has got facilities for primary school, higher secondary school and ITI in Alur village.	The area has got facilities for primary school in Lokikere village. The High School Facilities from Class VIIIth-XIIth is available in Kenchamalanahalli at 5 km.	The area has got facilities for primary school, higher secondary school in Kenchamalanahalli village.	The area has got facilities for primary school in Hullikere village. The High School Facilities from Class VIIIth-XIIth is available in Alur at 4 km.	The area has got facilities for primary school in Anabur village. The private High School Facilities aided by government from Class VIIIth-XIIth is available in the village.
12.	Transport facilities:	The State Transport	No government bus facility is availbale in	No government bus facility is availbale in	The State Transport Services i.e. KSRTC	The State Transport Services i.e. KSRTC

		Services i.e. KSRTC Bus is available.	the village. Only private bus facility is available.	the village. Only private bus facility is available.	Bus is available.	Bus is available twice a day. However, private bus facility is also available in the village.
13.	Health care facilities:	Primary Health Centre is located in the village. The nearest hospital is in Jagalur at 22km.	Primary Health Centre is located in Hosahalli village. The nearest hospital is in Jagalur at 25km.	Primary Health Centre is located in the village. The nearest hospital is in Jagalur at 20km.	Primary Health Centre is located in Hosahalli village. The nearest hospital is in Jagalur at 25 km.	Primary Health Centre is located in Anabur village. The nearest hospital is in Jagalur at 11 km.
14.	Water Supply facilities	The piped water supply connection from groundwater (panchayat borewell) source exists	The piped water supply connection from groundwater (panchayat borewell source exists	The piped water supply connection from groundwater (panchayat borewell source exists	The piped water supply connection from groundwater (panchayat borewell source exists	The piped water supply connection from groundwater (panchayat borewell source exists
15.	Electricity facilities	The village has around 24 hours of electricity in a day for residence and 7 hours for farming	The village has around 24 hours of electricity in a day for residence and 7 hours for farming	The village has around 24 hours of electricity in a day for residence and 7 hours for farming	The village has around 24 hours of electricity in a day for residence and 7 hours for farming	The village has around 24 hours of electricity in a day for residence and 7 hours for farming
16.	Role of Women	The women are housewives and	The women are housewives and also	The women are housewives and also	The women are housewives and also	The women are housewives and also

		also supports in farms for agriculture related works. Further, some of them also handle tailoring works.	supports in farms for agriculture related works.	supports in farms for agriculture related works. Further, some of them also handle tailoring works.	supports in farms for agriculture related works.	supports in farms for agriculture related works. Further, some of them also handle tailoring works.
17.	Veterinary facility	One in the village	In Hosahalli village at 4 km	In Alur village at 3 km	In Hosahalli village at 3 km	One in the village
18.	Fertilizer shop	One in the village	In Hosahalli village at 4 km	In Alur village at 3 km	In Hosahalli village at 3 km	In Alur village at 5 km
19.	Fair price shop	One in the village	One in the village	One in the village	One in the village	One in the village
20.	NGO working in the area	Dharamsthala	Dharamsthala	Dharamsthala	Dharamsthala	Dharamsthala
21.	Cultural Site	None	None	None	None	None

	Questions	Huchavanahalli	Channapur	Baggenahalli	Rastemachikere	Nellikatte
1.	Total population of the area:	Around 1200 (250 houses)	Around 100 (20 houses)	Around 1400 (147 houses)	Around 1200 (152 houses)	Around 900 (200 houses)
2.	Average Household Size:	4-5 people	4-5 people	4-5 people	5-6 people	4-5 people
3.	Literacy rate:	59.14 % compared to 75.36 % of Karnataka. In Huchavanahalli	50.94 % compared to 75.36 % of Karnataka. In Chennapura Male	58.48 % compared to 75.36 % of Karnataka. In Baggenahalli Male	77.00 % compared to 75.36 % of Karnataka. In Rastemachikere	66.72 % compared to 75.36 % of Karnataka. In Nellikatte Male

		village, Male literacy stands at 69.14 % while female literacy rate was 48.92 %.	literacy stands at 73.08 % while female literacy rate was 29.63 %.	literacy stands at 64.96 % while female literacy rate was 52.14 %.	Male literacy stands at 84.55 % while female literacy rate was 68.93 %.	literacy stands at 72.52 % while female literacy rate was 60.46 %.
4.	Caste/tribe details:	Schedule Caste (SC) constitutes 58.52 % while Schedule Tribe (ST) were 2.94 % of total population in the village.	Schedule Caste (SC) constitutes 100 % of total population while there is no ST population in the village.	Schedule Caste (SC) constitutes 99.10 % while there is no Schedule Tribe (ST) village.	Schedule Caste (SC) constitutes 17.84 % while Schedule Tribe (ST) were 40.38 % of total population in village.	Schedule Caste (SC) constitutes 28.46 % while Schedule Tribe (ST) were 17.37 % of total population in village.
5.	Religion:	85% Hindu, 15% Muslim	100% Hindu	100% Hindu	100% Hindu	100% Hindu
6.	Major Occupation:	Agriculture and miscellaneous labour	Agriculture and miscellaneous labour	Agriculture and miscellaneous labour	Agriculture and miscellaneous labour	Agriculture and miscellaneous labour
7.	Crops Grown:	Cotton, Groundnut, Sunflower, Maize	Cotton, Groundnut, Sunflower, Maize, Tomato, Chilli, Corn	Cotton, Groundnut, Sunflower, Maize, Ragi	Cotton, Groundnut, Sunflower, Maize, Ragi	Cotton, Groundnut, Sunflower, Maize, Ragi
8.	Land Holding details:	5-6 acres per family	3-4 acres per family	10-15 acres per family	2-3 acres per family	2-3 acres per family
9.	Type and number of livestock per household:	Goat, Cow, Hen, Buffalo, Sheep	Goat, Cow, Buffalo	Goat, Cow, Buffalo	Goat, Cow, Buffalo, Sheep	Goat, Cow, Buffalo, Sheep
10.	BPL Holders/Other government scheme:	50% BPL Holders, Karnataka Milk Foundation	100% BPL Holders, Karnataka Milk Foundation	100% BPL Holders, Karnataka Milk Foundation	80% BPL Holders, Karnataka Milk Foundation	10% BPL Holders, Karnataka Milk Foundation

11.	Educational facilities:	The area has got facilities for primary school in the village. The High School Facilities from Class VIIIth-XIIth is available in Alur at 6 km.	The area has no facilities for primary school village. The primary and high School Facilities from Class VIIIth-XIIth is available in Jagalur at 6 km.	The area has got facilities for primary school in the village. The High School Facilities from Class VIIIth-XIIth is available in Rastemachikere at 2 km.	The area has got facilities for primary and high school in village. The High School Facilities from Class VIIIth-XIIth is available in Jagalur at 4 km.	The area has got facilities for primary school in village.
12.	Transport facilities:	No government bus facility is availbale in the village. Only private bus facility is available five times a day.	No transport facility is available in the village.	No government bus facility is available in the village. Only private bus facility is available.	No government bus facility is available in the village. Only private bus facility is available.	The State Transport Services i.e. KSRTC Bus is available twice a day.
13.	Health care facilities:	Ayurvedic Health Centre is located in the village. The nearest hospital is in Jagalur at 18 km.	No Primary Health Centre is located in village. The nearest hospital is in Jagalur at 6 km.	No Primary Health Centre is located in village. The nearest hospital is in Jagalur at 5 km.	Primary Health Centre is located in village. The nearest hospital is in Jagalur at 4 km.	Primary Health Centre is located in Nellikatte village.
14.	Water Supply facilities:	The piped water supply connection from groundwater (panchayat borewell) source exists	The piped water supply connection from groundwater (panchayat borewell source exists	Water Storage Tank available. Tanker under costruction	The piped water supply connection from groundwater (panchayat borewell source exists	The piped water supply connection from groundwater (panchayat borewell source exists
15.	Electricity facilities	The village has	The village has	The village has	The village has	The village has

		around 24 hours of electricity in a day for residence and 7 hours for farming	around 24 hours of electricity in a day for residence and 3 hours for farming	around 24 hours of electricity in a day for residence and 6 hours for farming	around 24 hours of electricity in a day for residence and 6 hours for farming	around 24 hours of electricity in a day for residence and 6 hours for farming
16.	Role of Women	The women are housewives and also supports in farms for agriculture related works.	The women are housewives and also supports in farms for agriculture related works.	The women are housewives and also supports in farms for agriculture related works.	The women are housewives and also supports in farms for agriculture related works.	The women are housewives and also supports in farms for agriculture related works.
17.	Veterinary facility	One in the village	None	None	None	None
18.	Fertilizer shop	One in the village	None	None	None	None
19.	Fair price shop	One in the village	One in the village	One in the village	One in the village	One in the village
20.	NGO working in the area	Dharamsthala	Dharamsthala	Dharamsthala	Dharamsthala	Stree Shakti Sanga
21.	Cultural Site	None	None	None	None	None

	Questions	Gidanakatti	Kalagere	Kakabalu	Sagalkatti	Chikamalanahalli
1.	Total population of the area:	Around 1000 (250 houses)	Around 1800 (600 houses)	Around 1500 (300 houses)	Around 500 (150 houses)	Around 2000 (400 houses)
2.	Average Household Size:	4-5 people	3-4 people	4-5 people	3-4 people	5-6 people
3.	Literacy rate:	61.45 % compared to 75.36 % of Karnataka. In Giddanakatti	73.24 % compared to 75.36 % of Karnataka. In Kalagere Male literacy stands at	71.50 % compared to 75.36 % of Karnataka. In Kakabalu Male literacy stands at	59.89 % compared to 75.36 % of Karnataka. In Sagalkatti Male literacy stands at	60.64 % compared to 75.36 % of Karnataka. In Chikamalanahalli Male literacy stands

		Male literacy stands at 73.14 % while female literacy rate was 48.28 %.	79.40 % while female literacy rate was 67.01 %.	80.37 % while female literacy rate was 62.18 %.	65.25 % while female literacy rate was 54.96 %.	at 70.09 % while female literacy rate was 50.87 %.
4.	Caste/tribe details:	Schedule Caste (SC) constitutes 6.36 % while Schedule Tribe (ST) were 41.98 % of total population in village.	Schedule Caste (SC) constitutes 16.88 % while Schedule Tribe (ST) were 3.22 % of total population in village.	Schedule Caste (SC) constitutes 15.17 % while no Schedule Tribe (ST) village.	Schedule Caste (SC) constitutes 34.57 % while no Schedule Tribe (ST) in village.	Schedule Caste (SC) constitutes 37.20 % while Schedule Tribe (ST) were 13.86 % of total population in village.
5.	Religion	100% Hindu	100% Hindu	100% Hindu	100% Hindu	100% Hindu
6.	Major Occupation:	Agriculture and miscellaneous labour	Agriculture and miscellaneous labour	Agriculture and miscellaneous labour	Agriculture and miscellaneous labour	Agriculture and miscellaneous labour
7.	Crops Grown	Cotton, Groundnut, Sunflower, Maize, Corn	Cotton, Groundnut, Sunflower, Maize, Corn	Cotton, Groundnut, Sunflower, Maize, Corn	Cotton, Groundnut, Sunflower, Maize, Corn	Cotton, Groundnut, Sunflower, Maize, Corn
8.	Land Holding details	2 – 3 acres	10 – 20 acres	2 – 3 acres	2 – 3 acres	4 – 5 acres
9.	Type and number of livestock per household	Goat, Cow, Buffalo, Sheep	Goat, Cow, Buffalo, Sheep	Goat, Cow, Buffalo, Sheep	Goat, Cow, Buffalo, Sheep	Goat, Cow, Buffalo, Sheep
10.	BPL Holders/Other government scheme	20-30% BPL Holders,	75% BPL Holders, Karnataka Milk	30-40% BPL Holders, Karnataka Milk	70-80% BPL Holders, Karnataka Milk	20-30% BPL Holders, Karnataka Milk

		Karnataka Milk Foundation	Foundation	Foundation	Foundation	Foundation
11.	Educational facilities	The area has got facilities for primary school in the village.	The area has got facilities for primary school in the village.	The area has got facilities for primary school in the village.	The area has got facilities for primary school in the village.	The area has got facilities for primary school in the village.
12.	Transport facilities	No government bus facility is available in the village. Only private bus facility is available five times a day.	The State Transport Services i.e. KSRTC Bus is available twice a day.	No government bus facility is available in the village.	No government bus facility is available in the village.	The State Transport Services i.e. KSRTC Bus is available twice a day.
13.	Health care facilities	No Primary Health Centre is located in village. The nearest hospital is in Jagalur at 4 km.	Primary Health Centre is located in village.	Primary Health Centre is located in kalagere village.	No Primary Health Centre is located in village.	Primary Health Centre is located in village..
14.	Water Supply facilities	The piped water supply connection from groundwater (panchayat	The piped water supply connection from groundwater (panchayat borewell) source exists	The piped water supply connection from groundwater (panchayat borewell) source exists	The piped water supply connection from groundwater (panchayat borewell) source exists	The piped water supply connection from groundwater (panchayat borewell) source exists

		borewell) source exists				
15.	Electricity facilities	The village has around 24 hours of electricity in a day for residence and 6 hours for farming	The village has around 24 hours of electricity in a day for residence and 6 hours for farming	The village has around 24 hours of electricity in a day for residence and 6 hours for farming	The village has around 24 hours of electricity in a day for residence and 6 hours for farming	The village has around 24 hours of electricity in a day for residence and 8 hours for farming
16.	Role of Women	The women are housewives and also supports in farms for agriculture related works.	The women are housewives and also supports in farms for agriculture related works.	The women are housewives and also supports in farms for agriculture related works.	The women are housewives and also supports in farms for agriculture related works.	The women are housewives and also supports in farms for agriculture related works.
17.	Veterinary facility	None	None	None	None	None
18.	Fertilizer shop	None	None	None	None	None
19.	Fair price shop	One in the village	One in the village	One in the village	One in the village	One in the village
20.	NGO working in the area	Dharamsthala	Shri Shakti	Dharamsthala	Dharamsthala	Dharamsthala
21.	Cultural Site	None	None	None	None	None

Community Consultation proceedings at Alur village

Community Consultation and Land Seller proceedings at Chikkamalanhalli village

Community amd Land Seller Consultation proceedings at Lokikere village

Community Consultation proceedings at Anabur village

Community Consultation proceedings at Kenchamalanhalli village

Community Consultation proceedings at Huchavanahalli village

Community Consultation proceedings at Nellikatte village

Community and Vulnarble Group Consultation proceedings at Chennapura village

Community Consultation proceedings at Kakabalu village

Community Consultation proceedings at Kalagere village

Community and Women Consultation proceedings at Giddanakaate village

Sarpanch and Vulnerable group Consultation proceedings at Rastemachikere village

Community Consultation proceedings at Baiganahalli village

Community Consultation proceedings at Sagalkatte village

Consultation with Sarpanch of Project villages

Discussion was held with Sarpanch of Project villages during FGD discussions as mentioned in Table 5-6.

Table 5-6: Discussion with Sarpanch of project villages

S.No.	Key Questions	Response
1.	Understanding about the wind project	Sarpanch was aware about the existing and upcoming project and was positive about it as it will be going to improve the economy of village through more employment opportunities for the village people and also will improve the infrastructure facilities in the village.
2.	Is Sarpanch aware of the land acquisition taken in project village	All the private land patches are being acquired for the development of the proposed project. Sarpanch (Gram Panchayat Member) was aware of the land acquisition in the project villages and land of few gram panchayat members were also taken for the proposed project. Some of the land owners were consulted with the gram panchayat members few consultations with land sellers. The project land team has consulted village sarpanch/gram panchayat member in order to obtain the permission for using revenue land in the village as access path to some WTGs.
3.	Is Sarpanch aware about the land sellers and their living status who has provide the land for project	Private Land sellors has been consulted through sarpanch of the villages for WTG land or RoW in revenue land for WTG situated in private land. Also, due to scarcity of water and climate conditions, farming activities in project area is restricted to only monsoon season. In discussion with sarpanch, it was envisaged that none of the land sellers got landless due to the land acquisition for the proposed project. Land sellers has been provided fair compensation amount in comparision to market rate of the project area.
4.	What are the difficulties and challenges that villagers facing in project villages	Villagers are facing difficulties in terms of: • Local transportation • Employment • Cleanliness • Animal Husbandry

		• Health care facility within the village • Higher education facility in school (primary school at project villages is upto 8th class only; youth has to migrate for higher studies which is found to be very costly) • Community hall for marriages and other occasions • RO Facility • Veterinary Facility • Facilities for Women Employment within the village
5.	Is any land of vulnerable group has been acquired for the proposed project	3 land patches have been procured from ST community of Kanamadagu (Alur) village. Further, one land patch is taken from women headed family in Lokikere village.
6.	What is your expectations from the upcoming project	• Improvement in infrastructure of village • Improvement in transportation • Improvement in medical and higher education facilities • Employment opportunities to the village people • Cleanliness in the village • Ro Facility • Ambulance for emergency
7.	Is there any COVID 19 cases in project villages and what are the facilities provided by the government in this area for the same	• There are few COVID case in project villages. • Further masks were provided by the government in the village. But no special camps or healthcare center is available for COVID 19. • 50 % Vaccines (2nd dose) is also provided to the villagers for above 18 years.

View of consultation with Sarpanch of Nellikatte Village

View of consultation with Sarpanch and Woman of Baiganhalle Village

View of consultation with Gram Panchayat Member, Land Seller and Vulnerable group of Alur Village

Consultation with Vulnerable Group at Rasaliya Village

Discussion was held with the Vulnerable group at Project Villages during FGD discussions as mentioned in Table 5.7

Table 5-7: Discussion with Vunerable Group in Rasaliya Village

S.No.	Key Questions	Response
1.	Understanding about the wind project	Yes, they were aware about the existing and upcoming wind project but none of the project has provided better employment opportunities in the village. Villagers hopes for the employment due to the projects.
2.	Household size and if they fall under BPL	Majority of houses (4- 5 persons per house) Family comes under BPL
3.	Occupation	Labour (farming) / Migration of labor
4.	Role of Female	Household / farming labour
5.	Any caste discrimination/ untouchability	No, they are living as like other villagers in the area. Equality is maintained in the village with

		every caste person. The person from ST community is also a memeber of gram panchayat in villages.
6.	Any SC/ST land acquired for the upcoming projects in the village area	Yes, 3 land parcel has been acquired from Kanamadagu (Alur) village only. The project affected persons are well established and have other land as well apart from the land provided for the project.
8.	What are the difficulties and challenges that they are facing in Rasaliya village	• Local transportation • Employment • Cleanliness • Animal Husbandry • Health care facility within the village • Higher education facility in school (primary school at project villages is upto 8th class only; youth has to migrate for higher studies which is found to be very costly)
9.	What are their expectations from the project	Expectations from upcoming project: • Improvement of infrastructure facilities • Employment opportunities to the village people • Improvement in Transportation • Improvement in Health facility

Consultation with Vulnerable People in Kalagere

View of an orchard near on of the proposed WTG location

Discussions with Women Respondents (Socio-economic status of women)

The discussions held regarding Socio-economic status of women in project villages are mentioned in Table 5-8.

Table 5-8: Discussions with Women participants during Consultation

S.No.	Key Questions	Kenchamalanahalli	Chennapura	Nellikatte	Alur	Kalagere
1.	Status of Education	8th Class (No further studies due to non-availability of higher education in villages (50% graduated)	10th Class (No further studies due to non-availability of higher education in villages	10th Class (No further studies due to non-availability of higher education in villages (80% graduated)	10th Class (No further studies due to non-availability of higher education in villages (60% graduated)	10th Class (No further studies due to non-availability of higher education in villages (40% graduated)
2.	Marital Age	18 to 25 years	18 to 22 years	21 to 25 years	18 to 22 years	18 to 22 years
3.	Women workforce Participation	Agriculture / Homemaker	Agriculture / Homemaker	Agriculture / Homemaker/ Job	Agriculture / Homemaker / Job/ Labour	Agriculture / Homemaker
4.	Health Care Facilities	PHC Kenchamalanahalli for basic facilties. Major hospital in jagalur	No PHC or any other health facility is available in village. The nearest facilityavailable is in jagalur which is 6 km from village.	PHC Nellikatte for basic facilties. Major hospital in jagalur.	PHC Alur for basic facilties. Major hospital in jagalur.	PHC Kalagere for basic facilties. Major hospital in jagalur.
5.	Water Supply & Sanitation arrangements	Panchayat Water Supply is available in the villages. Sanitation facility is also available in	No pipeline supply is available in the village. Tankers water has been rpcoures by the villages. Only 20 %	Panchayat Water Supply is available in the villages. Sanitation facility is also available in the village.	Panchayat Water Supply is available in the villages. Sanitation facility is available in every house of the	Panchayat Water Supply is available in the villages. Sanitation facility is also available in majority of

		majority of the village area.	sanitation facility is available in village.		village	the village area.
6.	Are there any Women Help Groups or Self Help Groups?	Dharamsthala	Dharamsthala	Dharamsthala	12 self help groups for saving money within the village. Women also help in milk dairy for employment.	Dharamsthala Stree Shakti
7.	Needs of Women in area	• Employment • Transportation Facility • College for higher education • Sanitation facility • Water supply facilities	• Employment • Transportation Facility • College for higher education • Sanitation facility • Water supply facilities • Tailoring Centre • Health facility in village	• Employment • Transportation Facility • College for higher education • Sanitation facility • Water supply facilities	• Employment • Dairy Farming • Agriculture facilities • Tailoring Centre • Computer training centre • RO Facility • Higher Education facility	• Employment • Dairy Farming • Agriculture facilities • Tailoring Centre • Computer training centre • RO Facility • Higher Education facility

S.No.	Key Questions	Kakabalu	Anubur	Lokikere	Rastemachikere	Huchavanahalli
1.	Status of Education	8th Class (No further studies due to non-availability of higher education in villages (68% graduated)	8th Class (No further studies due to non-availability of higher education in villages (10% graduated)	8th Class (No further studies due to non-availability of higher education in villages (60% graduated)	10th Class (No further studies due to non-availability of higher education in villages	8th Class (No further s due to non-availabili higher education in vi (60-70% graduated)
2.	Marital Age	18 to 21 yrs	18 to 21 yrs	18 to 21 yrs	21 to 25 years	18 to 21 yrs

3.	Women workforce Participation	Contract labor/ housemaker	Agriculture / Homemaker	Agriculture / Homemaker	Agriculture / Homemaker	Agriculture / Homemaker
4.	Health Care Facilities	Healthcare facility available in some villages; Anganwadi services are facilitated in majority of the villages	PHC Anabur for basic facilties. Major hospital in jagalur.	PHC Hosahalli (5 km), Maternity Facility (Anganwadi)	PHC Rastemachikere for basic facilties. Major hospital in jagalur.	PHC Huchvanahalli for basic facilties. Major hospital in jagalur.
5.	Water Supply & Sanitation arrangements	Mini tankers are purchased by the villagers. No water supply is available in the village. Only 45% of houses have toilet facilties.	Panchayat Water Supply is available in the villages.	Panchayat Water Supply is available in the villages.	Panchayat Water Supply is available in the villages.	Panchayat Water Supply is available in the villages.
6.	Are there any Women Help Groups or Self Help Groups?	Dharamsthala	Dharamsthala	• Shri Shakti Sangthan • Basavewara	Dharamsthala	Dharamsthala
7.	Needs of Women in area	• Employment • Transportation Facility • College for higher education • Sanitation	• Employment • Transportation Facility • College for higher education • Sanitation facility • Water supply	• Sanitation Facility • Improvement in Maternity Facility • Veterinary Hospital • Health Facilities	• Tailoring Centre • Candle Business • Fancy design work business • Improvement in Maternity Facility • Veterinary Hospital	• Sanitation Facility • Improvement in Maternity Facility • Veterinary Hospital • Health Facilities

		facility • Water supply facilities • Tailoring Centre • Candle Business • Fancy design work business	facilities		• Health Facilities	

Lokikere

Kenchamalanahalli

Anabur

Huchhavanahalli

Chikkamalanahalli

	
Kanamadagu (Alur)	Chennapura
	
Rastemachikere	Sagalkatte
	
Nellikatte	Baiganahalle

Consultation with Women in Project Villages

View of an orchard near on of the proposed WTG location

Discussions with PAPs and PAFs

Consultations were performed with 32 land sellers along with their families. All the land sellers were consulted at the project site only. List of Project affected persons (PAPs) and Project affected families (PAFs) is mentioned in Table 5.9 and the discussions held with them is mentioned in Table 5-10.

Table 5-9: List of PAPs and PAFs of Project Villages

S.No.	Name	PAP/PAF	Village	Occupation	Amount of land sold/Total Land remaining
1.	Sandeep Kumar	PAP	Alur	Farmer	4/ 5 acres
2.	Boranna	PAP (ST)	Kanamadagu	Farmer	4/3 acres
3.	Chenna Basappa	PAP (ST)	Kanamadagu	Farmer	2/2 acres
4.	Vobhama	PAP	Kanamadagu	Farmer	2/2 acres
5.	Nagarja	PAP	Hullikere	Farmer	3/3 acres
6.	Saranappa	PAP	Hullikere	Farmer	1.8/2.5 acres
7.	Nagaranjan	PAP	Hullikere	Farmer	1.8/2.5 acres
8.	Eramma	PAP	Lokikere	Farmer	3.75/5 acres
9.	Mallikarajun	PAP	Alur	Farmer	3/4 acres
10.	Venkatesh	PAP	Kenchamalanahalli	Farmer	3.5/6.5 acres
11.	Manjunath	PAP	Kenchamalanahalli	Farmer	3.5/5 acres
12.	K.G. Kuber Gowda	PAP	Alur	Farmer	3.5/5.5 acres
13.	Basavaraja	PAP	Kenchamalanahalli	Farmer	3.5/2.5 acres
14.	K.G. Ningappa	PAP	Kenchamalanahalli	Farmer	3.96/4 acres
15.	Somasekhar	PAP	Lokikere	Farmer	3.5/5 acres
16.	Bharat				
17.	Renukama	PAF	Lokikere	Farmer	4/8 acres
18.	B. Kumarswamy	PAP	Lokikere	Farmer	4/13 acres
19.	Anjanappa	PAP	Kenchamalanahalli	Farmer	4.1/5.2 acres
20.	Rangaswamy	PAP	Anabur	Farmer	4/2.5 acres
21.	Katapa	PAP	Anabur	Farmer	3.5/3 acres
22.	Rangana Reddy	PAP	Huchavanahalli	Farmer	4/14 acres
23.	Satyanarayan Reddy	PAP	Huchavanahalli	Farmer	4.8/13 acres
24.	Hanuman Reddy	PAP	Huchavanahalli	Farmer	3.5/4.5 acres

25.	Jayamma	PAP	Chikkamalanahalli	Farmer	4/11 acres
26.	Mahadev Reddy	PAP	Yerrahalli	Farmer	2/2 acres
27.	Chaudappa	PAP	Nellikatte	Farmer	1.16/2.33 acres
28.	Prakash Prasanna	PAP	Nellikatte	Farmer	3.34/7 acres
29.	Niranjan Murti	PAP	Nellikatte	Homemaker	6.58/30 acres
30.	Rundamma KR				
31.	T.S Shivamurthi	PAP	Nellikatte	Farmer	4/10 acres
32.	Siddhalingappa	PAP	Rastemachekere	Farmer	4/4 acres

Table 5-10: Summary of Responses received from Land sellers

Questions	Summary of responses received from affected parties
What is the Land Use of the project site?	The land has been primarily used for agriculture dependent on rainfall due to non-availbaility of water source for irrigation purpose and Cotton, Groundnut, Maize, sunflower, ragi is cultivated however due to drought cultivation in the area is still rain-fed, the land has become fallow.
Has any land from local villages been acquired for the project?	Only Private local villagers land has been acquired for the project. All the land sellers are farmers living in the nearby villages of the project site.
Are the land disbursers contended with the remuneration received?	Yes. They are content with the amount of compensation received which is higher than the Market rates.
Have any of the land owners who sold their land for the project gone landless?	None of the land sellers has gone landless due to the proposed project land acquisition. Every land seller have their other land apart from the land provided for the project.
What is the occupation and Livelihood source of the locals in the project area?	The major occupation is agriculture/ labour which is totally dependent on rainfall. The younger generation is shifting their base to Bangalore and other developed cities etc. for gaining higher education and better jobs.
What is the general perception about Wind power projects?	People in the project area have positive percepton about the project as there are others projects as well and they don't have any good income from the agricultural land due to scarcity of water. Village has no issues with the wind power project. Has positive perception due to expected employment and income generation. Villagers want CSR activities to be focused on work in the schools, sanitation, health facility. Local community other than land seller also wants to sell their land to OKPPL for the project in order to utilize the money for purchasing more productive land. There are few WTGs which are located near villge habitation and residential structure near to them.
What will they do with the compensation they received	Land seller will invest the amount which is paid for the land sold for various activities including purchasing of land with water facility,

for selling land?	planning for drip irrigation system, children studies, children marriage, payment of previous loans, etc. They also want to sell their remaining land as well.
Other projects nearby or any other industry	There are no industries in the vicinity of the project site. However, there are three wind power projects of Cleanmax Hybrid project 110.5 MW adjacent to the project, S S Renewable Energy Ventures Pvt. Ltd. 19.5 MW Wind Farm in Anabur within the WTG cluster and another unnamed Wind Power Project in Lingannanahalli village at 7 km in south east direction. Also, a 10 MW Solar Power Project of Vedanga Energy Private Limited is located at 0.7 km from the project site in north direction and another unnamed solar plant Mudlamachikere village.
What are the overall needs of the community?	Higher education facilities at village schools; Health care facilities; Veterinary facility; employment for men and women, transportation facility, Santitation facility in few villages, Water Supply facilities as all villages don't have pipeline facilities






View of the consultation with Land Sellers

View of an orchard near on of the proposed WTG location

Consultation with Sub Registar Office, Jagalur, Kudligi & Chitradurga Tehsil

Consultation was done in Sub-Registrar Office, Jagalur, Kudligi & Chitradurga for the revenue land rates and its procedure. Table 5-11 is showing the discussions held with revenue department.

Table 5-11: Discussions with Sub Registrar Office (Jagalur, Kudligi & Chitradurga Tehsil)

S.No.	Questions	Response
1.	What are the rates of revenue land given on lease for Wind and	There is no specific procedure for taking government on lease for setting up the wind power Project. However, there is not much governemnt land is available to provide for wind power projects. Other developers in the área are taking private land only.

	Wind Power Projects FY 2021-22?	
2.	What are the revenue rates of private land for lease and purchase?	Private land revenue rate is availble on Kaveri online service website by government of Karnataka (https://kaverionline.karnataka.gov.in/KnowYourValuation/KnowYourValuation)
3.	Is any compensation needs to be paid for laying transmission line pole on revenue land?	Pole fixing can be done in revenue and private land by paying the adequate compensation amount to the second party for the exact usable área as per the government norms.
4.	What is the procedure of taking the revenue land on lease?	Procedure for taking revenue land on lease is described in Section 3.6 (Land Requirement)

Sub Registrar Office, Chitradurga

Sub Registrar Office, Jagalur

Sub Registrar Office, Kudligi

View of Sub Registrar Office

Consultation with Water Supply Department, Jagalur, Kudligi & Chitradurga Tehsil

Table 5-12: Discussions with Water Supply Department, Jagalur, Kudligi & Chitradurga Tehsil

S.No.	Questions	Response
1.	Is there any pipeline supply available in Taluka villages?	Water Supply pipeline is available only in town área. No wáter pipeline supply is provided in the rural áreas. In rural áreas, pipeline wáter supply is available through gram oanchayat borewell in most of the villages.
2.	What is the procedure of consuming water for industries (Solar or Wind Plant in the área)?	Water supply is not available for the industria projects. The supply is provided only for domestic purpose within the town área. Further, other projects are using tanker wáter for their construction activities and industry can dig a borewell with prior permission from KGWA under stipulated conditions.

3.	What is the procedure of withdrawing the ground water for the industrial use?	Permission for Groundwater is allowed for industrial activites in the project. However, the Project área comes under non- notified block as per the criteria of CGWB. OKPPL has to apply for ground wáter extraction approval from KGWA under various conditions considering the área as over exploited región.

Water Supply Department, Chitradurga

Water Supply Department, Jagalur

Water Supply Department, Kudligi

Consultation with School located in Project Villages

Consultation with the schools in project villages and the outcomes of discussions held is mentioned in Table 5-13.

Table 5-13: Discussions with locals for school in project villages

S.No.	Questions	Response in Project Village
1.	Facilities provided to students	Classes till 8th Class/10th Class Sanitation facilities available for students and teachers in few vilages Drinking Water facility Sitting desks Mid-Day Meal
2.	No. of Teachers and their qualification	5 to 10 teachers in every village
3.	Ratio of Boy: Girl admissions	The ration of Boys and Girls is 60:40.
4.	Improvements required at the school	RO facility Sports activities / Playground in some schools Introduction of higher education within the villages Number of rooms to be increased as only 3-4 rooms are available in some schools Extra curricular Activities Separate santitation facilties for girls, boys and tecahers. Smart Classes is required in the villages











View of School in Project Villages

View of an orchard near on of the proposed WTG location

Consultation with Primary Health Care Centre at Project Villages

Consultation was carried out with Nurse, Anganwadi and Support Staff at Primary Health Center in project villages. The discussions held is mentioned in Table 5.11. Anganwadi is present in project villages which is taken care by Anganwadi. The outcomes of the discussions are mentioned in Table 5.14.

Table 5-14: Discussions with Community Health center staff

S.No.	Questions	Response
1.	Facilities at Wellness center for the nearby villages	Treatment and Medication for all the common diseases is available Primary Health Centre and Sub – Primary Health centre are also available in the vilages with high population.
2.	Difficulties faced by the villagers	PHC & Sub- PHC is not available in every village. Some Villagers have to travel to nearby village or CHC in Jagalur or Kudligi for treatment. However, ambulance facility is available for the villages 24*7 by dialing 108.
3.	Improvements to be required	Health Centres are required in the villages with proper medical facilities so no one has to travel far away in case of emergency.
4.	What are the facilities available for COVID-19?	COVID – 19 testing facilties are available at CHC Jagalur and Kudligi. Vaccination has been carried out for the persons above 18 through vaccination drive within the villages and at community health centre.




View of Primary Health Centre in Project villages

View of an orchard near on of the proposed WTG location

Table 5-15: Discussions with locals for Anganwadi

S.No.	Questions	Response
1.	Facilities at Anganwadi for the project villages	Anganwadi is provided with some facilities. Infrastructure such as boundary line of Anganwadi, sanitation facility, power supply, staff fooding and lodging is not provided. Vaccinations and first aid is not facilitated in some Anganwadi No supporting staff is provided in some villages.
2.	Difficulties faced by the villagers	Since the proper facilities are not provided at Anganwadi therefore village people do not get facilitated with the Anganwadi facilities
3.	Improvements needed at Anganwadi	Medication and Vaccination till 5 years Infrastructure facilities to be improved as mentioned in section 1.





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View of Anganwadi at Project Villages

View of an orchard near on of the proposed WTG location

Consultation with Forest Department, Jagalur

Consultation was done with the Range forest officer at Jagalur. The outcomes of the discussions are mentioned in **Table 5-16.**

Table 5-16: Discussion Outcomes with Forest Officials

Sr. No.	Name	Department /Corporate Office (OR) Village	Date	Questions	Responses
1	Amrutha	Range Forest Officer (Jagalur)	11.10.2021	Any Protected area situated in near Jagalur Any reserved forests in this area Any Critically endangered or Endangered species been sighted around Jagalur GIB, Black-bellied Tern, Floricans and Vultures are distributed in Jagalur What are the faunal species distributed in Jagalur What are the migratory birds visit to Jagalur area	Rangayyanadurga Four Horned Antelope Wildlife Sanctuary it was reserved forest recently government declared as sanctuary Yes, Jagalur, Hosahalli, Anaburu No Not seen in this area Leopard, Four-horned Antelope, Striped Hyena, Common Mongoose, Sloth Bear and Common Langur Very less migratory birds in this area

Table 5-17: Discussion Outcomes with Locals

Sr. No.	Name	Department /Corporate Office (OR) Village	Date	Questions	Responses
1	Shranappa Erappa Ranganna Virabasavayya	Resthimachikere	9.10.2021	What are the faunal species distributed in this area	Four-horned Antelope, Common Langur, Wild Boar I have seen vultures in

				Have you seen Vultures in this area Do you know any medicinal plants nearby area	this area 10 years back but not now Neem, Milkweed, Hibiscus, Henna and Sweet Basil
2	Obanda Prakash Kasim Jaiappa	Madhapura	10.10.2021	Have you seen Vultures in this area What are the faunal species distributed in this area	No Common Langur, Wild Boar, Sloth Bear
3	Bhadranna Kalingappa		10.10.2021	What are the faunal species distributed in this area Have you seen any bat species in this area	Common Mongoose, Wild Boar, Three-striped Palm Squirrel Yes, Indian Flying Fox
4	Thippa Swamy Shekar Punit Anmanthappa	Siddvvanadurga	10.10.2021	What are the faunal species distributed in this area Have you seen Vultures in this area Have you seen Peafowl in this area What are the snakes do you know in this area What are the agriculture crops cultivating	Four-horned Antelope, Sloth Bear, Three-striped Palm Squirrel, Leopard No Yes Common Rat snake, Indian cobra Ground Nut, Bajra, Sorgham, Maize
5	Siddanna Chandrappa	Jagalur	10.10.2021	What are the faunal species distributed in this	Indian cobra, Monitor Lizard, Leopard, Common Mongoose

				area Do you know any water birds Have you seen Vultures in this area Do you know any medicinal plants nearby area	 Ducks, Egrets No American Mint, Garuga, Neem, Milkweed, Hibiscus, Drumstick and Sweet Basil
6	Mallesh Durgappa	Anaburu		What are the faunal species distributed in this area	Common Langur, Three-striped Palm Squirrel, Indian Peafowl, Common Rat snake
7	Basavaraj Thippaswamy Kallesh Verappa		10.10.2021	What are the faunal species distributed in this area Have you seen Vultures in this area What are the plants you know in this area	Sloth Bear, Common Langur, Three-striped Palm Squirrel, Indian Peafowl, Grey Francolin, House Crow, Indian cobra No Avaram, Neem, Custard Apple, Datura, Garuga, Hibiscus, Mango, Drumstick, Silver Date Palm, Guava, Teak, Indian Jujube

View of Consultation with the Forest Officials

View of an orchard near on of the proposed WTG location

Anabur

Rastemachikere

	
Muddapura	Siddavvanadurga

View of Consultation with local community

View of an orchard near on of the proposed WTG location

6 ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

This chapter describes various environmental and social impacts identified by accessing information gathered through primary and secondary sources. Impacts have been identified based on review of available project information; discussions conducted with the local community; representatives of the project and other sector specific professionals. Impacts during construction and operation phases have been included and are classified as per impact type.

Additionally, this section presents the identified impacts within a severity range to assess overall significance of impacts on environment, ecology, socio-economic resources, demographics, and livelihoods. Subsequently, mitigation measures have been suggested for impacts outlined in this section.

IFC Performance Standard-1 underscores the importance of managing social and environmental performance throughout the life of a project (any business activity that is subject to assessment and management). An effective social and environmental management system (SEMS) is a dynamic, continuous process initiated by management and involving communication between the client, its workers, and the local communities directly affected by the project (the affected communities). OKPPL is committed to implement an effective Social and Environmental Management System (hereinafter referred as SEMS) to continuously manage and communicate the potential social and environmental impacts and risks imposed on the project employees (direct and indirect) and the local communities residing in the immediate vicinity of the project area.

6.1 IMPACT ASSESSMENT CRITERIA

Identified impacts have been appraised through social and environmental components and have been presented in **Table 6-1** below. The appraisal criteria are classified according to spread, duration, intensity and nature of the impact. Severity levels have been sub classified under each criterion with specifics outlining the limits of each severity level.

Table 6-1: Impact Assessment Criteria

Criteria	Sub-Classification	Defining Limit	Remarks
Spread: Refers to area of direct influence from the impact of a	Insignificant/ local spread	impact is restricted within the foot prints of the Project boundary	except for ecology (which is defined as limited loss of

particular project activity.			vegetation only at site)
	Medium Spread	impact is spread up to 2 km around the project area	except for ecology (which is defined as loss of vegetation at site including large trees with limited disturbance to adjoining flora & fauna)
	High spread	impact is spread beyond 2 km from footprint boundary of the Project	except for ecology (which is defined as loss of vegetation at site and/ or damage to adjoining flora and fauna
Duration: Based on duration of impact and time taken by an environmental aspect to recover to its original state	Insignificant / Short Duration	when impact is likely to be restricted for a duration less than 2 years	the anticipated recovery of the impacted environmental aspect is within 2 years
	Medium Duration	when impact extends up to five years	the anticipated recovery of the impacted environmental aspect is within 5 years
	Long Duration	when impact extends beyond five years	the anticipated recovery of the impacted environmental aspect is more than 5 years
Intensity: Defines the magnitude of impact	Insignificant intensity	when changes in the prevailing (baseline) environmental conditions does not exceed 10%	However, it shall be reconsidered where the baseline values are already high
	Low intensity	when changes in the prevailing (baseline) environmental conditions does not exceed 20%	for ecology it refers to minimal changes in the existing ecology in terms of their reproductive capacity, survival or habitat change
	Medium intensity	when changes in the prevailing (baseline) environmental conditions does not exceed 30%	for ecology, it refers to changes that are potentially recoverable
	High intensity	when changes in the prevailing (baseline) environmental conditions exceeds 30%	While for ecology, high intensity refers to changes that result in serious destruction to species, productivity or critical habitat.

Nature: Refers to whether the effect is considered beneficial or adverse	Beneficial	-	Useful to Environment and Community
	Adverse	-	Harmful to Environment and Community

A "significance assessment matrix" has been adopted in order to assess impacts appraised as per criteria mentioned in below **Table 6-2** provides the impact significance criteria adopted for assessment.

Table 6-2: Impact Significance Criteria

Spread	Duration	Intensity	Overall Significance	
			Adverse	Beneficial
Local	Short	Low	Insignificant	Insignificant
Local	Short	Medium	Minor	Minor
Local	Medium	Low		
Local	Medium	Medium		
Medium	Short	Low		
Local	Long	Low		
Local	Short	High	Moderate	Moderate
Local	Medium	High		
Local	Long	Medium		
Medium	Short	Medium		
Medium	Medium	Low		
Medium	Medium	Medium		
Medium	Long	Low		
Medium	Long	Medium		
High	Short	Low		
High	Short	Medium		
High	Medium	Low		
High	Medium	Medium		
High	Long	Low		
Local	Long	High	Major	Major
Medium	Short	High		
Medium	Long	High		
High	Short	High		
High	Medium	High		
High	Long	Medium		

6.2 IMPACT IDENTIFICATION

Based on the activities involved, an impact interaction matrix for construction and operation phases has been prepared for the project. Impacts have been categorized based on

Environment and Social Aspects. The impact identification matrices are presented below in respective sections.

6.2.1 IMPACT IDENTIFICATION MATRIX

The impact identification matrix for construction, operation and decommissioning phases of the project, based on environmental, social and occupational health and safety variables are given in **Table 6-3 and Table 6-4** respectively. Each of the impacts identified has been further discussed and corresponding mitigation measures have been proposed.

Table 6-3: Impact Identification Matrix – Construction and Operation Phase

S.No	Main Activities	Environmental and Social Components										
		Land Use	Ecology	Water Resources	Ambient Air Quality	Soil Resources	Ambient Noise Quality	Water Quality	Traffic / Transport	Social/ Livelihood/Cultural	Occupational Health &	Visual Aesthetics
I.	CONSTRUCTION PHASE											
1	Site Preparation											
	Procurement of land	√								√		
	Site Grading		√			√						
	Site /Vegetation clearance		√			√						
2	Labour Engagement											
	Employment of workers									√	√	
	Water requirement			√								
	Power requirement				√							
	Waste handling and disposal					√						
	Sewage disposal					√		√				
3	Material Handling and Storage											
	Transportation and Unloading of construction material				√	√	√		√	√	√	
	Transportation, storage and handling of Wind Turbines –Hub, rotar blades				√	√	√		√	√	√	
4	Construction Works											
	Preparation/Mixing of construction material			√	√	√	√	√			√	
	Utilities (Water, power, sanitation etc)				√	√		√				

S.No	Main Activities	Environmental and Social Components										
		Land Use	Ecology	Water Resources	Ambient Air Quality	Soil Resources	Ambient Noise Quality	Water Quality	Traffic / Transport	Social/ Livelihood/Cultural	Occupational Health &	Visual Aesthetics
	Operation of construction machinery				√	√	√				√	
	Handling and Disposal of construction wastes		√				√				√	
	Laying of transmission lines	√									√	√
5	De-Mobilisation of Construction Equipment											
	Dismantling of temporary support construction structures /equipments				√	√	√					√
	Removal of construction machinery					√					√	
	Transportation of Construction /Dismantled wastes				√				√		√	
II.	OPERATION PHASE											
1	Wind power generation										√	
3	Repair and maintenance works					√					√	
4	Power Transmission		√									
II.	DECOMMISSIONING PHASE											
1	Transportation, storage and handling of Wind Turbines –Hub, rotor blades				√	√	√		√	√	√	
2	Site Grading		√			√						
3	Waste handling and disposal					√						

Table 6-4: Matrix relating to project stage and social impact assessment variables

Social impact assessment variables	Construction Phase	Operation and Maintenance Phase	Decommissioning Phase
Land Procurement			
Adequate Compensation	•		
Loss of Agricultural land	•		
Changing occupational opportunities	•		
Influx of migrant Workers			
Presence of an outside agency	•	•	
Conflicts Between Local Residents and Newcomers	•	•	
Income generating opportunities	•	•	
Increase in local employment	•	•	
Introduction of new Social classes	•		
Change in the commercial/industrial focus of the community	•	•	
Stress on local Infrastructure	•		
Loss of jobs			•
Community Infrastructure and property			
Change in community infrastructure		•	
Land acquisition or disposal	•		
Initiation of community development activities	•	•	
Effects on known cultural, historical and archaeological resources			

6.3 IMPACT ASSESSMENT - CONSTRUCTION PHASE

The construction activities for the part of 300 MW plant has been initiated. This section presents the impacts identified primarily for the construction phase of the 300 MW plant. Based on the activity – impact interaction matrix for construction phase, impacts on the following aspects have been identified:

1. Soil Resources and Quality;
2. Visual Amenities
3. Land Use;
4. Topography & Drainage
5. Waste Generation, Storage and Disposal;
6. Water Resources and Quality;
7. Ecology;

8. Traffic and Transport;
9. Ambient Air Quality;
10. Ambient Noise Quality;
11. Occupational Health and Safety;
12. Cultural Heritage;
13. Socio-economic
14. Road construction
15. Painting and finishing
16. Clean up operations
17. Landscaping

6.3.1 SOIL RESOURCES AND QUALITY

Project Phases and Associated Activities

For the impact assessment, the following phases of the Project cycles were considered for potential impacts on the soil and land environment. The phase wise project activities that may impact the environment are described below:

Construction Phase

- Construction/strengthening of access roads;
- Selective clearing of vegetation in areas designated for WTG erection, PSS and electrical poles;
- Stripping and stockpiling of soil layers;
- Excavation for WTG foundations and electrical poles; and
- Storage and transport of construction materials.

Anticipated Impacts

The site clearance, excavation and road construction will largely affect the top layers of the soil. Loss of top soil quality would have an impact on the agricultural productivity of the land but the effects can be reversed over time. Site clearance for the site is anticipated to be minimal because the scrubland patches are not located in a direct impact area (500m) of the proposed wind farm. Also scattered vegetation may be removed from private land for construction activities but this can be easily avoided as most vegetation is around seasonal natural drainage channels or along existing roads.

Road quality in the region is good and therefore vehicles will be encouraged to utilize the existing roads instead of going off-road. The usage of existing roads by vehicles and minimal access road construction will reduce the impact from soil compaction in the area. However,

approach road has to be constructed to carry plant equipment to site at locations which are not accessible by existing roads and where existing roads are interfering village route.

The improper disposal of municipal waste in absence of arrangements for disposal and handling of septic waste may deteriorate land conditions. Workers will be strictly instructed about random disposal of any waste generated from the construction activity, from contractors engaged during construction phase shall ensure that no unauthorized dumping of used oil and other hazardous wastes is undertaken.

The overall impact magnitude has been assessed to be small because of the reversible impact on the soil environment and limited impact from access road construction. The topography of the site is also flat and the region does not experience very high winds decreasing the chances of erosion.

Embedded/In-built Controls

- Vehicles will utilize existing roads to access the site. Existing roads will be widened to have the width and turning radius to accommodate the necessary vehicles for the Project;
- Stripping of top soil will be conducted only when required; and
- Stripping of top soil, excavation and access road construction will not be carried out during the monsoon season or during heavy winds to minimize erosion and run-off.

Significance of Impact

The overall impact significance on soil erosion and compaction has been assessed as minor. The existing infrastructure and wind levels can reduce the impacts due to soil compaction and erosion respectively.

Mitigation

Additional Mitigation Measures

- Top soil that has been stripped should be stored for landscaping of the site;
- The stock piles of soil should be kept moist to avoid wind erosion of the soil;
- Soil should be ploughed in compacted areas after completion of construction work; and
- Site should be restored at the end of the Project life cycle to pre-Project levels.
- Construction vehicles and equipment will be serviced regularly.
- Construction vehicles will remain on designated and prepared compacted gravel roads

Impact Significance

The impact on soil will have medium intensity with a local spread for a short duration which will result in an overall minor impact without mitigation. However, with proper implementation of suggested mitigation measures the overall impact will be negligible and insignificant.

Table 6-5: Impact Significance – Soil Resources and Quality

Impact	Soil Erosion and Compaction				
Impact Type	Direct	Indirect	Induced		
Impact Duration	Short-term		MediumTerm	Long	
Spread	Local	Medium	High		
Impact Scale	Limited to Project areas				
Frequency	Construction Phase				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/ Receptor Senstivity/ Intensity	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Minor**				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Negligible**				

6.3.2 VISUAL AMENITIES

Anticipated Impacts

The construction activities that are likely to create a visual intrusion and a disruption to aesthetics include: materials lay down, excavation, backfilling, and spoil. The project site consists of areas that are sparsely vegetated, and no significant vegetative covers will be removed as part of construction. Also, there are few communities and existing WTGs which are already in operation are present within the visual radius of the project. Hence, the visual effects of the construction will be of low significance within the project area.

Mitigation Measures

During construction phase, the project would include a temporary barricading to avoid disruption to aesthetics. The existing Turbines located in visible radius of the proposed site will be visible from long distance due to the height of the hub and the rotor blades but the visual intrusion from these structures is of great concern during construction phase. The construction period will be limited to 6-7 months and the workers will be restricted to work

during 8 to 10 hours. The labor camps will be designed to be located to avoid direct shadows of the wind turbine.

Impact Significance

The impact on aesthetics and visual aspects will have medium intensity with a local spread for a short duration which will result in minor impact without mitigation. The residual significant impact, after control of intensity and spread, will remain minor owing to the nature of the wind turbine.

Table 6-6: Impact Significance – Visual Amenities

Impact	Visual Amenities				
Impact Type	Direct	Indirect	Induced		
Impact Duration	Short-term		Medium	Long-term	
Spread	Local	Medium	High		
Impact Scale	Limited to visual range of Project areas (500 m)				
Frequency	Construction Phase				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/ Receptor Senstivity/ Intensity	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Minor**				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Minor**				

6.3.3 LAND USE

Impacts

The construction activities followed by site clearance and preparation for the WTGs, PSS and EHV line and construction/ strengthening of access roads will permanently change the land use of the site. 280 acres of private land has already been acquired for the project out of 548 acres of land proposed for the project.

Due to rain fed agriculture practices, the land use has become fallow. The entire area is dependent on rainfall for irrigation. The surrounding land use is rain fed agriculture. Currently no agricultural activities are undertaken on the site.

The land is being taken on “Willing Buyer-Willing Seller” basis through a voluntary negotiation settlement with the land sellers. Consultations with land sellers revealed that the

land is totally dependent upon rain for agriculture and the land sellers have additional land parcels apart from the land provided for the project and have voluntarily sold their land due to low agricultural yield for the proposed project in lieu of monetary payment from OKPPL.

The site borders to fallow land in all four directions. The surroundings of the project site are characterised by agricultural activities and rural setup. The grazing activities are not carried out at WTG locations. However, turbines of Enercon are also observed in the immediate vicinity near proposed Wind power Project Site. Besides land cultivation, livestock breeding is also performed in the nearby areas. There are no industries in the vicinity of the project site.

NOC for Change in Land Use is not trigerred for the present project in accordance with Section 3 of the Karnataka Land Reforms and Certain Other Law (Amendment) Act, 2014 according to which permission for change in the use of land from agricultural to industrial purpose will be deemed to have been accorded when the permission to purchase agricultural land under Section 109 of the Karnataka Land Reforms Act, 1961 is granted by the State Government.

The land proposed for the project is devoid of any cultivation. With the development of the proposed project, the land use of the site will change to industrial land use. As the actively cultivated fields are precluded from the development layout, the overall impact of the project on the area's agricultural potential and production will be low.

Mitigation

The project proponent has considered all aspects of siting and design prior to selection of the proposed site. The impacts on land use are restricted to the construction phase, which is expected to be for a maximum duration of six months for the current wind farm capacity. Construction activities will also be restricted to within the allotted land and immediate surroundings only. After construction work, any land taken for a temporary basis for operation of batching plant, will be restored to their original form. Existing roads will be used for access to the wind farm components with the exception of a small connection from the main village road to the foundation of each individual WTG.

Additional Enhancement Measures

- On completion of construction activities, land used for temporary facilities such as stockyard, batching plant, storage or labour camps if any should be restored to the extent possible; and

- The land use in and around permanent project facilities should not be disturbed.

Significance of Impact

Impact due to change of landuse will have low intensity with a local spread for a short duration (for only the 6-7 months' period when construction activities are ongoing) which will result in an overall minor impact with mitigation, which will remain a minor impact owing to permanent change in landuse.

Table 6-7: Impact Significance – Land Use

Impact	Changes in Land use during construction				
Impact Type	Direct	Indirect	Induced		
Impact Duration	Short-term		Medium	Long Term	
Spread	Local	Medium	High		
Impact Scale	Limited to WTG footprint, construction areas and associated facilities				
Frequency	Construction Phase				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/ Receptor Senstivity/ Intensity	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Minor**				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Minor**				

6.3.4 TOPOGRAPHY AND DRAINAGE

Impacts

The project area is characterized by rural setup and flat rainfed agricultural land with minor undulation. The project area has an elevation in the range of 638- 666 m above mean sea level for Phase I and elevation in the range of 656- 704 m above mean sea level for Phase II. There are no waterbodies located within visible radius (500 m) of the proposed WTGs. Topography is expected to be changed slightly due the construction of approach roads, excavation work for proposed WTGs and ancillary facilities.

Approximately, 5 seasonal waterbodies (Chinna Hagari river; Jagalur lake; Sangenahalli lake; Anaji lake; Katlalu lake) are present within Study Area. The drainage pattern may be impacted during foundation and leveling around the project site. Therefore, the impact

magnitude is considered to be minor due to undulating topography and presence of natural waterbodies within 15 km radius. However, the changes would be small and restricted to the immediate vicinity of the project components.

Mitigation

The contracted labor will be instructed to avoid any unnecessary changes in the topography. Waterbodies and hilly terrain should be particularly avoided when constructing access roads or planning the transmission line pathway. Appropriate number of cross drainage channels should be provided during access road construction to maintain flow in existing natural channels, if required.

Additional Enhancement Measures

- Levelling and grading operations should be undertaken with minimal disturbance to the existing contour thereby maintaining the general slope of the site; and
- Disruption/alteration of micro-watershed drainage pattern should be minimized to the extent possible.

Impact Significance

Topographic changes will be limited to the Project footprint and impact on drainage channels shall be minor due to its presence within visible radius from proposed WTG locations. However, any significant changes in topography can be avoided during access road construction and transmission line laying by avoiding hilly areas and water bodies.

Table 6-8: Impact Significance – Topography & Drainage

Impact	Changes in topography and Drainage				
Impact Type	Direct	Indirect	Induced		
Impact Duration	Short-term		Medium	Long Term	
Spread	Local	Medium	High		
Impact Scale	Limited to project site (specifically WTG locations, internal roads, laydown areas and batching plant)				
Frequency	Several times during Construction Phase				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/ Receptor Senstivity/ Intensity	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Minor**				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large

Residual Impact Significance	Negligible	Minor	Moderate	Major
	Significance of impact is considered **Minor**			

6.3.5 WASTE GENERATION, STORAGE AND DISPOSAL

The construction activities such as site clearing, excavation works, setting up of labour camps, installation of modules etc. will generate different types of solid and hazardous wastes. The construction demobilisation which includes removal of machinery, workers, campsite and other temporary structures will also generate some amount of solid waste. The following types of wastes will be generated due to construction of the project:

1. Domestic solid waste and sewage
2. Waste oil from generator and other construction machinery
3. Packaging waste such as gunny bags, plastics, etc.
4. Kitchen waste from Canteen at Site and at Labour Camp, if any;
5. Empty paint containers, metal scrap, etc.
6. Construction debris; access road maintenance
7. Scraped building material;
8. Excess concrete and cement;
9. Rejected components and materials; and

Anticipated Impacts

The construction debris generated due to the construction activities will have the potential for spread to areas outside the project boundary during construction. The dust particles from debris generated during construction activities can be carried along with the wind into nearby areas, thereby increasing the particulate matter in the area. However, this will happen only for a temporary period as the construction activities will be for small duration only.

The improper disposal of solid waste from the sanitary arrangement at site and lack of proper sanitation facility for labour can lead to unhygienic conditions due to open defecation and spread of diseases in the area. Further, the disposal of kitchen waste and other packaging waste material from Canteen at proposed project site can lead to discontent of local community and result in conflicts with the labour engaged at site.

Improper disposal of packaging materials, boxes, plastics, ropes etc. can lead to littering in the construction site and surrounding areas. Hazardous wastes such as waste oil, lubricants, hydraulic oil etc. can cause contamination of soil and water bodies if adequate precautions for management and handling are not undertaken. Use of chemicals such as paints, curing chemicals can lead to contamination of soil.

Mitigation

Arrangements for septic tanks and soak pits is being provided for handling domestic sewage generated by the labour and employees engaged during construction phase. An arrangement for segregation and collection of garbage in dustbins and daily disposal to the nearest dumpsite needs to be carried out near Labour camp, if any. OKPPL needs to ensure that a proper arrangement for a separate storageyard and scrapyard with proper fencing is being provided.

It was reported that approximately 200 personnel will be involved in the construction phase and around 200 personnel shall be deployed during peak construction phase. Since the government of India under The Swachh India campaign (The Swachh Bharat Abhiyan) is actively implementing and funding a program to desist open defecation in villages and in the said project site no open defecation take place, provision of separate toilets for male and female workers (if any) in the ratio of 1:15 and 1:10 (toilet to workers) respectively shall be made in order to maintain hygienic and clean surroundings. Washing and bathing areas in labour camp needs to be provided with proper drainage system so that wastewater is not accumulated in the sites. Low lying areas prone to accumulation of water should be sprayed with mosquito repellents on regular basis to prevent health hazards to workers and community. Disposal of sewage is being made through a septic tank – soak pit arrangement.

Waste/used oil generated from generators and construction machinery and equipment will be stored on paved surface in a secure location at the project site. Appropriate secondary containment capable of containing the 110 percent of the largest tank to be provided. The waste oil, which is characterized as hazardous according to Hazardous & Other Waste (Management and Transboundary Movement) Rules, 2019, will be sold to KSPCB approved vendors at frequent intervals. Empty paint containers will also be stored at a secured area designated for scrap and sold to authorized vendors. All packaging material will also be collected at the storage area and sold to CPCB/KSPCB authorized scrap dealers.

Construction debris and excavated material will be stored in a confined area to prevent spread by wind or water. The construction debris will be used for backfilling of excavated areas and for foundation works at site and excess soil will be given to the local villagers for filling up of low-lying areas in the vicinity.

A waste inventory of various waste generated will be prepared and periodically updated. The scrap metal waste generated from erection of structures and related construction activities will be collected and stored separately in a stack yard and sold to local recyclers.

Significance of Impact

The impact due to waste disposal will have medium intensity with a local spread for a short duration which will result in an overall minor impact without mitigation. However, with proper implementation of suggested mitigation measures the overall impact will be negligible and insignificant.

Table 6-9: Impact Significance- Waste Generation, Storage and Disposal

Impact	Impact on soil due to waste generation				
Impact Type	Direct	Indirect	Induced		
Impact Duration	Short-term		Medium	Long Term	
Spread	Local	Medium	High		
Impact Scale	Limited to project area				
Frequency	Construction Phase				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/ Receptor Senstivity/ Intensity	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Minor**				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **negligible**				

6.3.6 WATER RESOURCES AND QUALITY

Impact

During the construction stage, the construction water requirement is estimated at 25 – 30 KLD per WTG. In addition, for the labourers engaged during construction, for whom the domestic water requirement will be 9 - 10 KLD. The cumulative water requirement during construction period is estimated at 40 KLD.

Water will also be required for construction activities, domestic purposes and some drinking water for labourers and Project teams. For construction it is anticipated that 170 L of water would be needed for each m^3 of concrete. As the Project anticipates 180 m^3 concrete for the site, a total of 30,600 L of water per foundation would be required for construction activities. This water is being sources through tankers provided by neighbouring villagers.

At the peak of construction, approximately 200 people would be anticipated in the site at any given point mostly local manpower. Assuming an average of 4L of water per person, a total

of 800 KLD of drinking water would be required at the maximum. Drinking water would also be sourced from nearby villages. Further, there is a borewell in PSS Phase I used for meeting domestic water requirement.

The water requirement for the construction phase shall be met through tankers from neigbouring areas in Davanagere, Bellary, and Chitradurga. The impacts of proposed project on water resources are as follows:

- Decreased water availability from the water resources of the area due to consumption of water for carrying out project activities; and
- Affecting groundwater water quality due to wastewater discharge in the adjoining land and soil and spills/leaks from project activities and from Labour Camp (if any)
- Runoff of wastewater from bathing area in adjoining land parcels at labour Camp and from Canteen at project site and Labour Camp (if any)

Construction at the site could lead to increased erosion by concentrating water flows. Removal of the vegetation cover as well as increasing run-off from the site will reduce the rate of infiltration and groundwater recharge. The construction at site can alter the natural drainage pattern of the area at micro level. There is potential of contamination of low lying areas due to sediment runoff from construction activities.

The stagnant pools of water during construction activities and accumulation of water near bathing areas at Labour Camp (if any) may lead to increase in breeding of mosquitoes and generally create insanitary conditions. The main pollutants are organic components and microorganisms with the potential to cause contamination of water quality.

Mitigation

It is to be ensured that pre-treatment is provided to ground water if it will be utilized for drinking purpose. It is also suggested that the quality of water to be monitored regularly to check the contamination levels. The water quality monitoring for potable water needs to carried out on quarterly basis.

The approval from Gram Panchayat is required in case water will be obtained from water tankers drawn from villages having authorized borewells. NOC needs to be obtained from Karnataka Ground Water Authority for abstraction of water from borewell at PSS Phase-I and water meter needs to be installed for monitoring water consumption.

The natural slope of the site will be maintained to the extent possible in order to avoid any change in the drainage pattern. Adequate arrangement for storm water management during construction period will be made to avoid sediment runoff from the site. Storm water flow will

be directed to the existing channels with silt traps to avoid sedimentation of the channels or the receiving water body.

The waste water will should be arrested before discharge, to prevent solids build up in the existing drains. Proper drainage needs to be provided near Canteen at project site and labour camp and near bathing areas at Labour Camp, if any to avoid deterioration of groundwater quality and runoff in adjoining land parcels.

Significance of Impact

The impact on water resources will have medium intensity with a medium spread for a short duration which will result in an overall moderate impact without mitigation and minor impact with adoption of mitigation measures.

Table 6-10: Impact Significance - Water Resources

Impact	Water resource availability				
Impact Type	Direct	Indirect	Induced		
Impact Duration	Short-term		Medium	Long Term	
Spread	Local	Medium	High		
Impact Scale	Limited to project area				
Frequency	Construction Phase				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/ Receptor Senstivity/ Intensity	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Moderate**				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Minor**				

6.3.7 ECOLOGY

IFC Performance Standard 6 recognizes that protecting and conserving biodiversity—the variety of life in all its forms, including genetic, species and ecosystem diversity—and its ability to change and evolve. This Performance Standard reflects the objectives of the Convention on Biological Diversity to conserve biological diversity and promote use of renewable natural resources in a sustainable manner.

Impact

The impacts from the construction phase on the local ecology have been assessed with respect to the following activities:

- Clearance of vegetation for construction activities:
  - Removal of mature trees from agricultural habitat due to access road widening, internal road construction, WTG foundation and ancillary facilities,
  - Loss of connectivity of habitat,
  - Removal of scrub vegetation from boundaries of agricultural land and in open scrubland; and

- Impacts of construction activities on resident fauna:
  - Loss of habitat for burrowing species,
  - Effect of sedimentation and contamination in soil layers and surface water bodies,
  - Noise related impacts on sensitive species,
  - Increased vehicular and anthropogenic movement that increases
  - Road kills and human-wildlife conflicts.

- Laying of transmission line for the project:
  - Removal of grasslands while overlaying transmission line
  - Impact on nesting and breeding grounds of avifauna

Impacts on Flora

Clearance of herbs and grasses shall be done during the construction period however the clearance of vegetation will be restricted to the project site. The vegetation cover near WTG locations occupied by grasses, shrubs and herbs were observed to be mostly seasonal and the level of impact generated from removal of this seasonal understorey (vegetation cover) can be termed as negligible as the species are very common and have least conservation value.

Impacts on Fauna

Construction and associated activity like movement of vehicle will be temporary in nature. Most of the small mammalian species, birds and reptiles those were either sighted directly during primary survey or through secondary sources are very common and found all over the region. Temporarily, they may abandon the project activity area during the construction

period and migrate to nearby areas. Thus the impact on fauna of the area is considered to be minor.

The project area is not a designated site of national and international importance for biodiversity therefore the impact on disturbance to fauna of the area is of minor significance. However; the construction activities might have a probable impact leading to habitat disturbance of terrestrial fauna as SG JA-73 and SG JA-78 fall within the ESZ area of Rangayyanadurga Four Horned Antelope Wildlife Sanctuary.

Two roosting site of Indian Flying Fox Bat were identified. Apart from these, no other bat roosting sites could be found in the area during the study period. None of the bat species observed during the surveys falls under Schedule I category species as per Indian, Wildlife Protection Act or IUCN species of conservation category “Critically endangered”, “Endangered” species. However, bat roosting trees were also identified near the Kanamadagu village (Nearest WTG SGJA-47) and Muddapura village (Nearest WTG SGJA-114).

Impacts on Birds

The overall impacts on the birds can be classified as:

- Individual flight pattern
- Population status
- Feeding and foraging habitats
- Local and seasonal migration
- Impact of birds due to project activities under construction and operation phases
- Electrocution of birds due to power lines

Majority of the birds reported from the core and buffer area belong to the Schedule-IV of Wildlife Protection Act 1972 (WPA 1972). There are no direct or indirect impacts envisaged from the wind project on this species. The wind farms are not known to affect birds particularly when they are not placed in important bird breeding or nesting areas, bird sanctuaries or large wetlands known to harbour large populations of birds.

As per the primary survey there are no migratory birds listed under rare, endangered category within the 15 km radius of the project site. However; the construction activities might have a probable impact leading to habitat disturbance of avifauna as peacock corridor is located at a distance of 1.63 km in NE direction from SGJA 06; 1.57 km in NNE direction

from SG JA-07; 1.28 km in SW direction from SG JA-70 and at a distance of 4.68 km in SW direction from PSS Phase I.

Impacts on Migratory Birds

The project area does not fall in important bird area (IBA) and route of migratory birds. Two migratory species were observed during primary survey; Common Kestrel and Common Stonechat. This species are very common, have least conservation value and widely distributed in India. Therefore, impacts of construction of wind farm and transmission line on migratory birds would be minimal.

Impacts on Protected Areas, Forests and Habitat

The noise generating activities during construction phase might lead to habitat disturbance of fauna particularly near SG JA-73 and SG JA-78 as Rangayyanadurga Four Horned Antelope Wildlife Sanctuary boundary is located at 1.4 km from WTG SGJA-73 and SG JA-78. Further, these two WTG's fall within the ESZ area of Rangayyanadurga Four Horned Antelope Wildlife Sanctuary. This sanctuary consists of common flora and fauna. Therefore, the impacts of project activities on them would be negligible. These impacts could be in terms of temporary disturbance, and dusting due to traffic movement etc.

Eco Sensitive Zone declared around Rangayyanadurga Four Horned Antelope Wildlife Sanctuary vide Notification (enclosed in **Annexure VII**) of Ministry of Environment and Forest, Government of India dated 07.06.2017 notification, prohibited, controlled and permitted activities are listed wherein Sr. No. 16 "Erection of Electric Cables" is listed under controlled category and on Sr. No. 35 "Use of renewable energy source" is listed under permitted category.

Impacts on Water bodies

Chinna Hagari River (2.4 km) and Jagalur Lake (4.1 km) are located near proposed turbine SGJA-25 and SGJA-77. Wind turbine locations need to maintain safe distances from water bodies. Therefore, as such the water bodies are less likely to be affected by the wind turbine installation. However, the construction of access roads or transportation may cause temporary disturbance to the wetlands during the construction phase only. Such impacts are temporary in nature and could be nullified by taking proper care during the transportation of materials to the project locations.

Mitigation Measures

- The wind turbine blades shall be made visible to birds by painting their tips with orange or red colour as per international standard measure to isolate from the sky and mitigates risk of bird collisions.
- Construction work and anthropogenic movement should be restricted in proximity of water bodies and forest areas near WTG locations and transmission line to reduce the impact on flora and fauna.
- During construction of SGJA-78 and SGJA-73 WTG in order to minimize impacts on Rangayyanadurga Four Horned Antelope Wildlife Sanctuary the project staff shall be instructed to take care so that they do not blow horns, do not park their vehicles inside the Eco Sensitive Zone of Rangayyanadurga Four Horned Antelope Wildlife Sanctuary and shall not disturb any flora and fauna etc.
- NOC from Forest and Wildlife Department is required to be obtained for laying WTG's and associated facilities for the project due to presence of WTGs SGJA-78 & SGJA-73 within the ESZ boundary of the Rangayyanadurga Four Horned Antelope Wildlife Sanctuary.
- Construction work and anthropogenic movement should be restricted at Indian Peafowl corridor at a distance of 1.63 km in NE direction from SGJA 06; 1.57 km in NNE direction from SG JA-07; 1.28 km in SW direction from SG JA-70
- Bat roosting trees identified near the Kanamadagu village (Nearest WTG SGJA-47) and Muddapura village (Nearest WTG SGJA-114) should not be felled down and avoiding laying internal roads near the roosing habitats should be ensured.
- The construction activities should not be done during dawn and desk. Further, it shoukd be ensured that construction activities are limited to day-time and no construction works are carried out at night
- No hunting, trapping or injuring of local fauna should be communicated to labourers through a workshop or formal training exercise. The training should also communicate presence of species protected under Wildlife Protection Act, 1972 Schedule I and penalties associated with contravention on the identifies law.
- Tree cutting will be limited to those directly affecting the WTGs placement.
- Workforce to be instructed to avoid any other activity likely to affect the local flora & fauna.
- The construction activities will not be carried out in night. The use of artificial lighting at night shall also not be carried out to avoid impacts if any on fauna due to illumination
- Transportation should be avoided during peak ecological activity i.e. dawn (5:30 am to 7:30 am) and dusk (5:00 pm to 7:00 pm). Night time activities should be kept to a minimum.
- Transportation to be undertaken along identified paths

- Limiting construction activities within the wind farm site;
- Existing roads to be utilized for access to the project site therefore clearance of vegetation limited for road construction;
- Store the natural soil at special sites and reuse it when back-fill activities are needed;
- Shift natural vegetation and nutrient rich soil of the construction sites to nearby areas.
- Replant natural vegetation and transfer rich soil of the construction sites to nearby areas
- No blasting should be carried out within 1 km from the boundary of protected area during the work.
- There should be no high mast / beam / search lights high sounds within 1 km from the boundary of protected area
- Construction activities and Excavated areas should be adequately fenced and security should be deployed to prevent wildlife intrusion into these areas.
- Waste that is generated from the wind farm and transmission line during construction and operation should be stored in covered containers within the site premises. Uncovered waste may attract fauna to the wind farm and transmission line.
- Hazardous materials and waste should not be stored any drainage channels or cliff-sides to prevent contamination of the surrounding environment and impact on local flora/fauna.
- Noise control measures such as acoustic enclosures for DG sets, noise attenuation barriers in areas near sensitive habitat and proper maintenance of the vehicle used for the project site should be implemented to reduce the effect of construction noise on local ecology.
- Existing roads should be utilized for access to the project site therefore clearance of vegetation should be limited for road construction.
- Replanting natural vegetation and transfer rich soil of the construction sites to nearby areas
- All out door electrical equipments should be kept in compact sub-station (which is a cubical, metal box, consisting of CT, PT, VCB and meter) which can reduce chances of electric shock to wildlife which can accidently enter fenced yard.

Work should be under ISO14001 accreditation for environmental management which also be imposed on all the subcontractors; and Cover each spot where excavated material is stored when climate conditions requires to effect dust control by usage of dust suppression substances.

Significance of Impact

The impact on fauna and flora will have medium intensity with a medium spread for a short duration which will result in an overall minor impact without mitigation. However, with proper implementation of suggested mitigation the impact will be reduced to minor.

Table 6-11: Impact Significance – Ecology

Impact	Impact on Ecology				
Impact Type	Direct	Indirect	Induced		
Impact Duration	Short-term		Medium	Long Term	
Spread	Local	Medium	High		
Impact Scale	Limited to study area				
Frequency	Construction Phase				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/ Receptor Senstivity/ Intensity	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Minor**				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Minor**				

6.3.8 TRAFFIC AND TRANSPORT

Impact

The construction phase shall involve transportation of construction materials like the components of, Wind Turbines. The site (Phase I) is accessible from the PWD and village road which connects to Solapur-Mangalore National Highway (NH-50) at 280 m from WTG SGJA 33. However, the proposed project site (Phase II) is connected to Jagalur Taluka via State Highway (SH-65) which further connects to SH-50 located at 9 km in the South-East direction. The wind site can be approached by black top PWD road that on north and south side for both Phase I & Phase II. This road in turn leads to the individual WTGs with many kuccha village roads.

The project construction activities will lead to additional traffic and increased risk of traffic related accidents and injuries to local on activities community and to workers. The increase in traffic due to the project is however going to be marginal. The traffic density along the approach road is low and the additional traffic due to the construction activities will not have any significant impact on the traffic density. At few WTG locations, the access road is kaccha

which may lead to rough movement of transport vehicles during construction phase. However, all the approach road will be made paved for the smooth movement of transport vehicles. The strength of the road has been designed to carry the cranes and heavy trailers. At each tower location the surface shall be levelled and compacted for heavy equipment handling and assembly.

Mitigation

OKPPL will need to develop access road to individual WTGs from the available village road. In case village road is used for the transportation of construction material it should be continuously repaired in case the road is damaged.

For minimising the impacts due to the increased traffic, it is recommended that only trained drivers are recruited. The EPC Contractor should conduct training programs for all the drivers for raising awareness about road safety and adopting best transport and traffic safety procedures once in every six months. OKPPL should also organize eye checkups for all the drivers on a yearly basis. All the kaccha access road to the site should be made paved, widened and strengthened for heavy movement of trailers and cranes.

Mitigation measures such as emphasizing on safety amongst drivers, adopting limits for trip duration and arranging driver roster to avoid overtiredness and avoiding dangerous routes and times of day to reduce risk of accident shall also be implemented. Regular maintenance of vehicles and use of manufacturer approved parts should be adopted to minimize potentially serious accidents caused by equipment malfunction or premature failure.

The traffic management plan needs to be properly implemented to avoid impacts on community safety and security. The speed limit should not excced 20 km/hr and 10 km/hr in proximity of settlements and habitation in villages. The community should be well informed prior to movement of construction machinery, transportation of turbines. Also the village road should be continually repaired if damaged due to project activity.

The records of vehicles viz. PUC, registration certificate, driving license and fitness certificate needs to be maintained at site.

Significance of Impact

The impact due to traffic and transport will have medium intensity with a medium spread for a short duration which will result in an overall moderate impact without mitigation. However, with proper implementation of suggested mitigation the impact will be reduced to minor.

Table 6-12: Impact Significance: Traffic and Transport

Impact	Impact on traffic density				
Impact Type	Direct	Indirect	Induced		
Impact Duration	Short-term		Medium	Long Term	
Spread	Local	Medium	High		
Impact Scale	Limited to study area				
Frequency	Construction Phase				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/ Receptor Senstivity/ Intensity	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Moderate**				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Minor**				

6.3.9 ATMOSPHERIC EMISSIONS

Impacts

Construction activities will lead to generation of dust due to excavation works for foundations, mixing of construction materials in batching plant, contact of construction machinery with bare soil, and exposure of bare soil and soil piles to wind.

A secondary source of emissions includes exhaust from diesel generator sets. Other sources of atmospheric emissions during construction phase will include emissions from diesel engines of earth moving equipment, as well as from open burning of solid waste on-site. The increase in traffic volumes during the construction will also generate dust. Improper storage of soil and construction material can also increase dust emission from the site. Use of kaccha access road for the transport during construction phase will also lead to high dust emissions. These dust emissions will have impact on flora and fauna present within visual radius of the site. Also, at few WTG locations, residential areas are located within visual radius, so emissions will have health impact on community and will contaminate the waterbodies as well.

Mitigation

Contractor shall ensure reduction and control of air emissions from construction activities by minimising dust from material handling sources. Sprinkling of water is being carried out to suppress dust from construction, stock piles and transport movement.

OKPPL shall ensure that all stock piles are covered and storage areas provided with enclosures to minimise dust from open area source. Stock piling and storage of construction material will be oriented after considering the prominent wind direction. During construction, temporary barricading should be provided around the construction site to restrict the emissions. Also, temporary greenbelt which are dust absorbents should be proposed at the site to minimize the dust emissions. All the kaccha access road will be made paved prior construction for smooth movement of vehicles which lead to less gaseous and dust emissions around the site.

The scale of construction being small will require only a limited number of construction machinery and for limited duration, therefore emissions from heavy machinery are considered to be insignificant. Open burning of solid waste or packaging material will be strictly prohibited, and all such activity will be permitted at site. The construction activities are also going to occur for a small period of time (~ 7 months). The impact magnitude has been categorized as small because the soil type is largely coarse sand and the dust emissions will only occur for a limited period of time.

Operation of DG sets will be limited and timely maintenance of the units shall be undertaken to prevent unwanted emissions. Vehicles engaged for the project will be required to obtain “Pollution Under Control” certificates.

Significance of Impact

The impact on ambient air quality will have a local spread, medium intensity and will last for a short duration primarily limited to construction related activities which will result in an overall minor impact without mitigation. There will be some impacts due to plying of vehicles on remote village roads and due to the proximity of the proposed WTG locations to villages. The impacts however, are not anticipated to be significant. Proper implementation of suggested mitigation measures will reduce the impact to negligible and insignificant.

Table 6-13: Impact Significance - Ambient Air Quality

Impact	Impact on soil due to waste generation				
Impact Type	Direct	Indirect	Induced		
Impact Duration	Short-term		Medium	Long Term	
Spread	Local	Medium	High		
Impact Scale	Project area and vicinity				
Frequency	Construction Phase				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/ Receptor Senstivity/ Intensity	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	

	Significance of impact is considered **Minor**				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Negligible**				

6.3.10 NOISE AND VIBRATION

Impacts

Noise and vibration will be caused by the operation of earth moving and excavation equipment, concrete mixers, cranes and the transportation of equipment, materials and people. There is potential for disturbance to habitations in proximity of construction site. Movement of traffic during night hours can also disturb the local community. The site where at present access road is kaccha, noise and vibration of movement vehicles will be more due to rough path. All the villages are located atleast 400 m away from the proposed WTG structure, therefore the receptor sensitivity of the project will be low and the magnitude of impact will be minor.

Mitigation

Most of the construction activities involving excavation and foundation for Wind Turbine will be done manually and therefore will have limited noise. Mobile noise sources such as cranes, earth moving equipment and HGVs shall be routed in such a way that there is minimum disturbance to receptors. Contractor shall be instructed to arrange for inherently quiet construction equipments and machines to maintain the noise level to minimum. Only limited construction activities shall be carried out during night-time. Construction activity generates noise level in the range of 90-92 dB(A) which reduces to 45dB(A) at a distance of 80 m from the source which is the limit of noise level presecribed for the night time. The nearest habitation is located at a distance of over 323 to 500 m. It is observed that few existing WTGs of Enercon projects are located within close proximity of the proposed WTGs of SECI VI project. So, during construction phase, beside the noise of construction activities, existing WTGs present within visible radius will also contribute to further increase in noise decibel. As per the baseline monitoring, the average noise decibel of the study area is ranged from 48.1 dB to 56.3 dB during day time and 38.8 dB to 47 dB during night time. Therefore, considering the average baseline noise decibel the incremental noise in the area will be 92 dB.

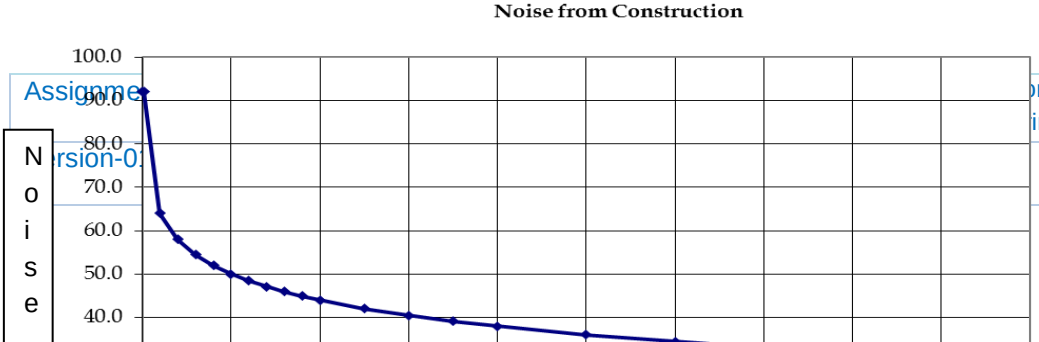


Figure 6-1:Noise Attenuation with Distance

As per Figure 6.2, at a distance of 350 m to 500 m, the noise level is reduced to 30 to 35 dB, therefore all the habitation in this range will not be impacted due to noise.
However, all loud and sudden noises will be avoided wherever possible and fixed noise sources to be located at least 50m away from the site boundary. Rubber padding/noise isolators will be used for equipment/machinery used for construction. Temporary noise barriers shall be provided surrounding the high noise generating construction equipments. The personnel involved in high noise generating activities shall be provided with personal protective devices to minimise their exposure to high noise levels. Construction vehicles and machinery will be well maintained and not kept idling when not in use. All the kaccha access road to the site will be made paved for the smooth movement of vehicles which will minimize the noise and vibration in the area.

Significance of Impact

The impact due to noise and vibration will have low intensity with a local spread for a short duration which will result in an overall minor impact without mitigation. However, with proper implementation of suggested mitigation the impact will be reduced to minor.

Table 6-14: Impact Significance - Noise and Vibration

Impact	Ambient Noise level			
Impact Type	Direct	Indirect	Induced	
Impact Duration	Short-term		Medium	Long Term
Spread	Local	Medium	High	
Impact Scale	Project area and vicinity			

Frequency	Construction Phase				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/ Receptor Senstivity/ Intensity	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Minor**				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Minor**				

6.3.11 HEALTH AND SAFETY HAZARDS

Impacts

During construction works, physical injury can result due to road accidents, construction accidents and other occupational hazards. Overexertion and ergonomic injuries and illness are potentially the most common health hazards associated with construction activities. Further there is potential for slips and fall on the same elevation associated with poor housekeeping, such as excessive waste debris, loose construction material, liquid spills and uncontrolled use of electrical cords and ropes on ground, which results in injuries and time loss during construction. Presently, due to ongoing COVID-19 pandemic situations, possibility of COVID cases may occur at the site during construction work.

Hazards associated with fall of construction material or tools, as well as collapse of constructed slabs, walls, roofs etc. can result in injury to head, eyes and extremities. Transportation and movement of vehicles are associated with road accidents and related hazards, which can lead to injuries and fatalities. The impact significance on occupational health and safety is therefore assessed as moderate.

The most frequent risks cause of accidental death and injury are:

Safety Risks:

1. Tripping due to uneven surfaces, obstacles, trailing cables;
2. Falling during working at height due to fall from fragile surfaces, roof edges and ladders;
3. Fire due to hot works, smoking, failure in electrical installations;
4. Mobile plant and vehicles; and
5. Electrical shocks

6. Blade throws from existing WTGs of Enercon in proximity of WTGs proposed at phase I and internal transmission lines

Health Risks

1. ***Manual handling and musculoskeletal disorders***: typical construction activities that can cause injury such as lifting, lowering, pushing, pulling and carrying;
2. ***Hand-arm vibration***: people work with hand-held or hand-guided power-tools and machines, such as: concrete breakers, pokers and compactors, sanders, grinders and disc cutters, hammer drills, chipping hammers, chainsaws, scrabbles and needle guns;
3. Temporary or permanent hearing loss which usually comes from noise generated from machinery used for excavation or piling work and from compressors and concrete mixers etc.;
4. Heat stress and working during high temperatures

Mitigation

The Contractor needs to adhere to Occupational Health and Safety (OHS) procedures for the construction works at site. It has further formulated an Emergency Preparedness and Response Procedure and an On-Site Emergency Procedure. The On-Site emergency procedure provides details of the anticipated emergencies, the emergency organisation, facilities, emergency procedures and roles and responsibilities. Contractor shall ensure that adequate training is provided to staff about raising awareness about use of PPEs and emergency response measures.

OKPPL shall introduce administrative controls into work processes such as job rotation, rest and stretch breaks etc to reduce overexertion. Work site layout will be well planned to avoid manual transfer of heavy loads. Contractor shall ensure good housekeeping at the construction site to avoid slips and falls. Excessive waste debris and liquid spills will be cleaned up regularly, while electrical cords and ropes will be placed along identified corridors marked for attention of everyone at site. Use of personal fall arrest system, such as full body harnesses as well as fall rescue procedures to deal with workers whose fall has been successfully arrested.

Dropping/lowering of construction material or tool will be restricted and undertaken only under strict supervision, if required. Personal Protection Equipment (PPE) such as safety glasses with side shields, face shields, hard hats and safety shoes shall be mandatory at construction site. Ear plugs shall be provided for workers placed at high noise areas. Structural integrity should be checked before undertaking any work. An up to date first aid box should be provided at all construction sites and a trained person should be appointed to manage it.

A Job Hazard Analysis (JHA) has been maintained at Site comprising of risks/job hazards along with its severity, probability, control measures and preventive action measures. It is advised that Safety Audits need to be carried out by Safety personnel in order to verify the adherence of safety norms followed atr Site. Further, safety warnings and signages need to be pasted at locations with ongoing construction activities in English and Kannad (local) language.

A safety or emergency management plan should be in place to account for natural disasters, accidents, and any emergency situations. The nearest hospital, ambulance, fire station and police station should be identified in the implemented emergency management plan. Security should be deputed at potential accident sites to restrict entry and prevent near miss or fatal incidents;

The construction work will be carried out in adherence w.r.t. COVID mitigation strategies suggested by the State labor department guidelines, Karnataka State for the migrant workers and for construction workers. OKPPL is further required to ensure maintaining HSE documentation for all workforce engaged at Site along with COVID-19 Precaution training records at Site.

OKPPL shall ensure availability of an Ambulance and two (2 nos.) of Paramedical Staff round the clock for handling emergency situations. Further, it is advised that health monitoring records for all workers engaged at Site at the time of induction needs to be maintained

Significance of Impact

The health and safety impacts will have high intensity with a local spread for a short duration which will result in an overall moderate impact without mitigation. However, with proper implementation of suggested mitigation the intensity can be reduced to low and the overall impact will be minor.

Table 6-15: Impact Significance - Health and safety

Impact	Health & Safety in windfarm construction			
Impact Type	Direct	Indirect	Induced	
Impact Duration	Short-term		Medium	Long Term
Spread	Local	Medium	High	
Impact Scale	The project will employ local workers primarily on a contractual basis, including semi-skilled and unskilled workers. Skilled workers may be migratory workers as and when needed by contractors			

Frequency	Construction Phase				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/ Receptor Senstivity/ Intensity	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Moderate**				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Minor**				

6.3.12 SOCIO-ECONOMIC IMPACTS

The project is expected to have potential socio-economic impacts on the community and the surrounding areas. Such impacts have been identified and assessed in this section:

Impacts due to Land Acquisition

A total of 548 acres of land in Jagalur, Kudligi & Chitradurga Taulka will be acquired for setting up of the project. The land acquired for the project comprises of rainfed agricultural land with limited agriculture activity due to scarity of water.

Approx. 280 acres of private land on Willing Buyer-Willing Seller transactions has been acquired for the project till date. However, since land acquisition is in progress for Wind Power project and remaining 268 acres of land are yet to be acquired for the project therefore OKPPL should ensure adherence w.r.t. Willing Buyer-Willing Sellor approach adopted in the project and avoidance of Physical and Economic displacement issues, if any.

The land for the wind project is being purchased on willing buyer-willing seller (WBWS) mode following the the guidance based on IFC PSs:

- Land markets or other opportunities for the productive investment of the sales income exist;
- The transaction took place with the seller's informed consent; and
- The seller was provided with fair compensation which was higher than prevailing market values

Further, the acquisition of private land is being carried out on "Willing Buyer-Willing Seller basis". The rate for 280 acres' land parcel have been finalized with the mutually agreed sale price. It was observed that the rates provided for the land taken is more than twice the prevailing market rates in the project area.

3 nos. of land parcel have been acquired from Schedule tribes community from Kanamadagu (Alur) Village till date. The ST land parcels were acquired from the same family headed by Deputy Sarpanch who also has provided land for the project. However, no assigned land was acquired till date for the project. During stakeholder consultations, it was inferred that land sellers have alternative land parcels apart from land provided for the project and were observed to be contented.

The project site is rainfed agricultural land with red soil. No physical displacement has been taken place in the transaction. Further, no issues related to landlessness were observed and PAPs have additional land parcels which is presently used for cultivation and henceforth have sold rainfed agricultural land parcels for repaying loans and buying cultivated land parcels in nearby areas.

OKPPL has also followed the norms:
(i) seller's informed consent; and
(ii) the seller was provided with fair compensation based on prevailing market values.

In addition following criterias were ascertained during selection and purchase of land for wind power project that:

- No revenue land, Gauchar land (common land for grazing), reserved forest land has been acquired.
- No landlessness due to the proposed project.
- No land owner took land for land or cash.
- Land markets or other opportunities for the productive investment of the sales income exist and on basis of discussions with land sellors; it was inferred that the land sellors will utilize amount received from selling off unirrigated land parcels given for the Project to OKPPL for purchase of agricultural land in the nearby áreas and for adoption of mechanized agricultural practices
- The transaction is in process with the seller's informed consent; and
- The seller shall be provided with fair compensation based on prevailing market values
- All land acquired is private land. Since the land proposed for the project does not belong to any government agency or villages sarpanch, VAO/patwari/revenue department, land registry office, therefore no farm laborers, cattle grazers etc. who might be dependent on such land will be affected due to project related activities.

The land sellers have rainfed agricultural land other than the land being sold to OKPPL which shall remain available for livelihood after the execution of Sale deed for respective land

parcels. OKPPL needs to ensure that no issues related to landlessness should come up during acquisition of the remaining land parcels for the project.

There is no direct physical displacement as a result of land disbursement; however, economic displacement will be a significant negative impact owing to local's primary occupation (agricultural labourers).

The father or son belonging to families of land sellers shall be provided with jobs in Security services. Further, jobs shall be given to them during Operation and Maintenance Phase as a part of livelihood restoration initiatives.

Mitigation

The land sellers would receive payments more than prevailing market rate in the area as a negotiated settlement will offer adequate and fair price for land and/or other assets.

There has been no loss of livelihood for the project affected households as the land was totally dependent on rainfall. With the payment received, the land sellers will have more purchasing power in hand to start up a new entrepreneurship venture of their own or invest in the purchase of land in some other area within the district.

Considering the economic status and the equality with relevance to the local community within the village and in consultations with PAPs from ST community, it was observed that the tribals in the area are having access to land and livelihood opportunities at par with other locals in the area. However, it is recommended to provide employment opportunities to the PAPs who belongs to ST community on priority basis and also consider their needs and basisc requirements as a part of their improvement plan. The other mitigation measures to be adopted by OKPPL are as follows:

- Stakeholder engagement needs to be carried out and community consultations should be ensured prior to land acquisition and records need to be maintained
- Proper fencing and adequate lightning arrangements needs to be provided for community safety and security.
- Although the community expressed satisfaction over the compensation of land and functioning of the project there is a need for implementation of Grievance Redressal Mechanism for addressing their concerns associated with the project, if any
- The land acquisition for ST land parcels should be avoided and alternative locations should be considered for procurement

- In case ST land acquisition is the last option and is being carried out for remaining land parces to be acquired; a separate consultation with ST community should be carried out in presence of Sarpanch
- NOC from Gram Panchayat and separately from ST community needs to be obtained
- In case of land being acquired from members of the Scheduled Tribes, at least one-third of the compensation amount due shall be paid to the affected families at the outset as first installment and the rest shall precede the taking over of the possession of the land
- Additional compensation should be paid to PAP's from ST community
- Employment opportunities should further be provided to locals including members of ST community from whom land has been acquired

Land for transmission line

Reportedly, there is no requirement for acquiring land for the transmission line. The RoW permission will be required for transmission line connectivity to the 400/220 kV grid substation at Hiriyur taluka, Chitradurga district. The adequate compensation shall be paid as per Ministry of Power "Guidelines for payment of Compensation towards damages in regard to Right of Way for Transmission Lines". As per this guidelines, Compensation towards diminution of land value in the width of Right of Way (RoW) Corridor due to laying of transmission line and imposing certain restriction would be decided by the States as per categorization/type of land in different places of States, subject to a maximum of 15% of land value as determined based on Circle rate / Guideline value / Stamp Act rates.

The approach route identified for the transmission line is based on a criterion to reduce the environmental and socioeconomic footprint of the transmission line. The shortest feasible route after considering following factors has been selected for the transmission line:

- Transmission line route does not fall under any habitations and thick vegetation
- No households or community structures are in the route of the transmission line
- All environmentally sensitive sites, archaeologically significant sites, areas of ecological and cultural significance have been avoided while selecting the route

A relatively small area of 6mx6m will be acquired by paying a one-time compensation to the land owner (which includes the compensation for crops in the Right of Way).

Access to Common Property Resources

The land procured for the project does not interfere with Gauchar.

Increased Community Expectations

The project area is predominantly rural. The advent of the project has created several expectations among the local community which centres on employment opportunities and improvement of infrastructure facilities.

The consultation undertaken with the community indicates that the community expects:

- Jobs for local villagers in the construction and operation phases of the project,
- business for local contractors and traders
- improvement of power situation in the area

Mitigation

OKPPL is envisaged to engage local villagers as labour in the project construction activities. The employment opportunities can be long term and extended for the operation phase of the project as well. OKPPL can simultaneously take up CSR activities in the project area through livelihood improvement schemes and training programs that will improve the skills of the local population and increase their employability or make them self employed.

Influx of Migrant Workers

The construction phase of the project is likely to last for around 6 - 9 months. Peak construction period is likely to last for 3 months wherein ~200 construction workers will be deployed while during normal construction activity 100 workers will be deployed. It is estimated that most of the workers to be deployed will be unskilled and will be solely from the nearby village. However, migrant skilled workers from other nearby cities and neigbourinmg states will also be involved in the project. The skilled workers from OKPPL and other EPC consultants will be staying in guesthouse accommodation in Jagalur.

There is no labour camp at the project site presently. The influx of workers in short to medium term is likely to have the following risks:

- Pressure on key local infrastructure such as water, healthcare, electricity;
- Spread of communicable diseases;
- Lack of hygiene and adequate sanitation facilities would create health ailments related to food poisoning or diseases like malaria, viral fever which could spread within the local community;
- Conflict amongst workers, and between workers and local community, based on cultural, religious or behavioural practices;
- Discontent amongst local community on engagement of outsiders.

In spite of the risks from influx of workers, there are also positive effects which are likely to benefit the local community in the immediate vicinity of the project area.

Short term business opportunities targeted to the construction labours. Local businesses such as shops are likely to benefit from their proximity to workers;

There could be enhancement of local skills set through interaction of local unskilled or semi-skilled labourers with the skilled migrant workers.

Increased Expectations in Construction Phase

Due to lack of industries and income generating opportunities in the project area, the proposed project may create some expectations among the local communities for employment opportunities and improvement of infrastructure facilities. The community also expects to be given priority in any local contracting opportunities.

Mitigation

The labour camp shall be constructed as per IFC Guidelines in case of hiring migrant labour. The contractor, Contractor shall ensure that all basic facilities such as fuel wood, medical facility, water supply, etc is made available to the migrant workers without any cost. The following facilities have been provided in the campsites:

- Accommodation: It shall be ensured that a minimum space of 4-4.5 m^2 is allocated per person.
- Common latrines and bathing facilities duly segregated for male and female labour - Number of toilets and sanitary fittings shall be considered as 1 toilet, 1 urinal and 1 bathroom per 15 male workers. Arrangement for female workers shall be 1 toilet and 1 bathroom per 10 female workers.
- Water supply through borewells and authorized water tankers- Adequate provisions of water with about 150 litre per capita per day shall be made.
- Disposal of sewage through a septic tank – soak pit arrangement.
- Arrangements for collection of garbage in dustbins and disposal through daily collection.
  Supply of fuel wood and LPG cylinders

Contractor shall ensure that there is a detailed briefing on cultural background and behavioural requirement for all the migrant workers, if hired for the project. OKPPL shall undertake medical fitness test of all the workers on regular basis. Information and awareness of communicable diseases, AIDS etc, shall be provided to workers. The area around the labour will be kept clean with daily disposal of water and proper drainage to avoid any water logging to prevent health issues arising from insect and other vectors.

The construction work will be carried out in adherence w.r.t. COVID mitigation strategies suggested by State labor department guidelines, Karnataka State for the migrant workers and for construction workers. OKPPL is further required to ensure maintaining HSE documentation for all workforce engaged at Site along with COVID-19 Precaution training records at Site.

Community Health and Safety

Potential health and safety impacts on the local community may include:

- Construction site health hazards and those related to increase in traffic will render the access road accident prone. Any accident or injury to local community by project vehicle can also lead to major dissent.
- Spread of communicable diseases including sexually transmitted and vector-borne infections due to higher incidences of community interactions in the project vicinity; COVID 19 symptoms.
- Incidences of common health ailments related to poor sanitation and living conditions as well as natural environment conditions such as stagnant water resulting from labour camp leading to diseases like malaria, gastroenteritis and viral fever can increase.

Mitigation

Contractor shall ensure proper training of drivers and planning for transport of construction machinery, material and manpower. The drivers of the project vehicles and those carrying construction materials to site shall be strictly instructed to adhere to the traffic management plan.

- All workers whether local or migrants will be instructed to follow strict code of conduct while at the construction site to avoid any kind of conflict. Security staff engaged at site will be trained and informed about the importance of cordial interaction with the community. Local security personnel shall preferably be engaged at site.
- To the extent possible, labour to be housed in camps, with good living conditions and access to amenities. Outside labour living in the local community should be discouraged;
- Health and safety training of the labour, raising awareness about STDs, and HIV, and maintaining behaviour standards while moving in the community should be a priority;
- OKPPL will ensure maintaining HSE documentation for all workforce engaged at Site along with COVID-19 Precaution training records at Site.

Any complaints or concerns with respect to labour should be addressed without delay. Local administration and police should be aware about the details of outside labourers as also a list should be provided to the Panchayat /block office.

Economic Impacts

The local economy of the area is likely to be impacted from the influx of migrant workers, in case of hiring migrant labour in the following ways:

- Increase in temporary demands of daily use products and services as well as other provisions in the immediate vicinity of the project area;
- Potential income generating opportunities for the locals from local trading opportunities;
- Increase in the local wage rates for non-agricultural labour and also a marginal exchange of skill levels due to community interactions of migrant workers with local laborers.

The local shopkeepers and traders will however face decline in income after completion of construction and dismantling of labour campsite.

Impacts on adjacent land

Site clearing activities, construction of the boundary wall can impact adjacent land due to the use of heavy construction equipment, haphazard storage etc. This has the potential to result in crop loss for any standing crops. However, there is not likelihood of contamination from the same.

The construction phase may also see other people migrating into the area in search of employment opportunities such as service, trading or food providers. These people are likely to encroach upon neighbouring land in the vicinity of the project and such encroachment can become a long-term phenomenon unless actively discouraged.

Mitigation

OKPPL shall ensure that all the project activities are restricted to the existing project site boundary. The use of land outside the boundary for purposes like parking of vehicles, storage of material during construction etc. warrants prior consent of the owner of that land. The project should proactively discourage any encroachment around the project area and involve the local panchayat authorities in the same. Construction of any structures outside the site boundary shall be prohibited.

Significance of Impact

The impact due to influx of migrants will be moderate but after implementation of mitigation measures, the residual impacts will be minor. The impact on community health and safety will be minor and after implementation of mitigation measures, the residual impact significance is anticipated to be negligible.

The impact significance due to reduction of land-holding and loss of agricultural income will be minor as although all the land acquired for the project will be private rainfed agriculture land and therefore income source due to land farming is also restricted to rainy season only, and all the private land will be acquired on willing buyer and seller basis. Also, as 3 land sellers whose land has been acquired for the project belongs to ST category, but during consultation with PAPs it was observed that they are from same family and ST community in the area are having socio-economic status at par with other locals in the area. It is further recommended to provide additional facilities to the PAPs who belongs to ST community by providing employment on priority basis and also consider their needs and basisc requirements as a part of their improvement plan. Therefore, residual impact significance is anticipated to be negligible.

Impact on local employment due to project will be positive due to employment opportunities for locals.

Table 6-16: Impact Significance - Socio-economic

Impact	Community health and safety Economic loss due to selling of land Impact on local employment opportunities during the project life cycle Labour in-migration issues				
Impact Type	Direct	Indirect	Induced		
Impact Duration	Short-term		Medium	Long Term	
Spread	Local	Medium	High		
Impact Scale	Limited to project footprint Locals will mostly have short term employment opportunities during construction phase of the project. However, people in limited numbers, from the neighbouring districts of Davangere, Bellary and Chitradurga and from the bordering regions of Karnataka are likely to be engaged in the project, especially in the highly skilled category of manpower. The required skill-set being not available at the local level, migrant workers, especially in the skilled and highly skilled categories will be employed during the construction phase of the project over a period of 4 to 6 months				
Frequency	Construction Phase				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	The impact magnitude will be positive as people from the locality will definitely be employed, especially during the construction phase of the project. However, the exact figures of local people benefitting from the employment opportunities cannot be estimated.				
Resource/ Receptor Senstivity/ Intensity	Low	Medium	High		
	The land sellers are reported to receive compensation amount higher than the				

	existing market rate. Generation of opportunities for employment will be created for the land sellers. With the remaining landholdings of the landowners being categorized between small and medium, the resource sensitivity is assessed to be low. Receptor Intensity in respect of community health and safety is medium. The receptor intensity due to influx of migrants will be medium as the local community is mostly engaged in agriculture and allied activities. Consequently, most of the local youth do not possess the requisite skills for participating in construction activities. However, abrupt influx of outside population to take advantage of employment opportunities cropping up in their region might create resentment among the local communities.				
Impact Significance	Negligible	Minor	Moderate	Major	
	Impact due to influx of migrants will be **moderate**. Significance of impact is considered **minor** in case Community health and safety & Economic loss due to selling of land but it will be **negligible** in case of local employment oppurtunities				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **minor**				

6.3.13 ARCHAEOLOGICAL, HISTORIC AND CULTURAL ASPECTS

Impact

There are no archaeological and historical sites of importance in proximity to the site and Area of Influence. Further, there are no temples or related cultural activities in and around the site. However; there is potential for cultural differences due to influx of migrant labourers.

Mitigation

OKPPL will ensure that the workforce engaged for construction is hired locally and from the nearby villages. This would reduce any potential for cultural difference amongst the workers. The project proponent will not engage in any kind of bias on basis of religious or cultural differences and shall communicate the same to its subcontractors. Though there are reportedly no cultural or religious site in the project area, cultural/religious practices and sensitivities will be taken into consideration while undertaking activities like extraction of water, informal symbols of worship etc.

In case of any chance find during construction, all work will be stopped, and relevant local offices will be informed about the same.

Significance of Impact

The impact on archaeology, historic or cultural aspect will have medium intensity with a local spread for a short duration which will result in an overall minor impact without mitigation. However, with proper implementation of suggested mitigation the impact will be reduced to insignificant.

Table 6-17: Impact Significance - Archaeology, Historic or Cultural Aspect

Impact	Impact on Archeological monument; cultural practices				
Impact Type	Direct	Indirect	Induced		
Impact Duration	Short-term		Medium	Long Term	
Spread	Local	Medium	High		
Impact Scale	Limited to project footprint				
Frequency	Construction Phase				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/ Receptor Senstivity/ Intensity	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Minor**				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Negligible**				

6.4 IMPACT ASSESSMENT - OPERATION PHASE

6.4.1 SOIL QUALITY

Anticipated Impacts

Compaction of soils from increased levelling and grading of areas within the site will result in lower permeability and therefore decreased infiltration and increased runoff. Once the plant is commissioned there will be limited disturbance to soil, however repair and maintenance of underground cables and associated utilities will lead to generation of hazardous wastes such as used transformer oil. The defunct/damaged WTGs parts will also be generated and storage/disposal on unpaved ground can lead to contamination of soil. Accidental spillage of lubricant, fuel and other chemicals may potentially cause soil degradation.

Mitigation Measures

Disturbance to soil from repair and maintenance activity will be limited and will ensure proper restoration of soil wherever excavation is undertaken. OKPPL shall explore the option of buyback agreements for defunct rotor, blades and for replacement and disposal of transformer oil by the supplier, otherwise will make arrangements for disposal of defunct turbines/blades and waste oil by KSPCB/CPCB authorized recyclers. Fuel and used oil will be stored in demarcated storage areas with adequate secondary containment and appropriate capacity. Spill control and prevention mechanism will be developed, and all the staff will be trained.

Significance

The impact on soil will be of medium intensity, local spread and will be for a short duration (of activity) which will result in an overall minor impact without mitigation and insignificant impact with implementation of mitigation measures.

Table 6-18: Impact Significance – Soil Quality

Impact	Soil Erosion and Compaction				
Impact Type	Direct	Indirect	Induced		
Impact Duration	Short-term		Medium	Long Term	
Spread	Local	Medium	High		
Impact Scale	Limited to Project areas				
Frequency	Operation Phase				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/ Receptor Senstivity/ Intensity	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Minor**				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Negligible**				

6.4.2 AESTHETICS AND VISUAL IMPACT

Anticipated Impacts

There will be a change of landscape due to installation of WTGs and related structures. Rotating WTGs blades cause visual disturbances by intercepting sun light, thereby causing

moving shadows, and light flashes from reflecting sun light. The change in landscape and glare from the WTGs can affect the habitation as well as fauna of the area.

Shadow flicker will only occur when certain conditions coincide:

- Daylight hours (sunrise to sunset) - shadow /licker does not occur at night:
- Sunshine - flicker will not occur on overcast days when daylight is not sufficiently bright 10 cast shadows;
- Receptor is within ten (10) rotor diameters of the turbine - beyond this distance a person will not be able to perceive a wind turbine to be chopping through sunlight, but rather as an object with the sun behind it.
- Windows face the turbine -turbine shadows can only enter a structure through un-shaded windows: and
- Turbine is rotating - no flicker will occur when the turbine is shut down.

Shadow Flicker from Turbines

There will be a change of landscape due to installation of Wind Turbine and related structures. Visual impact due to shadow generated from the rotors is also a key element. The change in landscape and shadow generated from the rotors can affect the habitation as well as faunal of the area.

Shadow Flicker Modelling

Shadow flicker from wind turbines occurs when rotating wind turbine blades pass between the sun and the viewer. Shadow flicker is generally experienced in areas near wind turbines where the distance between the viewer and blade is short enough that the glare from the sunlight is insufficient to conceal the blade. When the blades rotate, this shadow creates a visual pulsing effect with the sun known as shadow flicker. From longer distances, however, the wind turbine covers an increasingly smaller portion of the sun and light rays will "recombine" to eliminate the shadow flicker effect.

A number of factors influence shadow flicker on the shadow receptors. One consideration is the environment around the shadow receptor. Obstacles such as terrain, trees, or buildings between the wind turbine and a potential shadow flicker receptor significantly reduce or eliminate shadow flicker effects. Also, trees affect the ability of shadow flicker to reach the viewer depending on whether such trees have leaves or not. These obstacles and seasonal variations were not considered in the modelling.

Because of constantly changing solar aspect and azimuth, shadows will be cast on specific days of the year and will pass a stationary receptor relatively quickly. Flicker will not be an everyday event or be of extended duration when it does occur. For receptors located to the west of a turbine, a residence is more likely to fall within the shadow zone shortly after sunrise when affected residents are typically asleep with shades drawn. For receptors located to the east of a turbine, a residence is more likely to fall within the shadow -zone shortly before sunset.

When the rotor plane is in-line with the sun and receptor (as seen from the receptor), the cast shadows will be very narrow, of low intensity, and will move quickly past the stationary receptor. When the rotor plane is perpendicular to the sun-receptor "view Line, the cast shadow of the blades will move within a larger elliptical area.

The distance between a wind turbine and a receptor affects the intensity of the shadows cast by the blades, and therefore the intensity of flickering. Shadows cast close to a turbine will be more intense, distinct and "focused." This is because a greater proportion of the sun's disc is intermittently blocked.

Another consideration is the time of day when shadow flicker occurs. As an example, a factory or office building would not be affected if all the shadow impact occurred outside of business hours, whereas it would be more acceptable for residence to experience shadow impact wherein it can cause severe impacts on visual aesthetics.

Lastly, the climate also has to be considered when assessing shadow flicker. In areas with high rates of overcast weather there would be less shadow flicker. As well, when the wind is not blowing, the wind turbine blades do not move and therefore no shadow flicker occurs. Statistics regarding the wind conditions and sunshine probability were not modeled in this study.

One of the specific environmental issues to the operation of wind energy projects include:

- Noise and
- Shadow flicker

The duration of shadow flicker, its intensity and the locations it affects are most strongly determined by the relative position of the sun, the turbine and the receptor. The relative position of the sun varies with latitude, time of day and time of year. Other influential factors include:

- The size of the wind turbine rotor and the height of the tower
- Surface topography

- Intervening vegetation
- Direction of the wind (and hence the rotor plane of the wind turbine)
- Weather (particularly cloud cover)
- General visibility (including presence of mist, smoke and other particulates)

FACTORS CONSIDERATION IN SHADOW FLICKER ASSESSMENT

The wind turbines will cast a shadow when the sun is visible. As wind turbines rotate, a flickering or flashing effect may occur when the shadows of the rotating blades cause rapid changes in light intensity at stationary locations such as homes (referred to as receptors). This change in light intensity is known as shadow flicker. Shadow flicker at a receptor may occur only when the following four conditions are met:

- The sun is shining with no cloud cover present;
- The turbine is operating;
- The turbine blades are positioned on a line between the sun and the receptor; and
- The receptor is close enough to the turbine to distinguish the shadow created by the
- blades.

Shadow flicker intensity and frequency of occurrence at a given receptor are determined by several factors:

Local Topography: Elevation differences between the receptor and the turbine location can either increase or decrease frequency of shadow flicker, compared to flat terrain. For example, a receptor may be shielded from the turbine by a prominent hill, wind break, or by other nearby buildings.

Wind Direction: The area affected by shadow flicker depends on the orientation of the plane of blade rotation relative to a line between the receptor and the sun. If the other conditions are such that shadow flicker is possible and the plane is close to parallel to the receptor-sun line, the generation of flicker is negligible at the receptor. Alternatively, if the plane is close to perpendicular the generation of flicker at the receptor may be noticeable.

Receptor: At each residence it is assumed there is a window 1m x 1m in area located 2m above ground facing perpendicular to each WTG comprising the wind farm. In this way any shadow cast from a turbine is assumed to reach a window of the receptor. This is considered to be a conservative approach and provides an upper bound of the shadow impact hours.

Maintenance: It is occasionally necessary to shut down wind turbines for maintenance, during which time the turbine will not produce shadow flicker.

Sun Angle and Path: On a given day, shadows cast by the sun are longest during the periods around sunrise and sunset and shortest during mid-day hours. Shadows are also longer in the summer than the winter, with the longest shadows occurring on the summer solstice and shortest shadows occurring on the winter solstice

Position of Turbines Relative to Receptors: The frequency of shadow flicker at a receptor decreases as the distance between the receptor and a wind turbine increases. The frequency is also affected by the location of a wind turbine relative to the receptor. For example, a wind turbine will never cast a shadow on a receptor located directly to its south, since it is never possible for the turbine to lie between the receptor and the sun. A receptor located to the west of the turbine, however, may experience shadow flicker during the early morning hours when the sun is in the eastern sky and low to the ground provided other conditions are met.
Currently, shadow flicker impacts are not regulated by applicable laws and legislations at National Level however, a threshold of 30 hours of shadow flicker exposure in a year

METHODOLOGY
Shadow flicker modelling was performed using EMD's WindPro Software version 3.2, a wind modelling software program. WindPRO is used to calculate detailed shadow flicker map across an area of interest with site-specific locations using shadow receptors.

The WindPRO SHADOW module is able to incorporate the sun's position, topography of the wind farm site, locations of receptors, wind turbine specifications, and the observed wind direction distribution to calculate shadow positions and orientations at one-minute intervals for a calendar year.
The inputs for the WindPRO shadow flicker model include the following:

- The geographic locations and characteristics of the proposed WTGs;
- The locations of identified shadow receptors within 500 m, twice the distance given in IFC EHS guidelines for proposed WTGs;
- Turbine Model Specifications; and
- The WindPRO software calculates the position of the sun throughout the day in accordance to the curvature of the earth, the time of year and the project site's position. The software calculates the occurrences of shadow flicker at each of the identified receptor.

The expected values are based on assumptions on solar statistics and operating hours (8760 hours in a year i.e. turbines operating round the clock for 365 days at a stretch) and wind direction based on the meteorology of the area. Other assumption includes:

- No allowance was made for wind being below or above generation speeds.
- Blades are assumed to be moving during all daylight hours, when the sun's elevation is more than 3 degrees above the horizon. Shadow flicker is generally considered imperceptible when the sun is less than 3 degrees above the horizon (due to the scattering effect of the atmosphere on low angle sunlight).
- The possible screening effect of all existing trees and buildings adjacent to the receptors was not taken into consideration in the modeling. In addition, the number and/or orientation of windows in residential structures were not considered in the analysis.
- This omni-directional approach reports total shadow flicker results at a receptor regardless of the presence or orientation of windows at the receptor (i.e., it assumes shadows from all directions can be perceived at a residence, which may or may not be true).

This conservative assessment assumes that the turbines are in continuous operation during daylight hours, and that shadow flicker can be perceived at a receptor structure regardless of the presence or orientation of windows or the screening effects of all surrounding trees and buildings, the analysis presented herein is a conservative projection of the shadow-flicker effects at ground level.

Sunshine probabilities (percentage of lime from sunrise to sunset with sunshine). The WindPro model calculates shadow frequency based on monthly sunshine probabilities. The following sunshine probabilities were used for this analysis and are based on historic data. taken from the nearest India Meteorological Department (IMD) station and relevant meteorological center for a data period of 30 years as given below:

Table 6-19:Sunshine probability S (Average daily sunshine hours)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
10.04	10.28	9.34	9.65	9.45	4.31	3.22	4.18	5.94	7.85	9.14	9.61

- Hours of Operation: 8760 hours
- Day Step of calculation: 1
- Time step of calculation: 1 minute
- Minimum Sun height over horizon for influence: 3 degrees

Operational Time/Rotor orientation: The WindPro model assumes there will be no shadow flicker during calm winds (when the blades are not turning). Moreover. the orientation of the rotor (e.g., determined by wind direction) affects the size of a shadow cast area. To more accurately calculate the amount of time a shadow will be over a specific location (based on rotor orientation). The WindPro model considers typical wind direction. The operational time (hours per year) of wind direction is based on the meteorological data.

A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non-visible WTG do not contribute to calculated flicker values. For the receptors, a WTG is considered to be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:

Height contours used: Project Wizard Elevation Data Grid (SRTM: Shuttle DTM Obstacles used in calculation

Assumptions made during the analysis include optimal meteorological, natural light and geometrical conditions for the generation of shadow flicker. The worst-case assessment does not account for trees or other obstructions that intervene between receptor and turbine during times when effects may occur. The assessment calculation is therefore an over estimation in the probability of effects. It should also be noted that for shadow effects to occur, properties need to be occupied, with blinds or curtains open and views to the wind turbine unobstructed. However, for the purposes of assessment, it has been assumed that all worst- case circumstances apply.

The following strict criteria are provided to define the astronomic worst case which is less likely to occur than the realistic shadow flicker scenarios:

- There is continual sunshine and Perm.ly cloudless skies from sunrise to sunset
- There is sufficient wind for continually rotating turbine blades
- Rotor is perpendicular to the incident direction of the sunlight
- Sun angles less than 3 degrees above the horizon level are disregarded (due to likelihood for vegetation and building screening)
- Distances between the rotor plane and the tower axis are negligible.
- Light refraction in the atmosphere is not considered.

SHADOW RECEPTOR LOCATION AND ELEVATION

As with wind turbine location, the elevation, distance, and direction from a wind turbine are large factors in determining the significance of shadow flicker impact. The model was performed with shadow flicker with receptors one-meter-high by one-meter-wide and the worst-case orientation which assumes all receptors face the turbine directly. Rather than

facing a particular direction, shadow flicker receptors (windows) are simulated as horizontal planes, meaning they experience shadow flicker over 360°; this assumption therefore represents a worst-case scenario. Simulations have been carried out with a resolution of 1 minute; if shadow flicker occurs in any 1-minute period, the model registers this as 1 minute of shadow flicker.

It is generally accepted that shadow flicker from wind turbines does not occur beyond a distance, D, from a given wind turbine. The UK wind industry considers this distance to be equivalent to 10 rotor diameters, while the Danish wind industry suggests a value of between 500 and 1000 m. TUV-SUD has adopted a conservative approach and has assumed the length, D, that a shadow can be cast on the basis of the following formula:
D = 10 x (hub height + rotor radius)

Beyond this distance, a viewer does not perceive the turbine blade to be chopping the light, but rather as an object passing in front of the sun.

Shadow flicker calculations can be adjusted using an annual cloud coverage figure, which is based on historical meteorological data and statistics. According to data gathered from meteorological stations, an annual cloud cover can be estimated and applied as a percentage. Further, using the site-specific wind rose to consider the probability of the turbines being oriented in a given direction could lead to significant further reduction in the annual shadow flicker occurrence.

Salient features about noise: Minimum power density, maximum profitability: With a 56-meter blade and aerodynamic profiles developed using state-of-the-art technology, SG 2.1-114 guarantees maximum energy production combined with low noise emission thanks to the DinoTails® Next Generation serrated trailing edges.

Furthermore, by applying comprehensively validated and certified technologies from the Siemens Gamesa 2.X platform, this turbine significantly reduces the Levelized Cost of Energy

WTG Specifications

Rotor	
Maximum power output	2.1 MW
Diameter	114 m
Number of blades	3
Swept area	10207 m2
Blade length	56 m
Airfoils	Siemens Gamesa

Material	
Material	Fiberglass reinforced with epoxy or polyester resin
Hub	
Tower	Tubular tower
Hub Height	127 m

CONSERVATIVE ASSUMPTIONS

Shadow flicker duration calculated in the manner described above typically over-estimates the annual number of hours of shadow flicker experienced at a specified location for several reasons, namely:

1. The modelling of the wind turbine blades as discs rather than individual blades results in an overestimate of shadow flicker duration. Turbine blades are of non-uniform thickness with the thickest part of the blade (maximum chord) close to the hub and the thinnest part (minimum chord) at the tip. Diffusion of sunlight, as discussed above, results in a limit to the maximum distance that a shadow can be perceived. This maximum distance will also be dependent on the thickness of the turbine blade and the human threshold for perception of light intensity variation. As such, a shadow cast by the blade tip will be shorter than the shadow cast by the thickest part of the blade.
2. The wind turbine will not always be yawed such that its rotor is perpendicular to the sun-turbine vector). Any other rotor orientation will reduce the area of the projected shadow, and thus the incidence of shadow flicker. Additionally, the orientation of windows on a given receptor has not been taken into account, i.e. the model assumes that a window is always facing the turbine(s). The wind speed frequency distribution, or wind rose, at the site can be used to determine probable turbine orientation in order to calculate the resulting reduction in shadow flicker duration; however, this has not been done in this study.
3. Aerosols (moisture, dust, smoke, etc.) in the atmosphere have the ability to influence shadows cast by a wind turbine. The length of the shadow cast by a wind turbine is dependent on the degree that direct sunlight is diffused, which in turn is dependent on the amount of dispersants (humidity, smoke and other aerosols) in the path between the light source (sun) and the receiver.

4. Modelling the sun as a point light source rather than a disc results in an overestimate of the shadow flicker duration. The fact that the light source is a disc results in a shadow which is less well defined and of lower intensity as compared to a point light source. The occurrence of cloud cover has the potential to significantly reduce the number of hours of shadow flicker. Cloud cover measurements recorded at nearby

meteorological stations may be used to estimate probable levels of cloud cover, and to provide an indication of the resulting reduction in shadow flicker duration.

5. The presence of vegetation or other physical barriers around a shadow receptor location may shield the view of the wind turbine, and therefore reduce the incidence of shadow flicker.

6. Periods where the wind turbine is not in operation due to low winds, high winds, or for operational and maintenance reasons will also reduce shadow flicker occurrence. In light of the reasons listed above, it is likely that the shadow flicker durations assumed can be regarded as conservative.

ADDITIONAL FACTORS

This analysis does not consider the predicted wind speed and direction at each turbine, average cloud cover, and obstacles. These factors would reduce the operational time, line-of-sight, and shadow size cast by a wind turbine. These calculations also assume each residence is directly facing a wind turbine. Therefore, these estimates may be more conservative than what would likely be experienced by a given receptor. As such, it is likely receptors will be less impacted due to the following factors:

- Wind Speed: Rotors will only turn when wind speeds are above appropriate levels (typically 3.0 m/s). This analysis assumes that the wind is always blowing at a sufficient speed to turn the rotors, which results in a conservatively high estimate of shadow flicker impacts hours.

- Wind Direction: During operation the rotors will face into the wind and will continually orient themselves as the wind direction changes. The wind direction relative to the sun's location is key to whether shadow flicker impacts can occur. This analysis assumes that the wind is always oriented to produce shadow effect at a receptor location.

- The wind direction relative to the sun's location is key to whether shadow flicker impacts can occur. This analysis assumes that the wind is always oriented to produce shadow effect at a receptor location. Worst case assumes sun always shining (from sun rise to sun set), turbine always running and rotor oriented perpendicular to receptor.

- Average Cloud Cover: Average climate conditions for the project area would decrease shadow flicker impacts due to the sporadic presence of clouds, fog, and haze. The worst case model assumes every day of the year has clear skies and perfect visibility.

- Receptor Direction and Dimensions: Receptor orientations and dimensions are variable. When modelling each shadow receptor's actual direction and window dimensions, shadow flicker impacts typically decrease.

- Resident Occupancy: The estimate of hours assumes that a person is always present to observe the shadow flicker impacts. Seasonal residences would typically have a lower chance of being effected by shadow flicker due to the lack of occupancy. Furthermore, residences that are lived in year round may not always have occupants when shadow flicker is present.

- The ZVI calculation will be used for flicker map as well as the receptor calculations. The flicker map will as default be calculated for same elevation as the ZVI calculation. For the receptors, a WTG will be visible if it is visible from any part of the receiver window and is considered to be vertical Calculate only when more than 20 % of sun is covered by the blade Eye height for map: 4 m; Grid resolution: 1.0 m

  - Minimum sun height over horizon for influence: 3 °
  - Day step for calculation: 1 days
  - Time step for calculation: 1 minutes

RESULTS AND ANALYSIS

The term theoretical worst case means that turbine operational hours, wind direction, and local sunshine probabilities have not been accounted for. A total of 69 permanent and 150 temporary shadow receptors (individual structures, were identified) were analyzed, and a normal resolution shadow flicker map was generated.

It is relevant to emphasize that predicted hours of shadow flicker effects are real case scenarios with certain assumptions made during the analysis which include optimal meteorological, natural light and geometrical conditions for the generation of shadow flicker. The assessment does not account for trees or other obstructions that intervene between receptor and turbine during times when effects may occur. The assessment calculation is therefore an over estimation in the probability of effects. It should also be noted that for shadow effects to occur, properties need to be occupied, with blinds or curtains open and views to the wind turbine unobstructed. However, for the purposes of assessment, it has been assumed that all worst- case circumstances apply.

Therefore, output from the model includes the following information:

- Estimated shadow-flicker time (hours per year) at receptors within 300 m of the proposed Project turbine;
- Map showing turbine locations, identified shadow-flicker receptors, and projected shadow-flicker time (hours per year).

As a result of the scenario described above, the shadow flicker calculations represent a theoretical worst-case scenario and real case scenario and are presented in table.

Table 6-20 List of WTG and Shadow Receptors Associated with WTG

Receptor -ID.No.	WTG-ID.No.	WTG ID	WTG Coordinates (in UTM)		Nearest house/ structure within 500 m from WTG Footprint	Distance with direction	WTG ID	Use of Structure	Receptor Coodinates	
			X	Y	Type of Structure				x	y
1	1	SGJA-01	661289	1614478	S1 kaccha	S1: 260 m N	SGJA-01-S1	T	661341	1614693
2					S2 kaccha	S2: 303 m SW	SGJA-01-S2	T	660975	1614387
3					S3 kaccha	S3: 355 m SW	SGJA-01-S3	T	661049	1614261
4					S4 Pollutory Farm	S4: 292 m SSW	SGJA-01-S4	P	661006	1614362
5	2	SGJA-02	661437	1616278	S1 kaccha strcuture at field	S1: 326 m W	SGJA-02-S1	T	661112	1616314
6	3	SGJA-03	660311	1618770	S1 kaccha strcuture at field	S1: 485 m SW	SGJA-03-S1	T	659997	1618397
7	4	SGJA-04	659659	1613994	S1 Residential Structure	S1: 452 m NNW	SGJA-04-S1	p	659526	1614404
8					S2 and	S2: 267 m WSW	SGJA-04-S2	t	659532	1614435
9					S3 is Kuccha structure at field	S3: 146 m SE	SGJA-04-S3	t	659747	1613873
10	5	SGJA-05	661275	1616674	S1 Kuccha	S1: 485 m NE	SGJA-05-S1	t	661588	1617167
11					S2	S2: 489 m NW	SGJA-05-S2	t	660868	1616948
12					S3 is Kuccha	S3: 389 m SW	SGJA-05-S3	t	661506	1617177
13	6	SGJA-06	658597	1617716	S1 Kuccha	S1: 154 m WSW	SGJA-06-S1	t	658439	1617699
14	7	SGJA-07	658743	1617091	No Structure	..				
15	8	SGJA-08	660182	1617054	S1 Kuccha	S1: 266 m NW	SGJA-08-S1	t	659930	1617119
16	9	SGJA-09	660051	1616698	No Structure	..				
17	10	SGJA-10	660317	1616285	S1 Solar Plant Site Office	S1: 341m NE	SGJA-10-S1	P	660605	1616460
18					S2 Solar Plant Security Office	S2: 484 m NE	SGJA-10-S2	p	660624	1616527
19	11	SGJA-11	661545	1615954	No Structure	..				
20	12	SGJA-12	660399	1615607	S1 Kuccha	S1: 328 WSW	SGJA-12-S1	t	660073	1615555
21	13	SGJA-13	659520	1615385	S1 Pollutory Farm S2 is kaccha structure at field	S1: 305 m N	SGJA-13-S1	P	659528	1615682
22						S2: 470 m SSE	SGJA-13-S2	t	659618	1615819
23	14	SGJA-14	661417	1615152	S1 Kuccha	S1: 426 SSW	SGJA-14-S1	t	661341	1614692

24	15	SGJA-15	660589	1614680	S1 is Commercial shop	S1: 392 m SW	SGJA-15-S1	P	660336	1614375
25	16	SGJA-16	658405	1613645	S1 Kuccha	S1: 433 m W	SGJA-16-S1	T	658777	1613688
26					S1 Kuccha	S2: 372 m ENE	SGJA-16-S2	T	657918	1613694
27	17	SGJA-17	657897	1612584	No Structure	..				
28	18	SGJA-18	657925	1611891	No Structure	..				
29	19	SGJA-19	658369	1611359	No Structure	..				
30	20	SGJA-20	660817	1612326	S1 Kuccha	S1: 73 m W	SGJA-20-S1	T	660745	1612344
31					S1 Kuccha	S2: 386 m SW	SGJA-20-S2	T	660501	1612098
32	21	SGJA-21	657979	1611053	No Structure	..				
33	22	SGJA-22	660730	1612812	S1 Kuccha	S1: 383 m W	SGJA-22-S1	T	660140	1612849
34					S1 Kuccha	S2: 457 m W	SGJA-22-S2	T	660744	1612343
35					S1 Kuccha	S3: 465 m S	SGJA-22-S3	T	661431	1612824
36	23	SGJA-23	660226	1610956	S1 Kuccha	S1: 491 SW	SGJA-23-S1	t	659924	1610572
37	24	SGJA-24	658005	1610583	No Structure	..				
38	25	SGJA-25	661074	1610661	No Structure	..				
39	26	SGJA-26	658055	1610111	No Structure	..				
40	27	SGJA-27	659753	1609837	S1 Kuccha	S1: 218 m N	SGJA-27-S1	t	659714	1610052
41					S1 Kuccha	S2: 393 m SE	SGJA-27-S2	t	660011	1609514
42	28	SGJA-28	659435	1610613	S1 Kuccha	S1: 486 m ESE	SGJA-28-S1	t	659923	1610572
43					S1 Kuccha		SGJA-28-S2	t	659458	1610831
44	29	SGJA-29	657795	1609472	S1 Solar Plant Security Office S2 and S3 are Kuccha structure at field	S1: 361m SE	SGJA-29-S1	P	658106	1609258
45					S1 Kuccha	S2: 399 m W	SGJA-29-S2	t	658194	1609422
46					S1 Kuccha	S3: 432 m W	SGJA-29-S3	t	657239	1609696
47	30	SGJA-30	659207	1611723	No Structure	..				
48	31	SGJA-31	656814	1608328	S1 Residential (Multiple Structures) S2	S1: 445 m ESE	SGJA-31-S1	P	657227	1608142

					to S4 kaccha structure at field					
49					S1 Kuccha	S2: 485 m SE	SGJA-31-S2	t	657159	1608070
50					S1 Kuccha	S3: 392 m NNW	SGJA-31-S3	t	656797	1608730
51					S1 Kuccha	S4: 438 m SW	SGJA-31-S4	t	656484	1608052
52	32	SGJA-32	653536	1608491	S1 & S2 Commercial S3 Temple S4 & S5 kaccha structure at fiel	S1: 485 m ESE	SGJA-32-S1	P	653788	1608510
53						S2: 500 m SE	SGJA-32-S2	P	654040	1608530
54						S3: 464 m ENE	SGJA-32-S3	P	653995	1608447
55					S1 Kuccha	S4: 491 m NNE	SGJA-32-S4	T	653725	653725
56					S1 Kuccha	S5: 356 m SW	SGJA-32-S5	T	653287	1608237
57	33	SGJA-33	654814	1609648	S1 & S2 Residential S3 to S5 Commercial S6 & S7 kaccha structure at field	S1: 497 m SW	SGJA-33-S1	P	654379	1609481
58						S2: 462 m SW	SGJA-33-S2	P	654437	1609398
59						S3: 250 m SW	SGJA-33-S3	P	654577	1609550
60						S4: 367 m WNW	SGJA-33-S4	P	654460	1609731
61						S5: 328 m WNW	SGJA-33-S5	P	654449	1609864
62					S1 Kuccha	S6: 426 m SSW	SGJA-33-S6	T	654448	1609876
63					S1 Kuccha	S7: 500 m SSW	SGJA-33-S7	T	654522	1609562
64	34	SGJA-34	657290	1608952	No Structure	..				
65	35	SGJA-35	656380	1610744	No Structure	..				
66	36	SGJA-36	656203	1610174	No Structure	..				
67	37	SGJA-37	659972	1613637	S1 Kuccha	S1: 326 m NW	SGJA-37-S1	T	659747	1613872
68	38	SGJA-38	654213	1611649	No Structure	..				
69	39	SGJA-39	655324	1609963	S1 Kuccha	S1: 458 m NE	SGJA-39-S1	T	655679	1610247
70					S1 Kuccha	S2: 464 m ESE	SGJA-39-S2	P	655718	1609717

71						S3: 424 m NW	SGJA-39-S3	P	654927	1610274
72	40	SGJA-40	655970	1612336	S1 is Pollutary Farm	S1: 413 m NE	SGJA-40-S1	P	656315	1612578
73					S2 Commercial Stucture	S2: 481 m NW	SGJA-40-S2	P	655617	1612661
74					S3 Commercial Stucture	S3: 463 m NW	SGJA-40-S3	P	655627	1612925
75	41	SGJA-41	653952	1612206	No Structure	..				
76	42	SGJA-42	654683	1611115	S1 Commercial Structure	S1: 495 m NE	SGJA-42-S1	P	655139	1611504
77	43	SGJA-43	657931	1608519	No Structure	..				
78	44	SGJA-44	658403	1608953	S1 Solar Plant Security Office	S1: 432m NW	SGJA-44-S1	P	658106	1609270
79	45	SGJA-45	655269	1613124	No Structure	..				
80	46	SGJA-46	657466	1614473	No Structure	..				
81	47	SGJA-47	655823	1614414	S1 & S2 Residential S3 & S4 Kaccha Structure at Field	S1: 449 m NW	SGJA-47-S1	P	655406	1614724
82						S2: 491 m SW	SGJA-47-S2	P	655300	1614238
83					S1 Kuccha	S3: 371 m W	SGJA-47-S3	T	655462	1614504
84					S1 Kuccha	S4: 387 m ENE	SGJA-47-S4	T	655922	1614141
85	48	SGJA-48	656103	1614781	S1 to S3 Commercial S4 & S5 Kuccha Structure at field S6 Residential Structure	S1: 351 m ENE	SGJA-48-S1	p	656413	1614944
86						S2: 402 m SE	SGJA-48-S2	p	656439	1614547
87						S3: 430 m E	SGJA-48-S3	p	656261	1614651
88					S1 Kuccha	S4: 449 m NE	SGJA-48-S4	T	656394	1615117
89					S1 Kuccha	S5: 324 m ENE	SGJA-48-S5	T	656392	1614985
90						S6: 432 m W	SGJA-48-S6	p	655690	1614814
91	49	SGJA-49	656000	1615583	S1 Kuccha	S1: 356 m NE	SGJA-49-S1	T	656355	1615678
92	50	SGJA-50	654370	1610407	S1 Residential S2 Kuccha Structure at field S3 Commercial	S1:489 m WNW	SGJA-50-S1	P	654667	1610172

93					S1 Kuccha	S2: 249 m SE	SGJA-50-S2	T	653906	1610326
94						S3: 359 m ESE	SGJA-50-S3	P	654534	1610217
95	51	SGJA-51	659442	1610151	S1 Kuccha	S1:284 m ESE	SGJA-51-S1	T	659618	1609997
96	52	SGJA-52	657903	1614011	S1 Kuccha	S1:337 m SSE	SGJA-52-S1	T	657918	1613694
97	53	SGJA-53	659126	1613415	S1 Kuccha	S1:275 m NE	SGJA-53-S1	T	659349	1613603
98					S1 Kuccha	S2: 432 m NW	SGJA-53-S2	T	658675	1613356
99	54	SGJA-54	659132	1612226	S1 Pucca Vacant Structure	S1: 423 m ENE	SGJA-54-S1	T	659529	1612335
100	55	SGJA-55	652951	1618010	No Structure	..				
101	56	SGJA-56	660412	1615220	S1 Kuccha Structure at field	S1:478 m NW	SGJA-56-S1	T	660072	1615555
102	57	SGJA-57	652159	1617285	No Structure	..				
103	58	SGJA-58	652711	1617520	S1 Kuccha Structure at field	S1:385 m WSW	SGJA-58-S1	T	652327	1617438
104	59	SGJA-59	656326	1611098	No Structure	..				
105	60	SGJA-60	653936	1616841	No Structure	..				
106	61	SGJA-61	654967	1615966	No Structure	..				
107	62	SGJA-62	654618	1615007	No Structure	..				
108	63	SGJA-63	655277	1615302	S1 Commercial Structure	S1: 449 m ESE	SGJA-63-S1	P	655653	1615058
109					S2 Kuccha	S2: 369 m E	SGJA-63-S2	T	655673	1615300
110	64	SGJA-64	652519	1615343	Kuccha- S1	S1: 439 m NW	SGJA-64-S1	T	652221	1615486
111					Kuccha- S2	S2: 314 m WNW	SGJA-64-S2	T	652217	1615691
112	65	SGJA-65	653796	1615670	Kuccha- S1	S1: 71 m ENE	SGJA-65-S1	T	653862	1615973
113					Kuccha- S2	S2: 285 m NNE	SGJA-65-S2	T	654202	1616220
114	66	SGJA-66	652620	1614764	Kuccha- S1	S1: 231 m SE	SGJA-66-S1	T	652958	1614609
115					Kuccha- S2	S2: 361 m ESE	SGJA-66-S2	T	652772	1614574
116					Kuccha- S3	S3: 282 m SSW	SGJA-66-S3	T	652538	1614490
117						S4: 372 m SSW	SGJA-66-S4	P	655522	1615078
118	67	SGJA-67	650391	1613713	Kuccha- S1	S1: 389 m ESE	SGJA-67-S1	T	650507	1614028
119					Kuccha- S2	S2: 439 m ESE	SGJA-67-S2	T	650755	1613584
120					Kuccha- S3	S3: 331 m NNE	SGJA-67-S3	T	650834	1613661

121					S4 is Pollutary Farm	S4: 500 m NNE	SGJA-67-S4	P	650693	1614121
122	68	SGJA-68	653002	1614019	Kuccha- S1	S1: 433 m NNE	SGJA-68-S1	T	653068	1614495
123					Kuccha- S2	S2: 476 m NNE	SGJA-68-S2	t	653022	1614349
124	69	SGJA-69	654726	1615458	No Structure	..				
125	70	SGJA-70	656314	1615927	Kuccha- S1	S1: 223 m SSW	SGJA-70-S1	T	656343	1615763
126	71	SGJA-71	654966	1611871	S1 & S2 Commercial Structure	S1: 396 m SE	SGJA-71-S1	P	655139	1611504
127						S2: 480 m SSE	SGJA-71-S2	P	655117	1611405
128	72	SGJA-72	653279	1613690	No Structure	..				
129	73	SGJA-73	637464	1607261	S1 Residential S2: Commercial	S1: 165 m NE	SGJA-73-S1	P	637495	1607455
130						S2: 290 m NE	SGJA-73-S2	P	637514	1607567
131	74	SGJA-74	638508	1606511	S1, S3, S4, S5, S6: Kaccha Structure at Field S2 & S7 Residential	S1: 143 m N	SGJA-74-S1	T	638506	1606668
132						S2: 190 m NE	SGJA-74-S2	P	638585	1606702
133						S3: 305 m NE	SGJA-74-S3	T	638724	1606757
134						S4: 275 m SE	SGJA-74-S4	T	638731	1606353
135						S5: 337 m SE	SGJA-74-S5	T	638758	1606285
136						S6: 311 m S	SGJA-74-S6	T	638482	1606201
137						S7: 390 m SW	SGJA-74-S7	P	638236	1606228
138	75	SGJA-75	637957	1604943	S1 & S2 Residential multi structures	S1: 323 m S	SGJA-75-S1	P	638016	1604640
139						S2: 335 m SW	SGJA-75-S2	P	637632	1604856
140	76	SGJA-76	638466	1604560	No Structure	..				
141	77	SGJA-77	639756	1605006	S1 residential	S1: 473 m S	SGJA-77-S1	P	639789	1604547
142	78	SGJA-78	636847	1606547	S1 residential	S1 284 m SSE	SGJA-78-S1	P	636849	1606266
143	79	SGJA-79	639061	1605654	S1; S3; S4 kaccha structure at	S1: 225 m NE	SGJA-79-S1	T	638904	1605843

					field S2 Residential (2-3 structures)					
144						S2: 238 m NW	SGJA-79-S2	P	639255	1605805
145						S3: 235 m E	SGJA-79-S3	T	639302	1605667
146						S4: 390 m SW	SGJA-79-S4	T	638746	1605422
147	80	SGJA-80	636602	1605164	S1 Residential	S1: 240 m SE	SGJA-80-S1	P	636714	1605504
148					S2 Residential (multi structures)	S2: 451 m W	SGJA-80-S2	P	636153	1605155
149	81	SGJA-81	639073	1605181	S1;	S1: 276 m NE	SGJA-81-S1	T	639162	1605440
150					S2;	S2: 419 m NE	SGJA-81-S2	T	639357	1605537
151					S3;	S3: 338 m SW	SGJA-81-S3	T	638804	1604848
152					S4 kaccha	S4: 406 m NW	SGJA-81-S4	T	638745	1605421
153	82	SGJA-82	635063	1605123	No Structure	..				
154	83	SGJA-83	635103	1605564	No Structure	..				
155	84	SGJA-84	635159	1604676	No Structure	..				
156	85	SGJA-85	635789	1604096	S1 to S5 Kuccha Structure at field kaccha S6 Residential	S1: 86.3 m SW	SGJA-85-S1	T	635746	1604022
157						S2: 254 m SW	SGJA-85-S2	T	635618	1603906
158						S3: 495 m ESE	SGJA-85-S3	T	636286	1604162
159						S4: 467 m NE	SGJA-85-S4	T	636197	1604328
160						S5: 454 m NNW	SGJA-85-S5	T	635696	1604538
161						S6: 337 m NW	SGJA-85-S6	P	635623	1604385
162	86	SGJA-86	635129	1603880	S1 commercial/ residential	S1: 358 m SW	SGJA-86-S1	P	635050	1603523
163					S2,	S2: 312 m NE	SGJA-86-S2	T	635355	1604103
164					S3 kaccha	S3: 486 m E	SGJA-86-S3	T	635617	1603905
165	87	SGJA-87	638538	1603859	S1 kaccha	S1: 376 NW	SGJA-87-S1	T	638248	1604113
166	88	SGJA-88	631245	1594918	S1 kaccha	S1: 447 m SE	SGJA-88-S1	T	631408	1594499

167	89	SGJA-89	631598	1594361	S1 residential	S1: 484 m SW	SGJA-89-S1	P	631271	1594006
168	90	SGJA-90	631386	1592154	S1: kaccha	S1: 292 m SE	SGJA-90-S1	T	631662	1592051
169	91	SGJA-91	631476	1591662	S1 & S3 residential S2 & S4 Kuccha Structure at Field	S1: 359 m E	SGJA-91-S1	p	631851	1591709
170						S2: 406 m NE	SGJA-91-S2	T	631662	1592051
171						S3: 410 m S	SGJA-91-S3	p	631444	1591253
172						S4: 328 m SE	SGJA-91-S4	T	631638	1591374
173	92	SGJA-92	631709	1591089	S1 & S3 residential S2 & S4 Kuccha Structure at Field	S1: 260 m NW	SGJA-92-S1	p	631444	1591253
174						S2: 317 m SW	SGJA-92-S2	t	631425	1590948
175						S3: 473 m NE	SGJA-92-S3	p	631989	1591499
176						S4: 294 m N	SGJA-92-S4	t	632124	1591069
177	93	SGJA-93	631656	1590679	S1 kaccha S2: pakka temporary	S1: 345 m SE	SGJA-93-S1	t	632156	1590506
178						S2: 343 m NW	SGJA-93-S2	t	631425	1590948
179	94	SGJA-94	631746	1590187	S1 residential multi structure S2: pakka temporary	S1: 419 m E	SGJA-94-S1	p	632176	1590223
180						S2: 487 m SW	SGJA-94-S2	t	631408	1589832
181	95	SGJA-95	631836	1589695	S1 S2 pakka temporary	S1 : 227 m NW	SGJA-95-S1	t	631280	1589744
182						S2: 452 m NW	SGJA-95-S2	t	631816	1589477
183	96	SGJA-96	631925	1589203	S1 pakka temporary	S1: 286 m NW	SGJA-96-S1	t	631816	1589477
184	97	SGJA-97	632015	1588711	S1 kaccha	S1: 279 m WSW	SGJA-97-S1	t	631744	1588677
185	98	SGJA-98	632272	1588210	No Structure	..				
186	99	SGJA-99	633073	1587523	No Structure	..				
187	100	SGJA-100	631853	1597127	No Structure	..				
188	101	SGJA-101	632532	1598158	No Structure	..				

189	102	SGJA-102	631842	1597277	S1: kaccha	S1: 429 m NW	SGJA-102-S1	t	631444	1597430
190	103	SGJA-103	633967	1596047	No Structure	..				
191	104	SGJA-104	635154	1592906	S1 S2 kaccha	S1: 438 m NE	SGJA-104-S1	t	635442	1593254
192	105	SGJA-105	639251	1594134	No Structure	S2: 48 m NW				
193	106	SGJA-106	633764	1597472	S1 kaccha	S1: 456 m SW	SGJA-106-S1	t	633692	1597023
194	107	SGJA-107	633666	1596723	S1 S2 S3 kaccha	S1: 437 m SW	SGJA-107-S1	t	633268	1596551
195						S2: 302 m N	SGJA-107-S2	t	633691	1597022
196						S3: 481 m NW	SGJA-107-S3	t	633216	1596920
197	108	SGJA-108	639341	1593642	No Structure	..				
198	109	SGJA-109	637966	1592797	S1 kaccha	S1: 392 m SW	SGJA-109-S1	t	637606	1592635
199	110	SGJA-110	634558	1593880	S1 commercial S2 S3 kaccha	S1: 445 m S	SGJA-110-S1	p	634610	1593446
200						S2: 190 SW	SGJA-110-S2	t	634362	1593848
201						S3: 434 m SW	SGJA-110-S3	t	634257	1593578
202	111	SGJA-111	634318	1591888	S1 to S4 Kuccha Structure at Field	S1: 364 m NNW	SGJA-111-S1	t	634130	1592195
203						S2: 439 m SSW	SGJA-111-S2	t	634251	1591456
204						S3: 417 m SSE	SGJA-111-S3	t	634531	1591533
205						S4: 475 m SSE	SGJA-111-S4	t	634676	1591503
206	112	SGJA-112	635615	1592143	No Structure	..				
207	113	SGJA-113	635198	1591712	S1 & S2 Kuccha Structure at Field	S1: 438 m WSW	SGJA-113-S1	t	634676	1591503
208						S2: 474 m SSW	SGJA-113-S2	t	634844	1591461
209	114	SGJA-114	639233	1588635	S1 Kuccha Structure at Field S2 is Pollutary Farm	S1: 324 m NNE	SGJA-114-S1	t	639057	1588329
210						S2: 377 m NNW	SGJA-114-S2	P	639336	1588947
211	115	SGJA-115	635551	1589618	S1 is Industry S2, S3 & S4 Kuccha Structure	S1: 364 m NNW	SGJA-115-S1	p	635204	1589645

					at Field S5 is Pollutary Farm					
212						S2: 439 m SSW	SGJA-115-S2	t	635157	1589333
213						S3: 417 m SSE	SGJA-115-S3	t	635766	1589409
214						S4: 475 m SSE	SGJA-115-S4	t	635889	1589433
215						S5	SGJA-115-S5	p	635241	1589510
216	116	SGJA-116	635641	1589126	S1 Kuccha Structure at Field S2 Industry	S1: 305 m NE	SGJA-116-S1	t	635908	1589530
217						S2: 403 m NNE	SGJA-116-S2	p	635157	1589333
218	117	SGJA-117	635879	1588177	No Structure	..				
219	118	SGJA-118	637475	1587944	S1& S2 Kuccha Structure at Field S3 & S4 Residential Structure	S1: 314 m NW	SGJA-118-S1	t	637224	1588160
220						S2: 231 m SW	SGJA-118-S2	t	637378	1587743
221						S3: 493 m NNW	SGJA-118-S3	p	637345	1588323
222						S4: 396 m S	SGJA-118-S4	p	637501	1587545
223	119	SGJA-119	635968	1591812	No Structure	..				
224	120	SGJA-120	636000	1592478	S1 & S2 Kuccha Structure at Field	S1: 460 m ENE	SGJA-120-S1	t	636409	1592700
225						S2: 441 m N	SGJA-120-S2	t	635964	1592936
226	121	SGJA-121	636905	1591314	S1 Kuccha Structure at Field	S1: 467 m NE	SGJA-121-S1	t	637168	1591655
227	122	SGJA-122	637041	1590236	S1 Kuccha Structure at Field	S1: 315 m ESE	SGJA-122-S1	t	637360	1590228
228	123	SGJA-123	636493	1589780	No Structure	..				
229	124	SGJA-124	637496	1589405	No Structure	..				
230	125	SGJA-125	638491	1589231	No Structure	..				
231	126	SGJA-126	636642	1594456	S1 Kuccha Structure at Field S2 Commercial	S1: 243 WNW	SGJA-126-S1	t	636206	1594434
232						S2: 436 W	SGJA-126-S2	p	636428	1594602

233	127	SGJA-127	637628	1595528	S1 Temple S2 to S6 Kuccha Structure at Field	S1: 464 m ESE	SGJA-127-S1	p	638092	1595442
234						S2: 431 m ESE	SGJA-127-S2	t	637864	1595233
235						S3: 488 m ESE	SGJA-127-S3	t	637725	1595228
236						S4: 433 m W	SGJA-127-S4	t	637371	1595396
237						S5: 478 m SW	SGJA-127-S5	t	637401	1595129
238						S6: 328 m SSE	SGJA-127-S6	t	638083	1595337
239	128	SGJA-128	636154	1594363	S1, S2, S4, S5, S6, S7, S8 Kuccha Structure at Field S3 Commercial S9 Residential	S1: 165 m SE	SGJA-128-S1	t	636272	1594258
240						S2: 331 m ESE	SGJA-128-S2	t	636455	1594244
241						S3: 80 m NNE	SGJA-128-S3	p	636428	1594602
242						S4: 320 m NE	SGJA-128-S4	t	636160	1594681
243						S5: 304 m NNE	SGJA-128-S5	t	636438	1594571
244						S6: 245 m WNW	SGJA-128-S6	t	635924	1594459
245						S7: 388 m WSW	SGJA-128-S7	t	635785	1594114
246						S8: 431 m SSE	SGJA-128-S8	t	636272	1594119
247						S9: 377 m SSE	SGJA-128-S9	p	636261	1594001
248	129	SGJA-129	637286	1591524	S1 Kuccha Structure at Field	S1: 162 NW	SGJA-129-S1	t	637168	1591655
249	130	SGJA-130	637150	1592746	S1 & S2 Kuccha Structure at Field	S1: 466 m ESE	SGJA-130-S1	t	637500	1592595
250						S2: 349 m WSW	SGJA-130-S2	t	636945	1592630
251	131	SGJA-131	636866	1592165	S1 to S3 Kuccha Structure at Field	S1: 353 m ESE	SGJA-131-S1	t	637191	1592017
252						S2: 487 m N	SGJA-131-S2	t	636945	1592629
253						S3: 250 m NW	SGJA-131-S3	t	636646	1592305

254	132	SGJA-132	637834	1593550	No Structure	..				
255	133	SGJA-133	638000	1593235	No Structure	..				
256	134	SGJA-134	633923	1590066	S1 Kuccha Structure at Field	S1: 293 m NW	SGJA-134-S1	t	633632	1590197
257	135	SGJA-135	634461	1589390	No Structure	..				
258	136	SGJA-136	633417	1589200	S1 Kuccha Structure at Field	S1: 155 m WSW	SGJA-136-S1	t	633264	1589159
259	137	SGJA-137	638470	1592373	S1 Kuccha Structure at Field	S1: 436 m E	SGJA-137-S1	t	638908	1592398
260	138	SGJA-138	637929	1591927	S1 & S2 Kuccha Structure at Field	S1: 470 m SSE	SGJA-138-S1	t	638079	1591499
261						S2:90 m SE	SGJA-138-S2	t	638145	1591835
262	139	SGJA-139	638850	1590873	S1 Kuccha Structure at Field	S1: 205 m SE	SGJA-139-S1	t	638928	1590674
263	140	SGJA-140	633841	1597807	S1 Residential	S1: 357 m E	SGJA-140-S1	p	634206	1597766
264	141	SGJA-141	634517	1598617	S1 permanent commercial	S1: 377 m NNE	SGJA-141-S1	P	634386	1598982
265					S2 school	S2:414 m NNE	SGJA-141-S2	P	634214	1598915
266	142	SGJA-142	632792	1598655	No Structure	..				
267	143	SGJA-143	632161	1599279	S1 Kuccha Structure at Field	S1: 442 m E	SGJA-143-S1	t	632640	1599300

Table 6-21: Permanent Structures Receptor details

Receptor ID	Receptor Type	Distance and Director	Type - Permanent	x	y
SGJA-01-S4	S4 Poultary Farm	S4: 292 m SSW	P	661006	1614362
SGJA-04-S1	S1 Residential Structure	S1: 452 m NNW	p	659526	1614404
SGJA-10-S1	S1 Solar Plant Site Office	S1: 341m NE	P	660605	1616460
SGJA-10-S2	S2 Solar Plant Security Office	S2: 484 m NE	p	660624	1616527
SGJA-13-S1	S1 Pollutory Farm S2 is kaccha structure at field	S1: 305 m N	P	659528	1615682
SGJA-15-S1	S1 is Commercial shop	S1: 392 m SW	P	660336	1614375
SGJA-29-S1	S1 Solar Plant Security Office S2 and S3 are Kuccha structure at field	S1: 361m SE	P	658106	1609258
SGJA-31-S1	S1 Residential (Multiple Structures) S2 to S4 kaccha structure at field	S1: 445 m ESE	P	657227	1608142
SGJA-32-S1	S1 & S2 Commercial S3 Temple S4 & S5 kaccha structure at fiel	S1: 485 m ESE	P	653788	1608510
SGJA-32-S2		S2: 500 m SE	P	654040	1608530
SGJA-32-S3		S3: 464 m ENE	P	653995	1608447
SGJA-33-S1	S1 & S2 Residential S3 to S5 Commercial S6 & S7 kaccha structure at field	S1: 497 m SW	P	654379	1609481
SGJA-33-S2		S2: 462 m SW	P	654437	1609398
SGJA-33-S3		S3: 250 m SW	P	654577	1609550
SGJA-33-S4		S4: 367 m WNW	P	654460	1609731
SGJA-33-S5		S5: 328 m WNW	P	654449	1609864
SGJA-39-S2	S1 Kuccha	S2: 464 m ESE	P	655718	1609717

SGJA-39-S3		S3: 424 m NW	P	654927	1610274
SGJA-40-S1	S1 is Poultary Farm	S1: 413 m NE	P	656315	1612578
SGJA-40-S2	S2 Commercial Stucture	S2: 481 m NW	P	655617	1612661
SGJA-40-S3	S3 Commercial Stucture	S3: 463 m NW	P	655627	1612925
SGJA-42-S1	S1 Commercial Structure	S1: 495 m NE	P	655139	1611504
SGJA-44-S1	S1 Solar Plant Security Office	S1: 432m NW	P	658106	1609270
SGJA-47-S1	S1 & S2 Residential S3 & S4 Kaccha Structure at Field	S1: 449 m NW	P	655406	1614724
SGJA-47-S2		S2: 491 m SW	P	655300	1614238
SGJA-48-S1	S1 to S3 Commercial S4 & S5 Kuccha Structure at field S6 Residential Structure	S1: 351 m ENE	p	656413	1614944
SGJA-48-S2		S2: 402 m SE	p	656439	1614547
SGJA-48-S3		S3: 430 m E	p	656261	1614651
SGJA-48-S6		S6: 432 m W	p	655690	1614814
SGJA-50-S1	S1 Residential S2 Kuccha Structure at field S3 Commercial	S1:489 m WNW	P	654667	1610172
SGJA-50-S3		S3: 359 m ESE	P	654534	1610217
SGJA-63-S1	S1 Commercial Structure	S1: 449 m ESE	P	655653	1615058
SGJA-66-S4		S4: 372 m SSW	P	655522	1615078
SGJA-67-S4	S4 is Pollutary Farm	S4: 500 m NNE	P	650693	1614121
SGJA-71-S1	S1 & S2 Commercial Structure	S1: 396 m SE	P	655139	1611504
SGJA-71-S2		S2: 480 m SSE	P	655117	1611405
SGJA-73-S1	S1 Residential S2: Commercial	S1: 165 m NE	P	637495	1607455
SGJA-73-S2		S2: 290 m NE	P	637514	1607567

SGJA-74-S2		S2: 190 m NE	P	638585	1606702
SGJA-74-S7		S7: 390 m SW	P	638236	1606228
SGJA-75-S1	S1 & S2 Residential multi structures	S1: 323 m S	P	638016	1604640
SGJA-75-S2		S2: 335 m SW	P	637632	1604856
SGJA-77-S1	S1 residential	S1: 473 m S	P	639789	1604547
SGJA-78-S1	S1 residential	S1 284 m SSE	P	636849	1606266
SGJA-79-S2		S2: 238 m NW	P	639255	1605805
SGJA-80-S2	S2 Residential	S2: 451 m W	P	636153	1605155
SGJA-85-S6		S6: 337 m NW	P	635623	1604385
SGJA-86-S1	S1 commercial/ residential	S1: 358 m SW	P	635050	1603523
SGJA-89-S1	S1 residential	S1: 484 m SW	P	631271	1594006
SGJA-91-S1	S1 & S3 residential S2 & S4 Kuccha Structure at Field	S1: 359 m E	p	631851	1591709
SGJA-91-S3		S3: 410 m S	p	631444	1591253
SGJA-92-S1	S1 & S3 residential S2 & S4 Kuccha Structure at Field	S1: 260 m NW	p	631444	1591253
SGJA-92-S3		S3: 473 m NE	p	631989	1591499
SGJA-94-S1	S1 residential multi structure S2: pakka temporary	S1: 419 m E	p	632176	1590223
SGJA-110-S1	S1 commercial S2 S3 kaccha	S1: 445 m S	p	634610	1593446
SGJA-114-S2		S2: 377 m NNW	P	639336	1588947
SGJA-115-S1	S1 is Industry S2, S3 & S4 Kuccha Structure at Field S5 is Poultary Farm	S1: 364 m NNW	p	635204	1589645
SGJA-115-S5		S5	p	635241	1589510
SGJA-116-S2		S2: 403 m NNE	p	635157	1589333
SGJA-118-S3		S3: 493 m NNW	p	637345	1588323
SGJA-118-S4		S4: 396 m S	p	637501	1587545
SGJA-126-S2		S2: 436 W	p	636428	1594602

SGJA-127-S1	S1 Temple S2 to S6 Kuccha Structure at Field	S1: 464 m ESE	p	638092	1595442
SGJA-128-S3		S3: 80 m NNE	p	636428	1594602
SGJA-128-S9		S9: 377 m SSE	p	636261	1594001
SGJA-140-S1	S1 Residential	S1: 357 m E	p	634206	1597766
SGJA-141-S1	S1 permanent commercial	S1: 377 m NNE	P	634386	1598982
SGJA-141-S2	S2 school	S2:414 m NNE	P	634214	1598915

Table 6-22 Shadow Flicker Modelling Analysis- All Structures

Receptor ID	Type	Distance & Direction	Receptor Type	Shadow Flicker(h/year)
SGJA-01-S1	S1 kaccha	S1: 260 m N	T	1:26
SGJA-01-S2	S2 kaccha	S2: 303 m SW	T	1:33
SGJA-01-S3	S3 kaccha	S3: 355 m SW	T	2:03
SGJA-01-S4	S4 Pollutory Farm	S4: 292 m SSW	P	2:08
SGJA-02-S1	S1 kaccha strcuture at field	S1: 326 m W	T	5:38
SGJA-03-S1	S1 kaccha strcuture at field	S1: 485 m SW	T	3:57
SGJA-04-S1	S1 Residential Structure	S1: 452 m NNW	p	0:40
SGJA-04-S2	S2 and	S2: 267 m WSW	t	0:42
SGJA-04-S3	S3 is Kuccha structure at field	S3: 146 m SE	t	0:43
SGJA-05-S1	S1 Kuccha	S1: 485 m NE	t	1:16
SGJA-05-S2	S2	S2: 489 m NW	t	14:41
SGJA-05-S3	S3 is Kuccha	S3: 389 m SW	t	1:43
SGJA-06-S1	S1 Kuccha	S1: 154 m WSW	t	5:33
SGJA-08-S1	S1 Kuccha	S1: 266 m NW	t	24:42
SGJA-10-S1	S1 Solar Plant Site Office	S1: 341m NE	P	13:50
SGJA-10-S2	S2 Solar Plant Security Office	S2: 484 m NE	p	7:46
SGJA-12-S1	S1 Kuccha	S1: 328 WSW	t	10:04
SGJA-13-S1	S1 Poultary Farm S2 is kaccha structure at field	S1: 305 m N	P	
SGJA-13-S2		S2: 470 m SSE	t	4:54
SGJA-14-S1	S1 Kuccha	S1: 426 SSW	t	1:25
SGJA-15-S1	S1 is Commercial shop	S1: 392 m SW	P	9:41
SGJA-16-S1	S1 Kuccha	S1: 433 m W	T	6:27
SGJA-16-S2	S1 Kuccha	S2: 372 m ENE	T	3:57
SGJA-20-S1	S1 Kuccha	S1: 73 m W	T	37:28
SGJA-20-S2	S1 Kuccha	S2: 386 m SW	T	1:55

SGJA-22-S1	S1 Kuccha	S1: 383 m W	T	1:39
SGJA-22-S2	S1 Kuccha	S2: 457 m W	T	35:29
SGJA-22-S3	S1 Kuccha	S3: 465 m S	T	0:42
SGJA-23-S1	S1 Kuccha	S1: 491 SW	t	0:35
SGJA-27-S1	S1 Kuccha	S1: 218 m N	t	0:32
SGJA-27-S2	S1 Kuccha	S2: 393 m SE	t	2:25
SGJA-28-S1	S1 Kuccha	S1: 486 m ESE	t	0:35
SGJA-28-S2	S1 Kuccha		t	3:03
SGJA-29-S1	S1 Solar Plant Security Office S2 and S3 are Kuccha structure at field	S1: 361m SE	P	0.25
SGJA-29-S2	S1 Kuccha	S2: 399 m W	t	7:10
SGJA-29-S3	S1 Kuccha	S3: 432 m W	t	15:40
SGJA-31-S1	S1 Residential (Multiple Structures) S2 to S4 kaccha structure at field	S1: 445 m ESE	P	
SGJA-31-S2	S1 Kuccha	S2: 485 m SE	t	
SGJA-31-S3	S1 Kuccha	S3: 392 m NNW	t	1:10
SGJA-31-S4	S1 Kuccha	S4: 438 m SW	t	
SGJA-32-S1	S1 & S2 Commercial S3 Temple S4 & S5 kaccha structure at fiel	S1: 485 m ESE	P	
SGJA-32-S2		S2: 500 m SE	P	1:44
SGJA-32-S3		S3: 464 m ENE	P	0:11
SGJA-32-S4	S1 Kuccha	S4: 491 m NNE	T	
SGJA-32-S5	S1 Kuccha	S5: 356 m SW	T	
SGJA-33-S1	S1 & S2 Residential S3 to S5 Commercial S6 & S7 kaccha structure at field	S1: 497 m SW	P	
SGJA-33-S2		S2: 462 m SW	P	
SGJA-33-S3		S3: 250 m SW	P	
SGJA-33-S4		S4: 367 m WNW	P	
SGJA-33-S5		S5: 328 m WNW	P	
SGJA-33-S6	S1 Kuccha	S6: 426 m SSW	T	
SGJA-33-S7	S1 Kuccha	S7: 500 m SSW	T	
SGJA-37-S1	S1 Kuccha	S1: 326 m NW	T	0:43
SGJA-39-S1	S1 Kuccha	S1: 458 m NE	T	4:25

SGJA-39-S2	S1 Kuccha	S2: 464 m ESE	P	2:40
SGJA-39-S3		S3: 424 m NW	P	0:21
SGJA-40-S1	S1 is Pollutary Farm	S1: 413 m NE	P	2:33
SGJA-40-S2	S2 Commercial Stucture	S2: 481 m NW	P	1:00
SGJA-40-S3	S3 Commercial Stucture	S3: 463 m NW	P	1:58
SGJA-42-S1	S1 Commercial Structure	S1: 495 m NE	P	2:37
SGJA-44-S1	S1 Solar Plant Security Office	S1: 432m NW	P	6:33
SGJA-47-S1	S1 & S2 Residential S3 & S4 Kaccha Structure at Field	S1: 449 m NW	P	1:03
SGJA-47-S2		S2: 491 m SW	P	0:25
SGJA-47-S3	S1 Kuccha	S3: 371 m W	T	0:25
SGJA-47-S4	S1 Kuccha	S4: 387 m ENE	T	0:05
SGJA-48-S1	S1 to S3 Commercial S4 & S5 Kuccha Structure at field S6 Residential Structure	S1: 351 m ENE	p	7:44
SGJA-48-S2		S2: 402 m SE	p	3:50
SGJA-48-S3		S3: 430 m E	p	3:20
SGJA-48-S4	S1 Kuccha	S4: 449 m NE	T	0:06
SGJA-48-S5	S1 Kuccha	S5: 324 m ENE	T	6:41
SGJA-48-S6		S6: 432 m W	p	1:10
SGJA-49-S1	S1 Kuccha	S1: 356 m NE	T	
SGJA-50-S1	S1 Residential S2 Kuccha Structure at field S3 Commercial	S1:489 m WNW	P	6:36
SGJA-50-S2	S1 Kuccha	S2: 249 m SE	T	1:06
SGJA-50-S3		S3: 359 m ESE	P	4:50
SGJA-51-S1	S1 Kuccha	S1:284 m ESE	T	49:36
SGJA-52-S1	S1 Kuccha	S1:337 m SSE	T	0:21
SGJA-53-S1	S1 Kuccha	S1:275 m NE	T	1:36
SGJA-53-S2	S1 Kuccha	S2: 432 m NW	T	1:02
SGJA-54-S1	S1 Pucca Vacant Structure	S1: 423 m ENE	T	3:16
SGJA-56-S1	S1 Kuccha Structure at field	S1:478 m NW	T	8:27
SGJA-58-S1	S1 Kuccha Structure at field	S1:385 m WSW	T	11:14
SGJA-63-S1	S1 Commercial Structure	S1: 449 m ESE	P	16:48
SGJA-63-S2	S2 Kuccha	S2: 369 m E	T	2:18
SGJA-64-S1	Kuccha- S1	S1: 439 m NW	T	
SGJA-64-S2	Kuccha- S2	S2: 314 m WNW	T	0:12

SGJA-65-S1	Kuccha- S1	S1: 71 m ENE	T	8:24
SGJA-65-S2	Kuccha- S2	S2: 285 m NNE	T	6:41
SGJA-66-S1	Kuccha- S1	S1: 231 m SE	T	
SGJA-66-S2	Kuccha- S2	S2: 361 m ESE	T	
SGJA-66-S3	Kuccha- S3	S3: 282 m SSW	T	0:26
SGJA-66-S4		S4: 372 m SSW	P	17:19
SGJA-67-S1	Kuccha- S1	S1: 389 m ESE	T	0:00
SGJA-67-S2	Kuccha- S2	S2: 439 m ESE	T	
SGJA-67-S3	Kuccha- S3	S3: 331 m NNE	T	0:03
SGJA-67-S4	S4 is Pollutary Farm	S4: 500 m NNE	P	0:02
SGJA-68-S1	Kuccha- S1	S1: 433 m NNE	T	
SGJA-68-S2	Kuccha- S2	S2: 476 m NNE	t	
SGJA-70-S1	Kuccha- S1	S1: 223 m SSW	T	
SGJA-71-S1	S1 & S2 Commercial Structure	S1: 396 m SE	P	2:37
SGJA-71-S2		S2: 480 m SSE	P	12:34
SGJA-73-S1	S1 Residential S2: Commercial	S1: 165 m NE	P	
SGJA-73-S2		S2: 290 m NE	P	
SGJA-74-S1	S1, S3, S4, S5, S6: Kaccha Structure at Field S2 & S7 Residential	S1: 143 m N	T	0:09
SGJA-74-S2		S2: 190 m NE	P	0:10
SGJA-74-S3		S3: 305 m NE	T	0:10
SGJA-74-S4		S4: 275 m SE	T	
SGJA-74-S5		S5: 337 m SE	T	
SGJA-74-S6		S6: 311 m S	T	
SGJA-74-S7		S7: 390 m SW	P	
SGJA-75-S1	S1 & S2 Residential multi structures	S1: 323 m S	P	6:08
SGJA-75-S2		S2: 335 m SW	P	6:30
SGJA-77-S1	S1 residential	S1: 473 m S	P	0:01
SGJA-78-S1	S1 residential	S1 284 m SSE	P	1:47
SGJA-79-S1	S1; S3; S4 kaccha structure at field S2 Residential (2-3 structures)	S1: 225 m NE	T	9:52
SGJA-79-S2		S2: 238 m NW	P	
SGJA-79-S3		S3: 235 m E	T	
SGJA-79-S4		S4: 390 m SW	T	0:07
SGJA-80-S1	S1 kaccha	S5: 240 m SE	P	6:25
SGJA-80-S2	S2 Residential (multi structures)	S2: 451 m W	P	11:07

SGJA-81-S1	S1;	S1: 276 m NE	T	3:48
SGJA-81-S2	S2;	S2: 419 m NE	T	2:59
SGJA-81-S3	S3;	S3: 338 m SW	T	
SGJA-81-S4	S4 kaccha	S4: 406 m NW	T	0.875
SGJA-85-S1	S1 to S5 Kuccha Structure at field kaccha S6 Residential	S1: 86.3 m SW	T	4:35
SGJA-85-S2		S2: 254 m SW	T	1:03
SGJA-85-S3		S3: 495 m ESE	T	5:04
SGJA-85-S4		S4: 467 m NE	T	32:51
SGJA-85-S5		S5: 454 m NNW	T	
SGJA-85-S6		S6: 337 m NW	P	
SGJA-86-S1	S1 commercial/ residential	S1: 358 m SW	P	
SGJA-86-S2	S2,	S2: 312 m NE	T	1:33
SGJA-86-S3	S3 kaccha	S3: 486 m E	T	1:02
SGJA-87-S1	S1 kaccha	S1: 376 NW	T	0:00
SGJA-88-S1	S1 kaccha	S1: 447 m SE	T	
SGJA-89-S1	S1 residential	S1: 484 m SW	P	
SGJA-90-S1	S1: kaccha	S1: 292 m SE	T	
SGJA-91-S1	S1 & S3 residential S2 & S4 Kuccha Structure at Field	S1: 359 m E	p	0:02
SGJA-91-S2		S2: 406 m NE	T	
SGJA-91-S3		S3: 410 m S	p	
SGJA-91-S4		S4: 328 m SE	T	
SGJA-92-S1	S1 & S3 residential S2 & S4 Kuccha Structure at Field	S1: 260 m NW	p	
SGJA-92-S2		S2: 317 m SW	t	
SGJA-92-S3		S3: 473 m NE	p	
SGJA-92-S4		S4: 294 m N	t	0:28
SGJA-93-S1	S1 kaccha S2: pakka temporary	S1: 345 m SE	t	0:33
SGJA-93-S2		S2: 343 m NW	t	
SGJA-94-S1	S1 residential multi structure S2: pakka temporary	S1: 419 m E	p	0:32
SGJA-94-S2		S2: 487 m SW	t	
SGJA-95-S1	S1 S2 pakka temporary	S1 : 227 m NW	t	2:04
SGJA-95-S2		S2: 452 m NW	t	0:29
SGJA-96-S1	S1 pakka temporary	S1: 286 m NW	t	0:29
SGJA-97-S1	S1 kaccha	S1: 279 m WSW	t	1:16

SGJA-102-S1	S1: kaccha	S1: 429 m NW	t	
SGJA-104-S1	S1 S2 kaccha	S1: 438 m NE	t	0:48
SGJA-106-S1	S1 kaccha	S1: 456 m SW	t	
SGJA-107-S1	S1 S2 S3 kaccha	S1: 437 m SW	t	
SGJA-107-S2		S2: 302 m N	t	
SGJA-107-S3		S3: 481 m NW	t	1:28
SGJA-109-S1	S1 kaccha	S1: 392 m SW	t	6:01
SGJA-110-S1	S1 commercial S2 S3 kaccha	S1: 445 m S	p	
SGJA-110-S2		S2: 190 SW	t	2:56
SGJA-110-S3		S3: 434 m SW	t	
SGJA-111-S1	S1 to S4 Kuccha Structure at Field	S1: 364 m NNW	t	7:44
SGJA-111-S2		S2: 439 m SSW	t	
SGJA-111-S3		S3: 417 m SSE	t	0:04
SGJA-111-S4		S4: 475 m SSE	t	0:04
SGJA-113-S1	S1 & S2 Kuccha Structure at Field	S1: 438 m WSW	t	0:04
SGJA-113-S2		S2: 474 m SSW	t	0:05
SGJA-114-S1	S1 Kuccha Structure at Field S2 is Pollutary Farm	S1: 324 m NNE	t	0:43
SGJA-114-S2		S2: 377 m NNW	P	
SGJA-115-S1	S1 is Industry S2, S3 & S4 Kuccha Structure at Field S5 is Pollutary Farm	S1: 364 m NNW	p	8:08
SGJA-115-S2		S2: 439 m SSW	t	1:15
SGJA-115-S3		S3: 417 m SSE	t	0:05
SGJA-115-S4		S4: 475 m SSE	t	0:09
SGJA-115-S5		S5	p	2:07
SGJA-116-S1	S1 Kuccha Structure at Field S2 Industry	S1: 305 m NE	t	0:31
SGJA-116-S2		S2: 403 m NNE	p	14:15
SGJA-118-S1	S1& S2 Kuccha Structure at Field S3 & S4 Residential Structure	S1: 314 m NW	t	14:33
SGJA-118-S2		S2: 231 m SW	t	
SGJA-118-S3		S3: 493 m NNW	p	0:19
SGJA-118-S4		S4: 396 m S	p	
SGJA-120-S1	S1 & S2 Kuccha Structure at Field	S1: 460 m ENE	t	2:39

SGJA-120-S2		S2: 441 m N	t	1:13
SGJA-121-S1	S1 Kuccha Structure at Field	S1: 467 m NE	t	1:35
SGJA-122-S1	S1 Kuccha Structure at Field	S1: 315 m ESE	t	1:16
SGJA-126-S1	S1 Kuccha Structure at Field S2 Commercial	S1: 243 WNW	t	1:37
SGJA-126-S2		S2: 436 W	p	5:26
SGJA-127-S1	S1 Temple S2 to S6 Kuccha Structure at Field	S1: 464 m ESE	p	
SGJA-127-S2		S2: 431 m ESE	t	1:01
SGJA-127-S3		S3: 488 m ESE	t	
SGJA-127-S4		S4: 433 m W	t	
SGJA-127-S5		S5: 478 m SW	t	
SGJA-127-S6		S6: 328 m SSE	t	0:36
SGJA-128-S1	S1, S2, S4, S5, S6, S7, S8 Kuccha Structure at Field S3 Commercial S9 Residential	S1: 165 m SE	t	3:58
SGJA-128-S2		S2: 331 m ESE	t	2:14
SGJA-128-S3		S3: 80 m NNE	p	5:22
SGJA-128-S4		S4: 320 m NE	t	24:26
SGJA-128-S5		S5: 304 m NNE	t	31:50
SGJA-128-S6		S6: 245 m WNW	t	3:14
SGJA-128-S7		S7: 388 m WSW	t	1:55
SGJA-128-S8		S8: 431 m SSE	t	1:48
SGJA-128-S9		S9: 377 m SSE	p	3:37
SGJA-129-S1	S1 Kuccha Structure at Field	S1: 162 NW	t	1:35
SGJA-130-S1	S1 & S2 Kuccha Structure at Field	S1: 466 m ESE	t	4:29
SGJA-130-S2		S2: 349 m WSW	t	3:58
SGJA-131-S1	S1 to S3 Kuccha Structure at Field	S1: 353 m ESE	t	2:29
SGJA-131-S2		S2: 487 m N	t	3:58
SGJA-131-S3		S3: 250 m NW	t	10:20
SGJA-134-S1	S1 Kuccha Structure at Field	S1: 293 m NW	t	0:50
SGJA-136-S1	S1 Kuccha Structure at Field	S1: 155 m WSW	t	5:39
SGJA-137-S1	S1 Kuccha Structure at Field	S1: 436 m E	t	8:47
SGJA-138-S1	S1 & S2 Kuccha Structure	S1: 470 m SSE	t	0:55

	at Field			
SGJA-138-S2		S2:90 m SE	t	7:45
SGJA-139-S1	S1 Kuccha Structure at Field	S1: 205 m SE	t	0:23
SGJA-140-S1	S1 Residential	S1: 357 m E	p	9:54
SGJA-141-S1	S1 permanent commercial	S1: 377 m NNE	P	2:20
SGJA-141-S2	S2 school	S2:414 m NNE	P	3:21
SGJA-143-S1	S1 Kuccha Structure at Field	S1: 442 m E	t	1:34

Table 6-23: Shadow Flicker Modelling Analysis- Permanent Structures

Receptor ID	Type	Distance & Direction	Receptor Type	Shadow flicker(h/year)
SGJA-01-S4	S4 Poultary Farm	S4: 292 m SSW	P	2:08
SGJA-04-S1	S1 Residential Structure	S1: 452 m NNW	P	0:40
SGJA-10-S1	S1 Solar Plant Site Office	S1: 341m NE	P	13:50
SGJA-10-S2	S2 Solar Plant Security Office	S2: 484 m NE	P	7:46
SGJA-13-S1	S1 Pollutory Farm S2 is kaccha structure at field	S1: 305 m N	P	
SGJA-15-S1	S1 is Commercial shop	S1: 392 m SW	P	9:41
SGJA-29-S1	S1 Solar Plant Security Office S2 and S3 are Kuccha structure at field	S1: 361m SE	P	0.25
SGJA-31-S1	S1 Residential (Multiple Structures) S2 to S4 kaccha structure at field	S1: 445 m ESE	P	
SGJA-32-S1	S1 & S2 Commercial S3 Temple S4 & S5 kaccha structure at fiel	S1: 485 m ESE	P	
SGJA-32-S2		S2: 500 m SE	P	1:44
SGJA-32-S3		S3: 464 m ENE	P	0:11
SGJA-33-S1	S1 & S2 Residential S3 to S5 Commercial	S1: 497 m SW	P	

SGJA-33-S2		S2: 462 m SW	P	
SGJA-33-S3		S3: 250 m SW	P	
SGJA-33-S4		S4: 367 m WNW	P	
SGJA-33-S5		S5: 328 m WNW	P	
SGJA-39-S2	S1 Kuccha	S2: 464 m ESE	P	2:40
SGJA-39-S3		S3: 424 m NW	P	0:21
SGJA-40-S1	S1 is Pollutary Farm	S1: 413 m NE	P	2:33
SGJA-40-S2	S2 Commercial Stucture	S2: 481 m NW	P	1:00
SGJA-40-S3	S3 Commercial Stucture	S3: 463 m NW	P	1:58
SGJA-42-S1	S1 Commercial Structure	S1: 495 m NE	P	2:37
SGJA-44-S1	S1 Solar Plant Security Office	S1: 432m NW	P	6:33
SGJA-47-S1	S1 & S2 Residential S3 & S4 Kaccha Structure at Field	S1: 449 m NW	P	1:03
SGJA-47-S2		S2: 491 m SW	P	0:25
SGJA-48-S1	S1 to S3 Commercial S4 & S5 Kuccha Structure at field S6 Residential Structure	S1: 351 m ENE	P	7:44
SGJA-48-S2		S2: 402 m SE	P	3:50
SGJA-48-S3		S3: 430 m E	P	3:20
SGJA-48-S6		S6: 432 m W	P	1:10
SGJA-50-S1	S1 Residential S2 Kuccha Structure at field S3 Commercial	S1:489 m WNW	P	6:36
SGJA-50-S3		S3: 359 m ESE	P	4:50
SGJA-63-S1	S1 Commercial Structure	S1: 449 m ESE	P	16:48

SGJA-66-S4		S4: 372 m SSW	P	17:19
SGJA-67-S4	S4 is Poultary Farm	S4: 500 m NNE	P	0:02
SGJA-71-S1	S1 & S2 Commercial Structure	S1: 396 m SE	P	2:37
SGJA-71-S2		S2: 480 m SSE	P	12:34
SGJA-73-S1	S1 Residential S2: Commercial	S1: 165 m NE	P	
SGJA-73-S2		S2: 290 m NE	P	
SGJA-74-S2		S2: 190 m NE	P	0:10
SGJA-74-S7		S7: 390 m SW	P	
SGJA-75-S1	S1 & S2 Residential multi structures	S1: 323 m S	P	6:08
SGJA-75-S2		S2: 335 m SW	P	6:30
SGJA-77-S1	S1 residential	S1: 473 m S	P	0:01
SGJA-78-S1	S1 residential	S1 284 m SSE	P	1:47
SGJA-79-S2		S2: 238 m NW	P	
SGJA-80-S1	S1 kaccha	S5: 240 m SE	P	6:25
SGJA-80-S2	S2 Residential (multi structures)	S2: 451 m W	P	11:07
SGJA-85-S6		S6: 337 m NW	P	
SGJA-86-S1	S1 commercial/ residential	S1: 358 m SW	P	
SGJA-89-S1	S1 residential	S1: 484 m SW	P	
SGJA-91-S1	S1 & S3 residential S2 & S4 Kuccha Structure at Field	S1: 359 m E	P	0:02
SGJA-91-S3		S3: 410 m S	P	
SGJA-92-S1	S1 & S3 residential S2 & S4 Kuccha Structure at Field	S1: 260 m NW	P	

SGJA-92-S3		S3: 473 m NE	P	
SGJA-94-S1	S1 residential multi structure S2: pakka temporary	S1: 419 m E	P	0:32
SGJA-110-S1	S1 commercial S2 S3 kaccha	S1: 445 m S	P	
SGJA-114-S2		S2: 377 m NNW	P	
SGJA-115-S1	S1 is Industry S2, S3 & S4 Kuccha Structure at Field S5 is Poultary Farm	S1: 364 m NNW	P	8:08
SGJA-115-S5		S5	P	2:07
SGJA-116-S2		S2: 403 m NNE	P	14:15
SGJA-118-S3		S3: 493 m NNW	P	0:19
SGJA-118-S4		S4: 396 m S	P	
SGJA-126-S2		S2: 436 W	P	5:26
SGJA-127-S1	S1 Temple S2 to S6 Kuccha Structure at Field	S1: 464 m ESE	P	
SGJA-128-S3		S3: 80 m NNE	P	5:22
SGJA-128-S9		S9: 377 m SSE	P	3:37
SGJA-140-S1	S1 Residential	S1: 357 m E	P	9:54
SGJA-141-S1	S1 permanent commercial	S1: 377 m NNE	P	2:20
SGJA-141-S2	S2 school	S2:414 m NNE	P	3:21

Given the guidelines of 30 hours or less per year is considered acceptable, the operation of the wind farm theoretically results in shadow flicker impacts that could be considered minor for the purposes of this study.

The temporary structures that record more than 30 hours per year comprises of structures that are either a shed to store agricultural produce or animal shelter area.

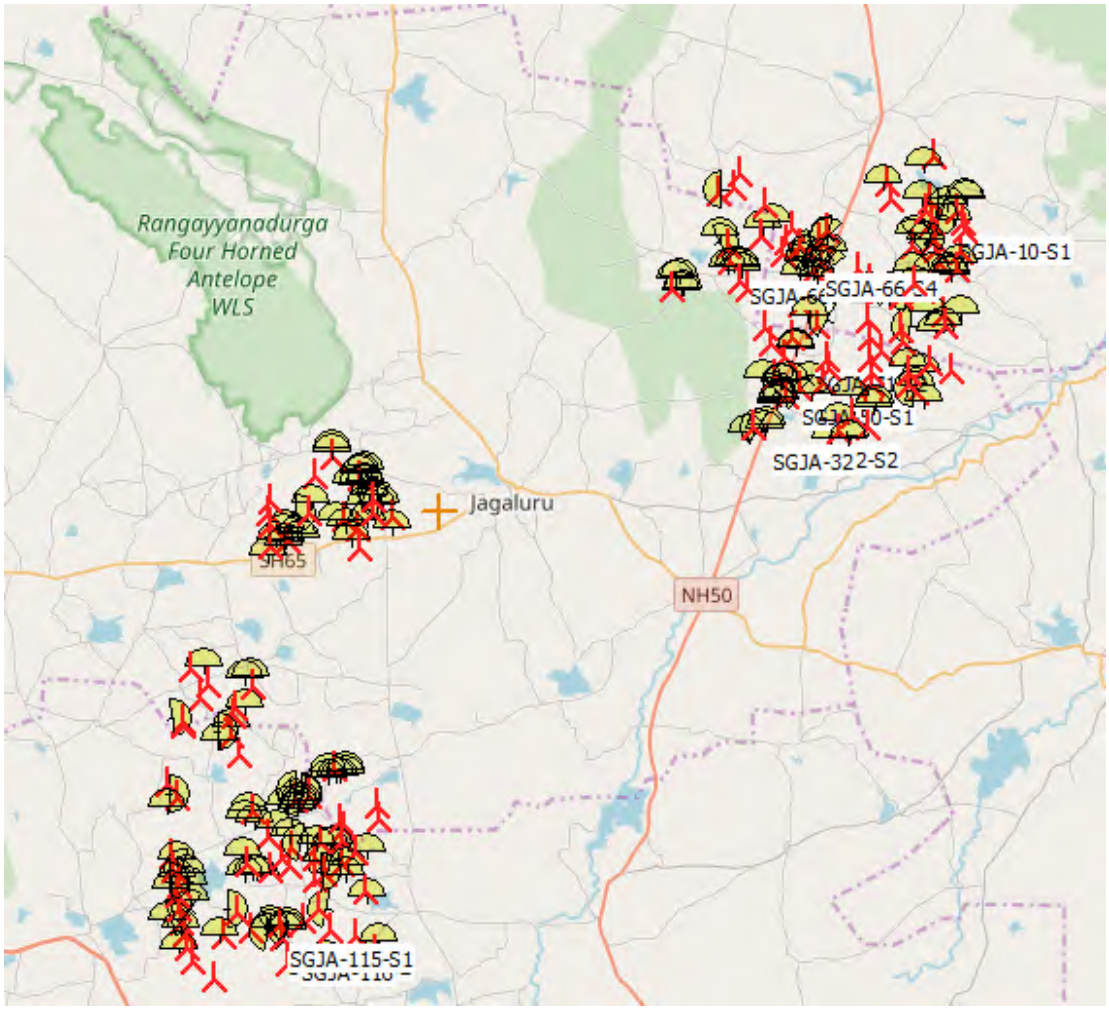


Figure 6-2: WTG and shadow receptors location map

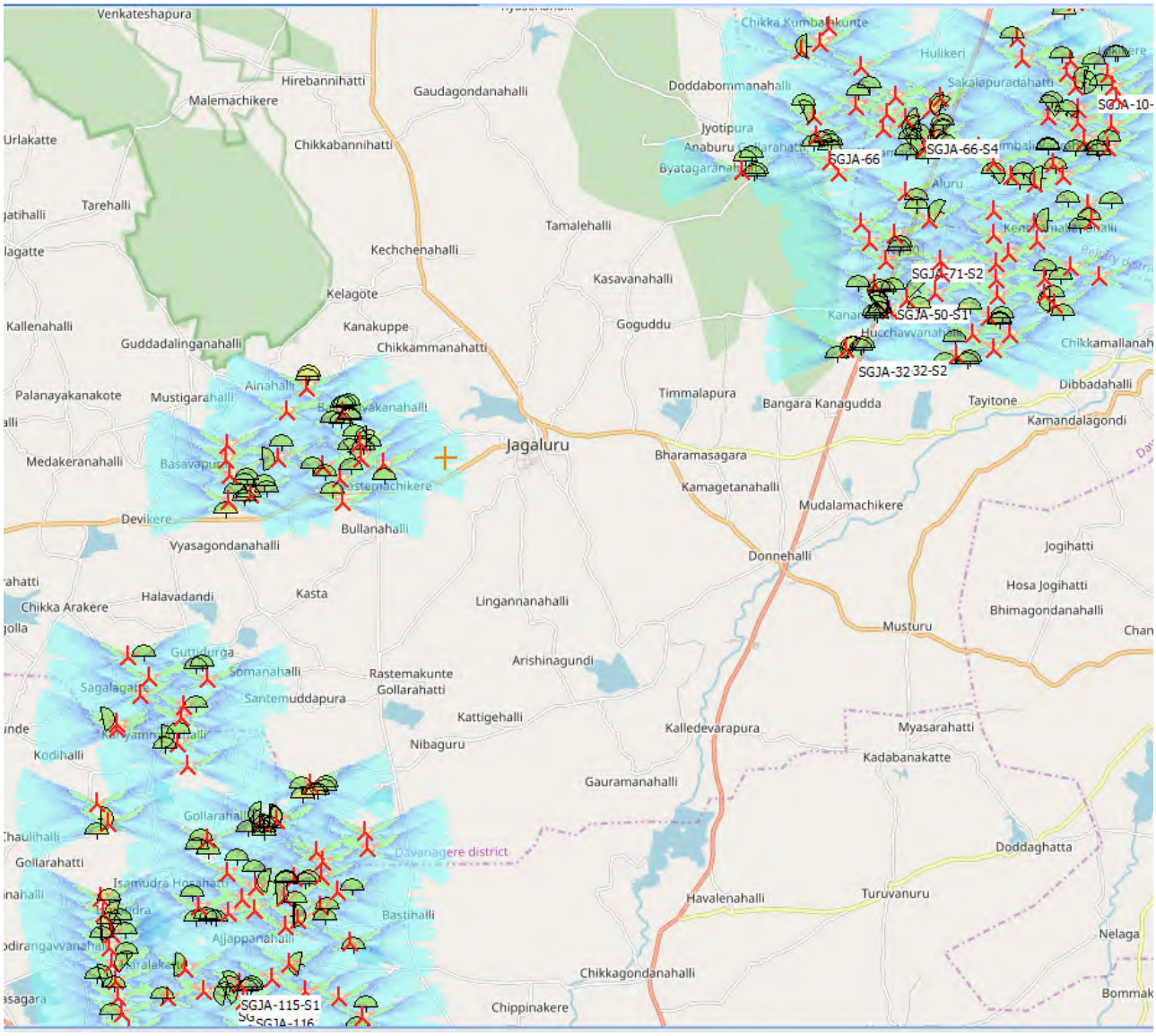


Figure 6-3: Shadow Flicker Analysis –Shadow Hours Per Year

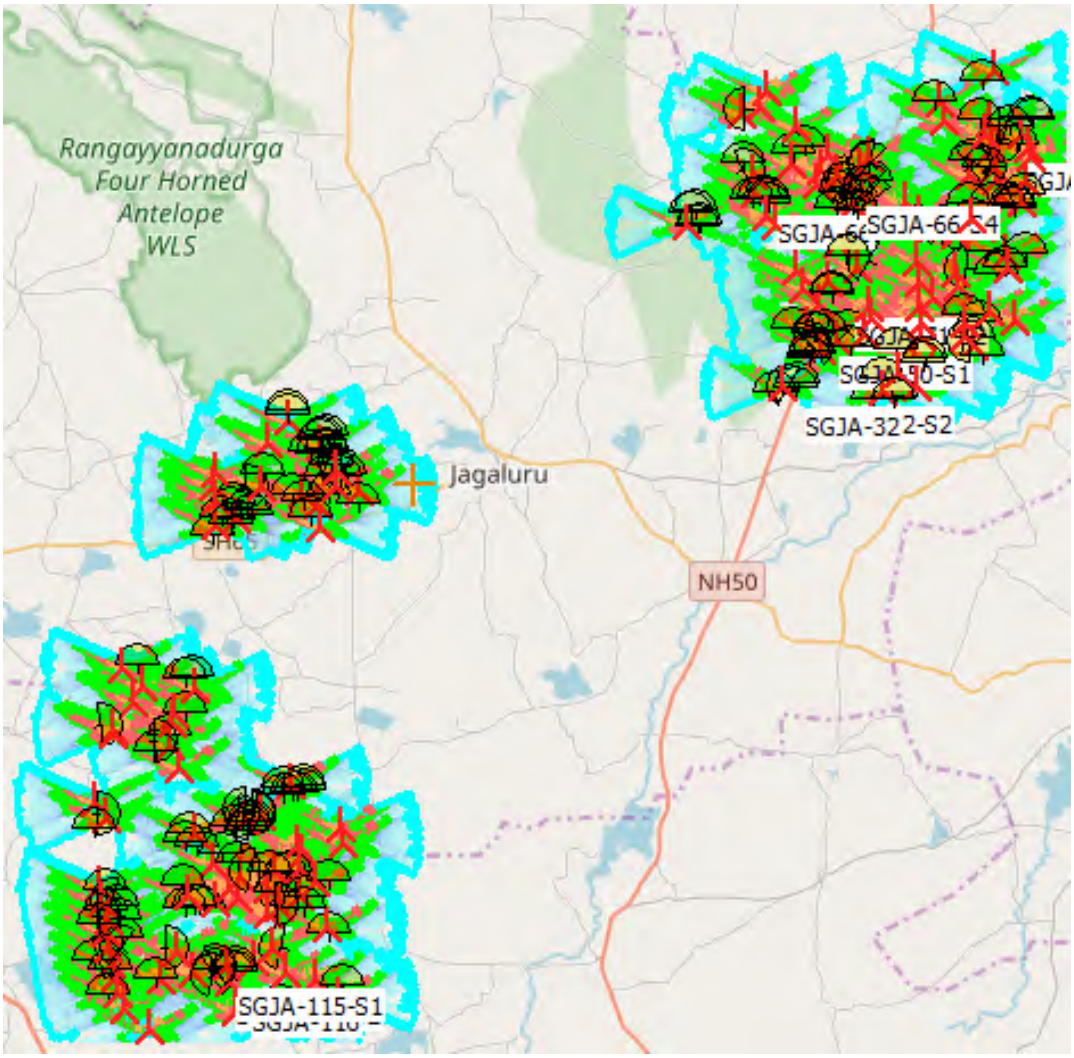


Figure 6-4: Shadow Flicker Analysis-Permanent Structures

Mitigation Measures

No mitigation measures are to be needed as the amount of shadow flicker hours/year are less than IFC guidelines of 30 h/year on permanent structures including dwelling units. The results of the WindPro shadow flicker assessment show that chances of shadow flicker incident to occur is very less.

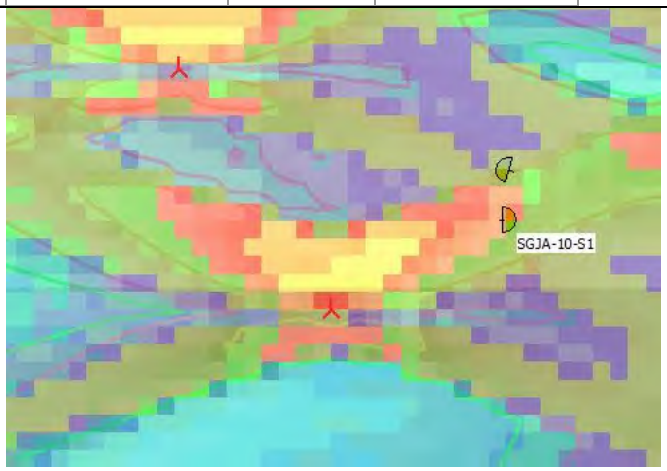
Majority of the structures located are kaccha structure at fields, few dwellings and commercial use. No specific mitigation measures are required to be taken up as the amount of shadow flicker hours/year are less than IFC guidelines of 30 h/year on permanent

structures. The results of the WindPro shadow flicker assessment show that during the real case that chances of shadow flicker occurence is very less.

Table 6-24 Shadow Flicker Modelling Analysis- Permanent Structures

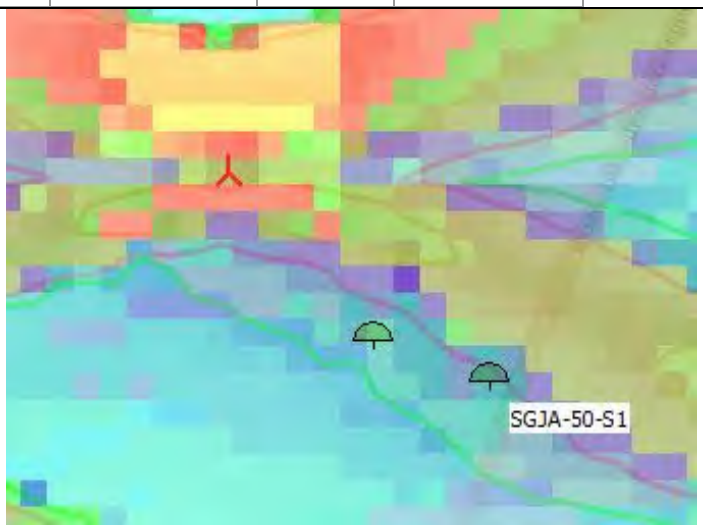
Receptor ID	Type	Distance & Direction	Receptor Type	Shadow Flicker (h/year)	Max minutes (min/day)
SGJA-140-S1	S1 Residential	S1: 357 m E	p	9:54	28
SGJA-50-S1	S1 Residential	S1:489 m WNW	P	6:36	29
SGJA-10-S1	S1 Solar Plant Site Office	S1: 341m NE	P	13:50	29
SGJA-71-S2		S2: 480 m SSE	P	12:34	28
SGJA-116-S2		S2: 403 m NNE	p	14:15	21
SGJA-32-S2		S2: 500 m SE	P	1:44	20
SGJA-115-S1	S1 is Industry	S1: 364 m NNW	p	8:08	27
SGJA-66-S4		S4: 372 m SSW	P	17:19	23

Receptor ID	Type	Distance & Direction	Receptor Type	Real case (h/year)	Max minutes (min/day)
SGJA-140-S1	S1 Residential	S1: 357 m E	p	9:54	28

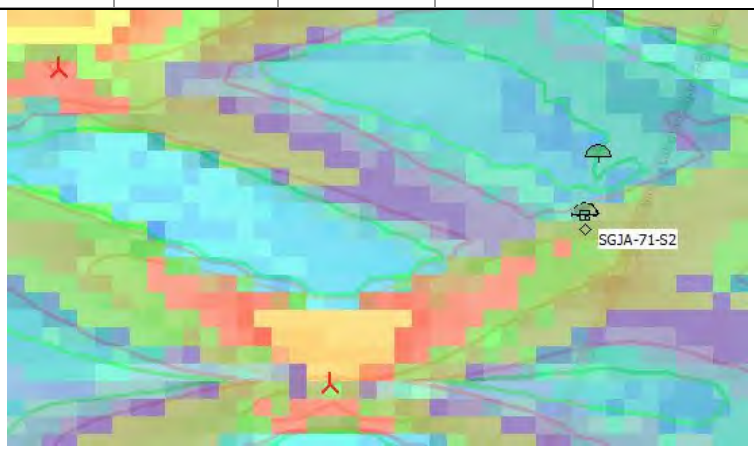


Receptor ID	Type	Distance & Direction	Receptor Type	Real case (h/year)	Max minutes (min/day)

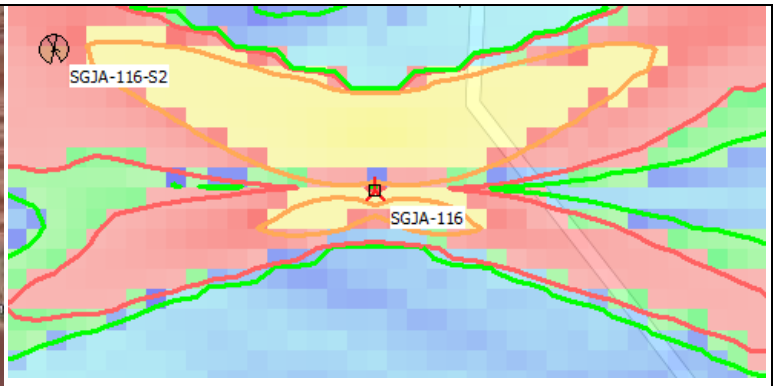
SGJA-50-S1	S1 Residential	S1:489 m WNW	P	6:36	29



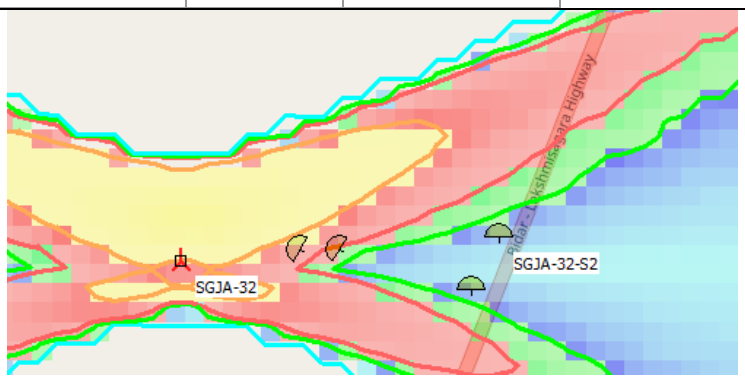
Receptor ID	Type	Distance & Direction	Receptor Type	Real case (h/year)	Max minutes (min/day)
SGJA-71-S2		S2: 480 m SSE	P	12:34	28



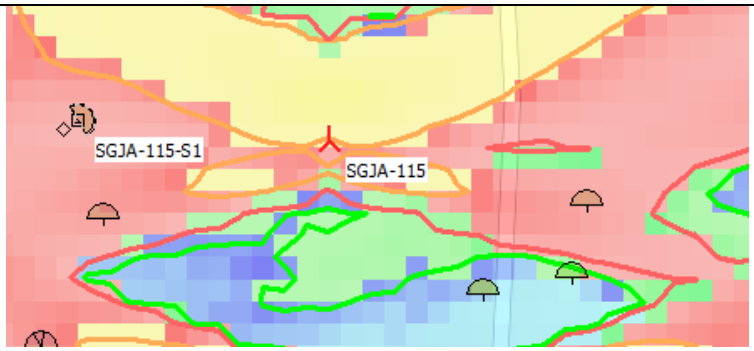
Receptor ID	Type	Distance & Direction	Receptor Type	Real case (h/year)	Max minutes (min/day)
SGJA-116-S2		S2: 403 m NNE	p	14:15	21



Receptor ID	Type	Distance & Direction	Receptor Type	Real case (h/year)	Max minutes (min/day)
SGJA-32-S2		S2: 500 m SE	P	1:44	20



Receptor ID	Type	Distance & Direction	Receptor Type	Real case (h/year)	Max minutes (min/day)
SGJA-115-S1	S1 is Industry	S1: 364 m NNW	p	8:08	27



Receptor ID	Type	Distance & Direction	Receptor Type	Real case (h/year)	Max minutes (min/day)
SGJA-66-S4		S4: 372 m SSW	P	17:19	23

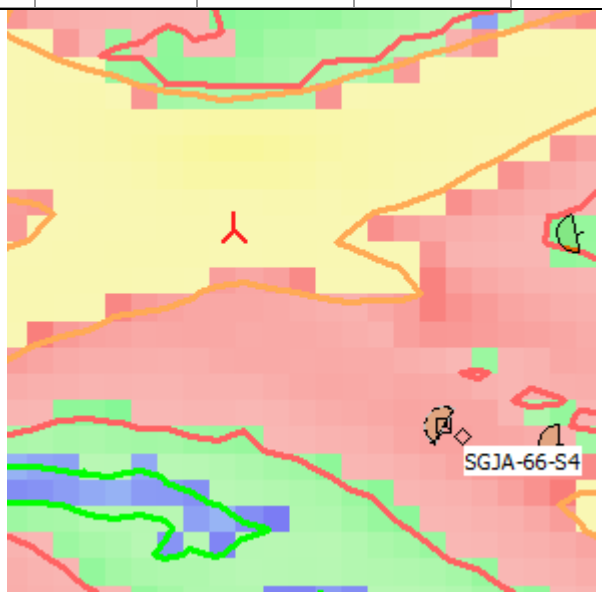


Figure 6-5: WTG and Shadow Receptor – Worst Case

Significance of Impacts:

The impact on visual and aesthetics will have medium intensity with a local spread for a long duration (of activity) which will result in an overall moderate impact without mitigation.

Table 6-25: Impact Significance – Visual and Aesthetics

Impact	Shadow Flickering during the Operation Phase				
Impact Type	Direct	Indirect	Induced		
Impact Duration	Short-term		Medium	Long Term	
Spread	Local	Medium	High		
Impact Scale	Within 500 m from the proposed WTGs on the receptors located in visible radius				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/ Receptor Senstivity/ Intensity	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	
	Considering the overall impact magnitude and vulnerability of receptors, the impact significance is assessed as **moderate** for permanent receptors, and minor for rest of the receptors.				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Minor**				

6.4.3 NOISE

Impacts

Noise from a wind turbine is typically made up of three distinct elements:

- a reasonably steady, broad-band noise of aerodynamic origin, which depends on the blade tip speed
- a tonal noise element from mechanical components within the nacelle
- a regular, pulsed element resulting from interaction between the mast and blades

The wind farm comprised of 143 wind turbine generators. A noise modelling exercise has been carried out for the project using the WindPRO software available for the design and planning of wind farms. WindPRO contains pre-configured noise calculation models in order to calculate predicted noise levels at each noise sensitive area plus a ready built catalogue of wind turbines and noise emission data.

The Noise Modelling was carried out to estimate increase in noise levels during Operational Phase of the project and cumulative impacts on noise levels in the vicinity during Day Time and Night Time. Wind turbines produce noise through a number of different mechanisms, which can be roughly grouped into mechanical and aerodynamic sources therefore the

Assessment was carried out to foresee impacts of the project and to adopt mitigation measures for the project during planning phase.

The Noise Modelling was carried out in accordance with IFC's EHS Guidelines for Wind Energy, 2015. The receptors were chosen according to their environmental sensitivity (human, livestock, or wildlife). The modelling includes background ambient noise levels in the absence of any wind turbines. The quantification of impact due to the project is made considering the magnitude criteria in the table below.

Table 6-26: Criteria for Impact Magnitude for Assessment of Impact to Ambient Noise

Magnitude Criteria	Negligible	Small	Medium	Large
Noise Quality	Predicted noise levels are at or less than 3 dB(A) above the relevant limits / threshold	Predicted noise levels are 3 to less than 5 dB(A) above the relevant limits/ thresholds	Predicted noise levels are between 5 and 10 dB(A) above the relevant limits/ thresholds.	Predicted noise levels are more than 10 dB(A) above the relevant limits / thresholds.
	Short Term exposure (few hours in a day and not continuous)		Medium Term exposure (1 to 6 months)	Long term exposure (>6 months)

Source: ISO 9613-2: 1996

Ambient Noise Standards

As per IFC EHS Guidelines, the hourly equivalent noise level (LAeq) for residential, institutional and commercial area shall be within 55 dB (A) during daytime (0700-2200 hours) and 45dB (A) during night time (2200-0700 hours).

Ambient noise standards have been notified by MoEFCC via gazette notification dated February 14, 2000 have been furnished in Table 6: Ambient Air Quality Standards in respect of Noise. Further; Noise standards in the work environment are specified by Occupational Safety and Health Administration (OSHA-USA) which in turn are being enforced by Government of India through model rules framed under the Factories Act.

NOISE MODELLING

Noise impact due to operation of the proposed Project, was analysed using numerical model SoundPlan v 8.0 which is specifically designed for environmental and workplace noise assessment. The ISO 9613-2 general noise calculation model was used which considers frequency dependent attenuation due to geometric divergence, atmospheric absorption, and ground effect. The model is valid for downwind propagation under a well-developed moderate ground-based temperature inversion, which are conditions favorable to noise propagation from source to receiver.

The numerical results were then used to produce a noise map that visually indicates the extent of the incremental noise emissions from the site. The noise emissions of 99 dBA (due to low noise wind blades) were modelled for estimated wind speed of the area i.e. 10 m/s at a hub height of 127 m and rotor diameter of 114m as per the technical specification provided for the WTG. The data available for wind turbines from the WindPRO wind catalogue was used for the noise assessment. The estimated wind speed is based on the cutoff wind speed details for the WTG. The direction of the wind is not taken into consideration as the wind could blow from any direction at the speeds that were modelled.

It is imperative to mention here that noise modelling has been carried out at ideal condition of turbine as well as wind speed calculated based on meteorological data. The incremental noise at any receptor is a function of its distance and presence of other noise sources (which may be another turbine). The Incremental values indicate the additional noise at the receptor location due to the WTGs and is hence dependent on the distance of the receptor from the proposed turbine/turbines;

The resultant values have been calculated by taking the logarithmic addition of the incremental noise from WTG/WTGs and the baseline noise level. The additional exposure has thereafter been calculated as the absolute difference between the resultant and the baseline value. Since the night time baseline noise levels are generally lower than the incremental, the logarithmic addition tends to be higher as compared to the values for daytime. The formula for calculating resultant noise level is:

Resultant Noise Level = 10 log (10 (Baseline noise/10) + 10 (Incremental Noise/10))

Operating of WTGs with 100% usage scenario was modelled to cover the operation phase of the Project. In addition, to represent a worst-case scenario for the assessment, all WTGs were assumed to be operating simultaneously and for 24 hours. Noise generation had been considered at the hub height of 130 m above ground. Flat terrain was assumed as a

conservative measure. It has been assumed that the noise sensitive receptors are always in downwind direction to consider the worst-case scenario.

It can be seen from the figures below that the predicted turbine immission levels for INOX Turbines are below the noise limits derived following the guidance of MOEF and ETSU-R-97 for both day time and night time periods. The overall sufficient uncertainty is built into the predictions to ensure the noise limits will not be breached in practice.

ASSUMPTIONS

- Noise calculation model: IOA Wind Turbine
- Wind speed: 10 m/s as per the WTG Catalogue for 2.1 MW WTG
- Ground attenuation: General, fixed, Ground factor: 1 (hard surface)
- Topographic screening, Reduction: 0 dB
- Meteorological coefficient, C0: 0dB
- Type of demand in calculation: 3: WTG noise is compared to ambient noise
- Height above ground level, when no value in NSA object: 4.0 m
- Daytime Temperature: day time high of 30^0C and humidity of 70% and night time of 26^0C and humidity of 50% was used for the model (it is to be noted lower the temperature and higher is the humidity is more conducive for higher transmission of noise in the air)

NOISE RECEPTORS

During the site survey, households located within 500 m of the project turbines were identified as receptors since the impact of noise is usually limited within this distance range only. In total; 219 receptors for noise and 8 noise monitoring stations were used as a reference point for baseline noise levels for determing impact on temporary and permanent receptors.

Table 6-27: List of Monitoring Stations and Noise Results

S.No.	Monitoring Location	Distance and Direction	Reasons for selecting location	Geographical Coordinates	Leq (day)	Leq (night)
1	N1 Alur	802 m NW from WTG 47	Village road connecting Highway (Solapur Mangalore Highway)	656154.19 m E 1613685.01 m N	52.9	39.6

2	N2 Basavapura	871 m NE from WTG 82	Village road connecting Highway (SH 65)	634232.36 m E 1604866.57 m N	49.6	41.1
3	N3 Issmudra	470 m NW from WTG 91		631934.26 m E 1591568.45 m N	50.2	38.8
4	N4 Huchavvananahalli	608 m NW from WTG 33	Village road connecting Highway (Solapur Mangalore Highway)	655023.79 m E 1609088.38 m N	52.0	39.9
5	N5 Guttidurga	707 m S from WTG 141	WTG site 141 approaching road connecting Village road and Highway SH 65	634393.58 m E 1599308.48 m N	49.6	39.8
6	N6 Yelagodu	1.5 km from the WTG125	WTG 125 and WTG 114 site approach road connecting Village road	639876.93 m E 1589852.20 m N	48.1	39.8
7	N7 Hulikere	926 m SE from the WTG 70	WTG 70 site approach road connecting Village road	656061.29 m E 1616745.89 m N	48.5	38.8
8	N8 Giddanakatte	494 m S from the WTG 77	WTG 77 site approach road connecting Village road	640678.62 m E 1606152.73 m N	56.3	47.0

IDENTIFIED NOISE RECEPTORS

During the field survey, the project area was assessed to identify all noise sensitive receptors in the study area.

Table 6-28: List of WTG's studied for Noise Assessment

Receptor - ID.No.	WTG - ID.No.	WTG ID	WTG Coordinates (in UTM)		Nearest house/ structure within 500 m from WTG Footprint	Distance with direction	WTG ID	Use of Structure	Receptor Coodinates	
			X	Y	Type of Structure				x	y
1	1	SGJA-01	661289	1614478	S1 kaccha	S1: 260 m N	SGJA-01-S1	T	661341	1614693
2					S2 kaccha	S2: 303 m SW	SGJA-01-S2	T	660975	1614387
3					S3 kaccha	S3: 355 m SW	SGJA-01-S3	T	661049	1614261
4					S4 Pollutory Farm	S4: 292 m SSW	SGJA-01-S4	P	661006	1614362
5	2	SGJA-02	661437	1616278	S1 kaccha strcuture at field	S1: 326 m W	SGJA-02-S1	T	661112	1616314
6	3	SGJA-03	660311	1618770	S1 kaccha strcuture at field	S1: 485 m SW	SGJA-03-S1	T	659997	1618397
7	4	SGJA-04	659659	1613994	S1 Residential Structure	S1: 452 m NNW	SGJA-04-S1	p	659526	1614404
8					S2 and	S2: 267 m WSW	SGJA-04-S2	t	659532	1614435
9					S3 is Kuccha structure at field	S3: 146 m SE	SGJA-04-S3	t	659747	1613873
10	5	SGJA-05	661275	1616674	S1 Kuccha	S1: 485 m NE	SGJA-05-S1	t	661588	1617167
11					S2	S2: 489 m NW	SGJA-05-S2	t	660868	1616948
12					S3 is Kuccha	S3: 389 m SW	SGJA-05-S3	t	661506	1617177
13	6	SGJA-06	658597	1617716	S1 Kuccha	S1: 154 m WSW	SGJA-06-S1	t	658439	1617699

14	7	SGJA-07	658743	1617091	No Structure	..				
15	8	SGJA-08	660182	1617054	S1 Kuccha	S1: 266 m NW	SGJA-08-S1	t	659930	1617119
16	9	SGJA-09	660051	1616698	No Structure	..				
17	10	SGJA-10	660317	1616285	S1 Solar Plant Site Office	S1: 341m NE	SGJA-10-S1	P	660605	1616460
18					S2 Solar Plant Security Office	S2: 484 m NE	SGJA-10-S2	p	660624	1616527
19	11	SGJA-11	661545	1615954	No Structure	..				
20	12	SGJA-12	660399	1615607	S1 Kuccha	S1: 328 WSW	SGJA-12-S1	t	660073	1615555
21	13	SGJA-13	659520	1615385	S1 Pollutory Farm S2 is kaccha structure at field	S1: 305 m N	SGJA-13-S1	P	659528	1615682
22						S2: 470 m SSE	SGJA-13-S2	t	659618	1615819
23	14	SGJA-14	661417	1615152	S1 Kuccha	S1: 426 SSW	SGJA-14-S1	t	661341	1614692
24	15	SGJA-15	660589	1614680	S1 is Commercial shop	S1: 392 m SW	SGJA-15-S1	P	660336	1614375
25	16	SGJA-16	658405	1613645	S1 Kuccha	S1: 433 m W	SGJA-16-S1	T	658777	1613688
26					S1 Kuccha	S2: 372 m ENE	SGJA-16-S2	T	657918	1613694
27	17	SGJA-17	657897	1612584	No Structure	..				
28	18	SGJA-18	657925	1611891	No Structure	..				
29	19	SGJA-19	658369	1611359	No Structure	..				
30	20	SGJA-20	660817	1612326	S1 Kuccha	S1: 73 m W	SGJA-20-S1	T	660745	1612344
31					S1 Kuccha	S2: 386 m SW	SGJA-20-S2	T	660501	1612098
32	21	SGJA-21	657979	1611053	No Structure	..				
33	22	SGJA-22	660730	1612812	S1 Kuccha	S1: 383 m W	SGJA-22-S1	T	660140	1612849
34					S1 Kuccha	S2: 457 m W	SGJA-22-S2	T	660744	1612343
35					S1 Kuccha	S3: 465 m S	SGJA-22-S3	T	661431	1612824

36	23	SGJA-23	660226	161095	S1 Kuccha	S1: 491 SW	SGJA-23-S1	t	659924	1610572
37	24	SGJA-24	658005	161058	No Structure	..				
38	25	SGJA-25	661074	161066	No Structure	..				
39	26	SGJA-26	658055	161011	No Structure	..				
40	27	SGJA-27	659753	160983	S1 Kuccha	S1: 218 m N	SGJA-27-S1	t	659714	1610052
41					S1 Kuccha	S2: 393 m SE	SGJA-27-S2	t	660011	1609514
42	28	SGJA-28	659435	161063	S1 Kuccha	S1: 486 m ESE	SGJA-28-S1	t	659923	1610572
43					S1 Kuccha		SGJA-28-S2	t	659458	1610831
44	29	SGJA-29	657795	160947	S1 Solar Plant Security Office S2 and S3 are Kuccha structure at field	S1: 361m SE	SGJA-29-S1	P	658106	1609258
45					S1 Kuccha	S2: 399 m W	SGJA-29-S2	t	658194	1609422
46					S1 Kuccha	S3: 432 m W	SGJA-29-S3	t	657239	1609696
47	30	SGJA-30	659207	161172	No Structure	..				
48	31	SGJA-31	656814	160832	S1 Residential (Multiple Structures) S2 to S4 kaccha structure at field	S1: 445 m ESE	SGJA-31-S1	P	657227	1608142
49					S1 Kuccha	S2: 485 m SE	SGJA-31-S2	t	657159	1608070
50					S1 Kuccha	S3: 392 m NNW	SGJA-31-S3	t	656797	1608730
51					S1 Kuccha	S4: 438 m SW	SGJA-31-S4	t	656484	1608052
52	32	SGJA-32	653536	160849	S1 & S2 Commercial S3 Temple S4 & S5	S1: 485 m ESE	SGJA-32-S1	P	653788	1608510

					kaccha structure at fiel					
53						S2: 500 m SE	SGJA-32-S2	P	654040	1608530
54						S3: 464 m ENE	SGJA-32-S3	P	653995	1608447
55					S1 Kuccha	S4: 491 m NNE	SGJA-32-S4	T	653725	653725
56					S1 Kuccha	S5: 356 m SW	SGJA-32-S5	T	653287	1608237
57	33	SGJA-33	654814	160948	S1 & S2 Residential S3 to S5 Commercial S6 & S7 kaccha structure at field	S1: 497 m SW	SGJA-33-S1	P	654379	1609481
58						S2: 462 m SW	SGJA-33-S2	P	654437	1609398
59						S3: 250 m SW	SGJA-33-S3	P	654577	1609550
60						S4: 367 m WNW	SGJA-33-S4	P	654460	1609731
61						S5: 328 m WNW	SGJA-33-S5	P	654449	1609864
62					S1 Kuccha	S6: 426 m SSW	SGJA-33-S6	T	654448	1609876
63					S1 Kuccha	S7: 500 m SSW	SGJA-33-S7	T	654522	1609562
64	34	SGJA-34	657290	160895	No Structure	..				
65	35	SGJA-35	656380	161074	No Structure	..				
66	36	SGJA-36	656203	161017	No Structure	..				
67	37	SGJA-37	659972	161363	S1 Kuccha	S1: 326 m NW	SGJA-37-S1	T	659747	1613872
68	38	SGJA-38	654213	161164	No Structure	..				
69	39	SGJA-39	655324	160963	S1 Kuccha	S1: 458 m NE	SGJA-39-S1	T	655679	1610247
70					S1 Kuccha	S2: 464 m ESE	SGJA-39-S2	P	655718	1609717
71						S3: 424 m NW	SGJA-39-S3	P	654927	1610274
72	40	SGJA-40	655970	161233	S1 is Pollutary Farm	S1: 413 m NE	SGJA-40-S1	P	656315	1612578
73					S2	S2: 481 m	SGJA-40-	P	655617	1612661

					Commercial Stucture	NW	S2			
74					S3 Commercial Stucture	S3: 463 m NW	SGJA-40-S3	P	655627	1612925
75	41	SGJA-41	653952	1612206	No Structure	..				
76	42	SGJA-42	654683	161115	S1 Commercial Structure	S1: 495 m NE	SGJA-42-S1	P	655139	1611504
77	43	SGJA-43	657931	160819	No Structure	..				
78	44	SGJA-44	658403	160953	S1 Solar Plant Security Office	S1: 432m NW	SGJA-44-S1	P	658106	1609270
79	45	SGJA-45	655269	161324	No Structure	..				
80	46	SGJA-46	657466	161473	No Structure	..				
81	47	SGJA-47	655823	161414	S1 & S2 Residential S3 & S4 Kaccha Structure at Field	S1: 449 m NW	SGJA-47-S1	P	655406	1614724
82						S2: 491 m SW	SGJA-47-S2	P	655300	1614238
83					S1 Kuccha	S3: 371 m W	SGJA-47-S3	T	655462	1614504
84					S1 Kuccha	S4: 387 m ENE	SGJA-47-S4	T	655922	1614141
85	48	SGJA-48	656103	161478	S1 to S3 Commercial S4 & S5 Kuccha Structure at field S6 Residential Structure	S1: 351 m ENE	SGJA-48-S1	p	656413	1614944
86						S2: 402 m SE	SGJA-48-S2	p	656439	1614547
87						S3: 430 m E	SGJA-48-S3	p	656261	1614651
88					S1 Kuccha	S4: 449 m NE	SGJA-48-S4	T	656394	1615117

89					S1 Kuccha	S5: 324 m ENE	SGJA-48-S5	T	656392	1614985
90						S6: 432 m W	SGJA-48-S6	p	655690	1614814
91	49	SGJA-49	656000	1615583	S1 Kuccha	S1: 356 m NE	SGJA-49-S1	T	656355	1615678
92	50	SGJA-50	654370	1610407	S1 Residential S2 Kuccha Structure at field S3 Commercial	S1:489 m WNW	SGJA-50-S1	P	654667	1610172
93					S1 Kuccha	S2: 249 m SE	SGJA-50-S2	T	653906	1610326
94						S3: 359 m ESE	SGJA-50-S3	P	654534	1610217
95	51	SGJA-51	659442	1610151	S1 Kuccha	S1:284 m ESE	SGJA-51-S1	T	659618	1609997
96	52	SGJA-52	657903	1614011	S1 Kuccha	S1:337 m SSE	SGJA-52-S1	T	657918	1613694
97	53	SGJA-53	659126	1613415	S1 Kuccha	S1:275 m NE	SGJA-53-S1	T	659349	1613603
98					S1 Kuccha	S2: 432 m NW	SGJA-53-S2	T	658675	1613356
99	54	SGJA-54	659132	1612226	S1 Pucca Vacant Structure	S1: 423 m ENE	SGJA-54-S1	T	659529	1612335
100	55	SGJA-55	652951	1618010	No Structure	..				
101	56	SGJA-56	660412	1615220	S1 Kuccha Structure at field	S1:478 m NW	SGJA-56-S1	T	660072	1615555
102	57	SGJA-57	652159	1617285	No Structure	..				
103	58	SGJA-58	652711	1617520	S1 Kuccha Structure at field	S1:385 m WSW	SGJA-58-S1	T	652327	1617438
104	59	SGJA-59	656326	1611098	No Structure	..				
105	60	SGJA-60	653936	1616841	No Structure	..				
106	61	SGJA-61	654967	1615966	No Structure	..				
107	62	SGJA-62	654618	1615007	No Structure	..				
108	63	SGJA-63	655277	1615302	S1 Commerc	S1: 449 m ESE	SGJA-63-S1	P	655653	1615058

					ial Structure					
109					S2 Kuccha	S2: 369 m E	SGJA-63-S2	T	655673	1615300
110	64	SGJA-64	652519	1615343	Kuccha-S1	S1: 439 m NW	SGJA-64-S1	T	652221	1615486
111					Kuccha-S2	S2: 314 m WNW	SGJA-64-S2	T	652217	1615691
112	65	SGJA-65	653796	1615670	Kuccha-S1	S1: 71 m ENE	SGJA-65-S1	T	653862	1615973
113					Kuccha-S2	S2: 285 m NNE	SGJA-65-S2	T	654202	1616220
114	66	SGJA-66	652620	1614764	Kuccha-S1	S1: 231 m SE	SGJA-66-S1	T	652958	1614609
115					Kuccha-S2	S2: 361 m ESE	SGJA-66-S2	T	652772	1614574
116					Kuccha-S3	S3: 282 m SSW	SGJA-66-S3	T	652538	1614490
117						S4: 372 m SSW	SGJA-66-S4	P	655522	1615078
118	67	SGJA-67	650391	1613713	Kuccha-S1	S1: 389 m ESE	SGJA-67-S1	T	650507	1614028
119					Kuccha-S2	S2: 439 m ESE	SGJA-67-S2	T	650755	1613584
120					Kuccha-S3	S3: 331 m NNE	SGJA-67-S3	T	650834	1613661
121					S4 is Pollutary Farm	S4: 500 m NNE	SGJA-67-S4	P	650693	1614121
122	68	SGJA-68	653002	1614019	Kuccha-S1	S1: 433 m NNE	SGJA-68-S1	T	653068	1614495
123					Kuccha-S2	S2: 476 m NNE	SGJA-68-S2	t	653022	1614349
124	69	SGJA-69	654726	1615458	No Structure	..				
125	70	SGJA-70	656314	1615927	Kuccha-S1	S1: 223 m SSW	SGJA-70-S1	T	656343	1615763
126	71	SGJA-71	654966	1611871	S1 & S2 Commercial Structure	S1: 396 m SE	SGJA-71-S1	P	655139	1611504
127						S2: 480 m SSE	SGJA-71-S2	P	655117	1611405
128	72	SGJA-72	653279	1613690	No Structure	..				
129	73	SGJA-73	637464	1607261	S1 Residential S2: Commercial	S1: 165 m NE	SGJA-73-S1	P	637495	1607455
130						S2: 290 m NE	SGJA-73-S2	P	637514	1607567

131	74	SGJA-74	638508	160611	S1, S3, S4, S5, S6: Kaccha Structure at Field S2 & S7 Residential	S1: 143 m N	SGJA-74-S1	T	638506	1606668
132						S2: 190 m NE	SGJA-74-S2	P	638585	1606702
133						S3: 305 m NE	SGJA-74-S3	T	638724	1606757
134						S4: 275 m SE	SGJA-74-S4	T	638731	1606353
135						S5: 337 m SE	SGJA-74-S5	T	638758	1606285
136						S6: 311 m S	SGJA-74-S6	T	638482	1606201
137						S7: 390 m SW	SGJA-74-S7	P	638236	1606228
138	75	SGJA-75	637957	160493	S1 & S2 Residential multi structures	S1: 323 m S	SGJA-75-S1	P	638016	1604640
139						S2: 335 m SW	SGJA-75-S2	P	637632	1604856
140	76	SGJA-76	638466	160460	No Structure	..				
141	77	SGJA-77	639756	160506	S1 residential	S1: 473 m S	SGJA-77-S1	P	639789	1604547
142	78	SGJA-78	636847	160647	No Structure	..				
143	79	SGJA-79	639061	160564	S1; S3; S4 kaccha structure at field S2 Residential (2-3 structures)	S1: 225 m NE	SGJA-79-S1	T	638904	1605843
144						S2: 238 m NW	SGJA-79-S2	P	639255	1605805
145						S3: 235 m E	SGJA-79-S3	T	639302	1605667
146						S4: 390 m SW	SGJA-79-S4	T	638746	1605422
147	80	SGJA-80	636602	160516 4	S1 kaccha	S5: 240 m SE	SGJA-80-S1	T	636714	1605504
148					S2	S2: 451 m W	SGJA-80-	P	636153	1605155

					Residential (multi structures)		S2			
149	81	SGJA-81	639073	1605181	S1;	S1: 276 m NE	SGJA-81-S1	T	639162	1605440
150					S2;	S2: 419 m NE	SGJA-81-S2	T	639357	1605537
151					S3;	S3: 338 m SW	SGJA-81-S3	T	638804	1604848
152					S4 kaccha	S4: 406 m NW	SGJA-81-S4	T	638745	1605421
153	82	SGJA-82	635063	1605123	No Structure	..				
154	83	SGJA-83	635103	1605564	No Structure	..				
155	84	SGJA-84	635159	1604676	No Structure	..				
156	85	SGJA-85	635789	1604096	S1 to S5 Kuccha Structure at field kaccha S6 Residential	S1: 86.3 m SW	SGJA-85-S1	T	635746	1604022
157						S2: 254 m SW	SGJA-85-S2	T	635618	1603906
158						S3: 495 m ESE	SGJA-85-S3	T	636286	1604162
159						S4: 467 m NE	SGJA-85-S4	T	636197	1604328
160						S5: 454 m NNW	SGJA-85-S5	T	635696	1604538
161						S6: 337 m NW	SGJA-85-S6	P	635623	1604385
162	86	SGJA-86	635129	1603880	S1 commercial/ residential	S1: 358 m SW	SGJA-86-S1	P	635050	1603523
163					S2,	S2: 312 m NE	SGJA-86-S2	T	635355	1604103
164					S3 kaccha	S3: 486 m E	SGJA-86-S3	T	635617	1603905
165	87	SGJA-87	638538	1603859	S1 kaccha	S1: 376 NW	SGJA-87-S1	T	638248	1604113
166	88	SGJA-88	631245	1594918	S1 kaccha	S1: 447 m SE	SGJA-88-S1	T	631408	1594499
167	89	SGJA-89	631598	1594361	S1 residential	S1: 484 m SW	SGJA-89-S1	P	631271	1594006
168	90	SGJA-	63138	15921	S1:	S1: 292 m SE	SGJA-90-	T	631662	1592051

		90	6	54	kaccha		S1			
169	91	SGJA-91	631476	591662	S1 & S3 residential S2 & S4 Kuccha Structure at Field	S1: 359 m E	SGJA-91-S1	p	631851	1591709
170						S2: 406 m NE	SGJA-91-S2	T	631662	1592051
171						S3: 410 m S	SGJA-91-S3	p	631444	1591253
172						S4: 328 m SE	SGJA-91-S4	T	631638	1591374
173	92	SGJA-92	631709	591089	S1 & S3 residential S2 & S4 Kuccha Structure at Field	S1: 260 m NW	SGJA-92-S1	p	631444	1591253
174						S2: 317 m SW	SGJA-92-S2	t	631425	1590948
175						S3: 473 m NE	SGJA-92-S3	p	631989	1591499
176						S4: 294 m N	SGJA-92-S4	t	632124	1591069
177	93	SGJA-93	631656	590679	S1 kaccha S2: pakka temporary	S1: 345 m SE	SGJA-93-S1	t	632156	1590506
178						S2: 343 m NW	SGJA-93-S2	t	631425	1590948
179	94	SGJA-94	631746	590187	S1 residential multi structure S2: pakka temporary	S1: 419 m E	SGJA-94-S1	p	632176	1590223
180						S2: 487 m SW	SGJA-94-S2	t	631408	1589832
181	95	SGJA-95	631836	589695	S1 S2 pakka temporary	S1 : 227 m NW	SGJA-95-S1	t	631280	1589744
182						S2: 452 m NW	SGJA-95-S2	t	631816	1589477
183	96	SGJA-96	631925	589203	S1 pakka temporary	S1: 286 m NW	SGJA-96-S1	t	631816	1589477
184	97	SGJA-97	632015	588711	S1 kaccha	S1: 279 m WSW	SGJA-97-S1	t	631744	1588677
185	98	SGJA-98	632272	588210	No Structure	..				
186	99	SGJA-	63307	15875	No	..				

		99	3	23	Structure					
187	100	SGJA-100	631853	1597127	No Structure	..				
188	101	SGJA-101	632532	1598158	No Structure	..				
189	102	SGJA-102	631842	1597277	S1: kaccha	S1: 429 m NW	SGJA-102-S1	t	631444	1597430
190	103	SGJA-103	633967	1596047	No Structure	..				
191	104	SGJA-104	635154	1592906	S1 S2 kaccha	S1: 438 m NE	SGJA-104-S1	t	635442	1593254
192	105	SGJA-105	639251	1594134	No Structure	S2: 48 m NW				
193	106	SGJA-106	633764	1597472	S1 kaccha	S1: 456 m SW	SGJA-106-S1	t	633692	1597023
194	107	SGJA-107	633666	1596723	S1 S2 S3 kaccha	S1: 437 m SW	SGJA-107-S1	t	633268	1596551
195						S2: 302 m N	SGJA-107-S2	t	633691	1597022
196						S3: 481 m NW	SGJA-107-S3	t	633216	1596920
197	108	SGJA-108	639341	1593642	No Structure	..				
198	109	SGJA-109	637966	1592797	S1 kaccha	S1: 392 m SW	SGJA-109-S1	t	637606	1592635
199	110	SGJA-110	634558	1593880	S1 commercial S2 S3 kaccha	S1: 445 m S	SGJA-110-S1	p	634610	1593446
200						S2: 190 SW	SGJA-110-S2	t	634362	1593848
201						S3: 434 m SW	SGJA-110-S3	t	634257	1593578
202	111	SGJA-111	634318	1591888	S1 to S4 Kuccha Structure at Field	S1: 364 m NNW	SGJA-111-S1	t	634130	1592195
203						S2: 439 m SSW	SGJA-111-S2	t	634251	1591456
204						S3: 417 m SSE	SGJA-111-S3	t	634531	1591533
205						S4: 475 m SSE	SGJA-111-S4	t	634676	1591503
206	112	SGJA-112	635615	1592143	No Structure	..				
207	113	SGJA-113	635198	1591712	S1 & S2 Kuccha Structure at Field	S1: 438 m WSW	SGJA-113-S1	t	634676	1591503
208						S2: 474 m SSW	SGJA-113-S2	t	634844	1591461
209	114	SGJA-	63923	15886	S1	S1: 324 m	SGJA-114-	t	639057	1588329

		114	3	35	Kuccha Structure at Field S2 is Pollutary Farm	NNE	S1			
210						S2: 377 m NNW	SGJA-114-S2	P	639336	1588947
211	115	SGJA-115	635551	158961 8	S1 is Industry S2, S3 & S4 Kuccha Structure at Field S5 is Pollutary Farm	S1: 364 m NNW	SGJA-115-S1	p	635204	1589645
212						S2: 439 m SSW	SGJA-115-S2	t	635157	1589333
213						S3: 417 m SSE	SGJA-115-S3	t	635766	1589409
214						S4: 475 m SSE	SGJA-115-S4	t	635889	1589433
215						S5	SGJA-115-S5	p	635241	1589510
216	116	SGJA-116	635641	158912 6	S1 Kuccha Structure at Field S2 Industry	S1: 305 m NE	SGJA-116-S1	t	635908	1589530
217						S2: 403 m NNE	SGJA-116-S2	p	635157	1589333
218	117	SGJA-117	635879	158817 7	No Structure	..				
219	118	SGJA-118	637475	158794 4	S1& S2 Kuccha Structure at Field S3 & S4 Residential Structure	S1: 314 m NW	SGJA-118-S1	t	637224	1588160
220						S2: 231 m SW	SGJA-118-S2	t	637378	1587743
221						S3: 493 m NNW	SGJA-118-S3	p	637345	1588323
222						S4: 396 m S	SGJA-118-S4	p	637501	1587545
223	119	SGJA-119	635968	159181 2	No Structure	..				
224	120	SGJA-	63600	15924	S1 & S2	S1: 460 m	SGJA-120-	t	636409	1592700

		120	0	78	Kuccha Structure at Field	ENE	S1			
225						S2: 441 m N	SGJA-120-S2	t	635964	1592936
226	121	SGJA-121	636905	591314	S1 Kuccha Structure at Field	S1: 467 m NE	SGJA-121-S1	t	637168	1591655
227	122	SGJA-122	637041	590236	S1 Kuccha Structure at Field	S1: 315 m ESE	SGJA-122-S1	t	637360	1590228
228	123	SGJA-123	636493	589780	No Structure	..				
229	124	SGJA-124	637496	589405	No Structure	..				
230	125	SGJA-125	638491	589231	No Structure	..				
231	126	SGJA-126	636642	594456	S1 Kuccha Structure at Field S2 Commercial	S1: 243 WNW	SGJA-126-S1	t	636206	1594434
232						S2: 436 W	SGJA-126-S2	p	636428	1594602
233	127	SGJA-127	637628	595528	S1 Temple S2 to S6 Kuccha Structure at Field	S1: 464 m ESE	SGJA-127-S1	p	638092	1595442
234						S2: 431 m ESE	SGJA-127-S2	t	637864	1595233
235						S3: 488 m ESE	SGJA-127-S3	t	637725	1595228
236						S4: 433 m W	SGJA-127-S4	t	637371	1595396
237						S5: 478 m SW	SGJA-127-S5	t	637401	1595129
238						S6: 328 m SSE	SGJA-127-S6	t	638083	1595337
239	128	SGJA-128	636154	594363	S1, S2, S4, S5, S6, S7, S8 Kuccha Structure at Field S3 Commerc	S1: 165 m SE	SGJA-128-S1	t	636272	1594258

					ial S9 Residential					
240						S2: 331 m ESE	SGJA-128-S2	t	636455	1594244
241						S3: 80 m NNE	SGJA-128-S3	p	636428	1594602
242						S4: 320 m NE	SGJA-128-S4	t	636160	1594681
243						S5: 304 m NNE	SGJA-128-S5	t	636438	1594571
244						S6: 245 m WNW	SGJA-128-S6	t	635924	1594459
245						S7: 388 m WSW	SGJA-128-S7	t	635785	1594114
246						S8: 431 m SSE	SGJA-128-S8	t	636272	1594119
247						S9: 377 m SSE	SGJA-128-S9	p	636261	1594001
248	129	SGJA-129	637286	1591524	S1 Kuccha Structure at Field	S1: 162 NW	SGJA-129-S1	t	637168	1591655
249	130	SGJA-130	637150	1592746	S1 & S2 Kuccha Structure at Field	S1: 466 m ESE	SGJA-130-S1	t	637500	1592595
250						S2: 349 m WSW	SGJA-130-S2	t	636945	1592630
251	131	SGJA-131	636866	1592165	S1 to S3 Kuccha Structure at Field	S1: 353 m ESE	SGJA-131-S1	t	637191	1592017
252						S2: 487 m N	SGJA-131-S2	t	636945	1592629
253						S3: 250 m NW	SGJA-131-S3	t	636646	1592305
254	132	SGJA-132	637834	1593550	No Structure	..				
255	133	SGJA-133	638000	1593235	No Structure	..				
256	134	SGJA-134	633923	1590066	S1 Kuccha Structure at Field	S1: 293 m NW	SGJA-134-S1	t	633632	1590197
257	135	SGJA-135	634461	1589390	No Structure	..				
258	136	SGJA-136	633417	1589200	S1 Kuccha Structure at Field	S1: 155 m WSW	SGJA-136-S1	t	633264	1589159
259	137	SGJA-	63847	15923	S1	S1: 436 m E	SGJA-137-	t	638908	1592398

		137	0	73	Kuccha Structure at Field		S1			
260	138	SGJA-138	637929	591927	S1 & S2 Kuccha Structure at Field	S1: 470 m SSE	SGJA-138-S1	t	638079	1591499
261						S2:90 m SE	SGJA-138-S2	t	638145	1591835
262	139	SGJA-139	638850	590873	S1 Kuccha Structure at Field	S1: 205 m SE	SGJA-139-S1	t	638928	1590674
263	140	SGJA-140	633841	597807	S1 Residential	S1: 357 m E	SGJA-140-S1	p	634206	1597766
264	141	SGJA-141	634517	598617	S1 & S2 Kuccha Structure at Field	S1: 377 m NNE	SGJA-141-S1	t	634386	1598982
265						S2:414 m NNE	SGJA-141-S2	t	634214	1598915
266	142	SGJA-142	632792	598655	No Structure	..				
267	143	SGJA-143	632161	599279	S1 Kuccha Structure at Field	S1: 442 m E	SGJA-143-S1	t	632640	1599300

table 6-29: List of Noise Receptors

Receptor ID	Receptor Type	Distance and Director	Type - Permanent	x	y
SGJA-01-S4	S4 Poultary Farm	S4: 292 m SSW	P	661006	1614362
SGJA-04-S1	S1 Residential Structure	S1: 452 m NNW	p	659526	1614404
SGJA-10-S1	S1 Solar Plant Site Office	S1: 341m NE	P	660605	1616460
SGJA-10-S2	S2 Solar Plant Security Office	S2: 484 m NE	p	660624	1616527
SGJA-13-S1	S1 Pollutory Farm S2 is kaccha structure at field	S1: 305 m N	P	659528	1615682
SGJA-15-S1	S1 is Commercial shop	S1: 392 m SW	P	660336	1614375

SGJA-29-S1	S1 Solar Plant Security Office S2 and S3 are Kuccha structure at field	S1: 361m SE	P	658106	1609258
SGJA-31-S1	S1 Residential (Multiple Structures) S2 to S4 kaccha structure at field	S1: 445 m ESE	P	657227	1608142
SGJA-32-S1	S1 & S2 Commercial S3 Temple S4 & S5 kaccha structure at fiel	S1: 485 m ESE	P	653788	1608510
SGJA-32-S2		S2: 500 m SE	P	654040	1608530
SGJA-32-S3		S3: 464 m ENE	P	653995	1608447
SGJA-33-S1	S1 & S2 Residential S3 to S5 Commercial S6 & S7 kaccha structure at field	S1: 497 m SW	P	654379	1609481
SGJA-33-S2		S2: 462 m SW	P	654437	1609398
SGJA-33-S3		S3: 250 m SW	P	654577	1609550
SGJA-33-S4		S4: 367 m WNW	P	654460	1609731
SGJA-33-S5		S5: 328 m WNW	P	654449	1609864
SGJA-39-S2	S1 Kuccha	S2: 464 m ESE	P	655718	1609717
SGJA-39-S3		S3: 424 m NW	P	654927	1610274
SGJA-40-S1	S1 is Pollutary Farm	S1: 413 m NE	P	656315	1612578
SGJA-40-S2	S2 Commercial Stucture	S2: 481 m NW	P	655617	1612661
SGJA-40-S3	S3 Commercial Stucture	S3: 463 m NW	P	655627	1612925
SGJA-42-S1	S1 Commercial Structure	S1: 495 m NE	P	655139	1611504

SGJA-44-S1	S1 Solar Plant Security Office	S1: 432m NW	P	658106	1609270
SGJA-47-S1	S1 & S2 Residential S3 & S4 Kaccha Structure at Field	S1: 449 m NW	P	655406	1614724
SGJA-47-S2		S2: 491 m SW	P	655300	1614238
SGJA-48-S1	S1 to S3 Commercial S4 & S5 Kuccha Structure at field S6 Residential Structure	S1: 351 m ENE	p	656413	1614944
SGJA-48-S2		S2: 402 m SE	p	656439	1614547
SGJA-48-S3		S3: 430 m E	p	656261	1614651
SGJA-48-S6		S6: 432 m W	p	655690	1614814
SGJA-50-S1	S1 Residential S2 Kuccha Structure at field S3 Commercial	S1:489 m WNW	P	654667	1610172
SGJA-50-S3		S3: 359 m ESE	P	654534	1610217
SGJA-63-S1	S1 Commercial Structure	S1: 449 m ESE	P	655653	1615058
SGJA-66-S4		S4: 372 m SSW	P	655522	1615078
SGJA-67-S4	S4 is Pollutary Farm	S4: 500 m NNE	P	650693	1614121
SGJA-71-S1	S1 & S2 Commercial Structure	S1: 396 m SE	P	655139	1611504
SGJA-71-S2		S2: 480 m SSE	P	655117	1611405
SGJA-73-S1	S1 Residential S2: Commercial	S1: 165 m NE	P	637495	1607455
SGJA-73-S2		S2: 290 m NE	P	637514	1607567
SGJA-74-S2		S2: 190 m NE	P	638585	1606702
SGJA-74-S7		S7: 390 m SW	P	638236	1606228
SGJA-75-S1	S1 & S2	S1: 323 m S	P	638016	1604640

	Residential multi structures				
SGJA-75-S2		S2: 335 m SW	P	637632	1604856
SGJA-77-S1	S1 residential	S1: 473 m S	P	639789	1604547
SGJA-79-S2		S2: 238 m NW	P	639255	1605805
SGJA-80-S2	S2 Residential (multi structures)	S2: 451 m W	P	636153	1605155
SGJA-85-S6		S6: 337 m NW	P	635623	1604385
SGJA-86-S1	S1 commercial/ residential	S1: 358 m SW	P	635050	1603523
SGJA-89-S1	S1 residential	S1: 484 m SW	P	631271	1594006
SGJA-91-S1	S1 & S3 residential S2 & S4 Kuccha Structure at Field	S1: 359 m E	p	631851	1591709
SGJA-91-S3		S3: 410 m S	p	631444	1591253
SGJA-92-S1	S1 & S3 residential S2 & S4 Kuccha Structure at Field	S1: 260 m NW	p	631444	1591253
SGJA-92-S3		S3: 473 m NE	p	631989	1591499
SGJA-94-S1	S1 residential multi structure S2: pakka temporary	S1: 419 m E	p	632176	1590223
SGJA-110-S1	S1 commercial S2 S3 kaccha	S1: 445 m S	p	634610	1593446
SGJA-114-S2		S2: 377 m NNW	P	639336	1588947
SGJA-115-S1	S1 is Industry S2, S3 & S4 Kuccha Structure at Field S5 is Pollutary Farm	S1: 364 m NNW	p	635204	1589645
SGJA-115-S5		S5	p	635241	1589510
SGJA-116-S2		S2: 403 m NNE	p	635157	1589333

SGJA-118-S3		S3: 493 m NNW	p	637345	1588323
SGJA-118-S4		S4: 396 m S	p	637501	1587545
SGJA-126-S2		S2: 436 W	p	636428	1594602
SGJA-127-S1	S1 Temple S2 to S6 Kuccha Structure at Field	S1: 464 m ESE	p	638092	1595442
SGJA-128-S3		S3: 80 m NNE	p	636428	1594602
SGJA-128-S9		S9: 377 m SSE	p	636261	1594001
SGJA-140-S1	S1 Residential	S1: 357 m E	p	634206	1597766

RESULTS AND ANALYSIS

It is to be observed that the contribution of the noise level from the WTG should be below the CPCB guideline value of 55 dBA during daytime and 45 dBA during nighttime. The above location are based on the setback distance given by TEDA.

- Disturbance and potential health impact from elevated noise levels are considered negative
- The impact duration is long term during the project lifetime
- Impacts of noise in operation phase are within the project area
- The operational noise level may occur intermittently or continuously depending on the wind conditions and WTG operations
- The impact magnitude is small as the predicted noise levels generated by the WTGs slight exceed the IFC permissible limit at certain permanent locations for the nighttime, but below the daytime limit.
- The residential receptors are already exposed to manmade and natural sources of noise and the nighttime baseline noise levels here are already considerably higher than IFC permissible limits.

The predicted noise levels within the study domain at 219 receptors and 8 monitoring stations during day and night-time with clear conditions and stable atmospheric condition for worst case consideration and with strong wind conditions. It is evident from results that the noise level at all the receptors is within standards during both day and night time except the below mentioned receptors where the noise level is exceeding the standards during day and night time. However, there are few receptors where the noise level is only exceeding during night time.

Table 6-30: **Noise Modelling Results and Analysis**

Receptor	Receptor Type	Overall Noise level		Difference Std. Limit- (Baseline + Noise from WTG)		Impact
		Leq,d dB(A)	Leq,n dB(A)	Leq,d,diff dB	Leq,n,diff dB	
SGJA-01-S1	T	54	48	-1	3	Small
SGJA-01-S2	T	54	46	-1	1	Negligible
SGJA-01-S3	T	54	46	-1	1	Negligible
SGJA-01-S4	P	54	46	-1	1	Negligible
SGJA-02-S1	T	54	47	-1	2	Negligible
SGJA-03-S1	T	53	43	-2	-2	Negligible
SGJA-04-S1	p	53	45	-2	0	Negligible
SGJA-04-S2	t	53	45	-2	0	Negligible
SGJA-04-S3	t	55	50	0	5	Small
SGJA-05-S1	t	53	43	-2	-2	Negligible
SGJA-05-S2	t	53	44	-2	-1	Negligible
SGJA-05-S3	t	53	43	-2	-2	Negligible
SGJA-06-S1	t	54	48	-1	3	Small
SGJA-08-S1	t	54	47	-1	2	Negligible
SGJA-10-S1	P	54	46	-1	1	Negligible
SGJA-10-S2	p	54	46	-1	1	Negligible
SGJA-12-S1	t	54	47	-1	2	Negligible
SGJA-13-S1	P	54	46	-1	1	Negligible
SGJA-13-S2	t	53	45	-2	0	Negligible
SGJA-14-S1	t	54	48	-1	3	Small
SGJA-15-S1	P	53	45	-2	0	Negligible
SGJA-16-S1	T	50	46	-5	1	Negligible
SGJA-16-S2	T	50	46	-5	1	Negligible
SGJA-20-S1	T	53	51	-2	6	Medium
SGJA-20-S2	T	50	45	-5	0	Negligible
SGJA-22-S1	T	49	44	-6	-1	Negligible
SGJA-22-S2	T	53	51	-2	6	Medium
SGJA-22-S3	T	49	42	-6	-3	Negligible
SGJA-23-S1	t	50	45	-5	0	Negligible
SGJA-27-S1	t	52	49	-3	4	Small
SGJA-27-S2	t	50	44	-5	-1	Negligible
SGJA-28-S1	t	50	45	-5	0	Negligible
SGJA-28-S2	t	51	48	-4	3	Small
SGJA-29-S1	P	50	46	-5	1	Negligible
SGJA-29-S2	t	50	46	-5	1	Negligible
SGJA-29-S3	t	49	44	-6	-1	Negligible

SGJA-31-S1	P	52	44	-3	-1	Negligible
SGJA-31-S2	t	52	44	-3	-1	Negligible
SGJA-31-S3	t	53	45	-2	0	Negligible
SGJA-31-S4	t	52	44	-3	-1	Negligible
SGJA-32-S1	P	53	46	-2	1	Negligible
SGJA-32-S2	P	52	43	-3	-2	Negligible
SGJA-32-S3	P	52	43	-3	-2	Negligible
SGJA-32-S4	T	52	44	-3	-1	Negligible
SGJA-32-S5	p	52	40	-3	-5	Negligible
SGJA-33-S1	P	52	43	-3	-2	Negligible
SGJA-33-S2	P	52	44	-3	-1	Negligible
SGJA-33-S3	P	53	46	-2	1	Negligible
SGJA-33-S4	P	53	45	-2	0	Negligible
SGJA-33-S5	t	53	45	-2	0	Negligible
SGJA-33-S6	T	53	45	-2	0	Negligible
SGJA-33-S7	T	53	46	-2	1	Negligible
SGJA-37-S1	T	54	46	-1	1	Negligible
SGJA-39-S1	p	53	45	-2	0	Negligible
SGJA-39-S2	P	53	45	-2	0	Negligible
SGJA-39-S3	P	53	45	-2	0	Negligible
SGJA-40-S1	P	53	44	-2	-1	Negligible
SGJA-40-S2	P	53	44	-2	-1	Negligible
SGJA-40-S3	P	50	44	-5	-1	Negligible
SGJA-42-S1	P	50	45	-5	0	Negligible
SGJA-44-S1	P	50	46	-5	1	Negligible
SGJA-47-S1	P	50	45	-5	0	Negligible
SGJA-47-S2	t	49	43	-6	-2	Negligible
SGJA-47-S3	T	50	45	-5	0	Negligible
SGJA-47-S4	P	50	46	-5	1	Negligible
SGJA-48-S1	p	50	45	-5	0	Negligible
SGJA-48-S2	p	50	45	-5	0	Negligible
SGJA-48-S3	t	51	46	-4	1	Negligible
SGJA-48-S4	T	50	45	-5	0	Negligible
SGJA-48-S5	p	50	45	-5	0	Negligible
SGJA-48-S6	t	50	46	-5	1	Negligible
SGJA-49-S1	p	51	48	-4	3	Small
SGJA-50-S1	T	50	45	-5	0	Negligible
SGJA-50-S2	p	49	43	-6	-2	Negligible

SGJA-50-S3	t	51	47	-4	2	Negligible
SGJA-51-S1	T	52	49	-3	4	Small
SGJA-52-S1	T	50	46	-5	1	Negligible
SGJA-53-S1	T	51	47	-4	2	Negligible
SGJA-53-S2	T	50	46	-5	1	Negligible
SGJA-54-S1	T	50	45	-5	0	Negligible
SGJA-56-S1	T	50	47	-5	2	Negligible
SGJA-58-S1	P	51	48	-4	3	Negligible
SGJA-63-S1	T	50	46	-5	1	Negligible
SGJA-63-S2	T	50	45	-5	0	Negligible
SGJA-64-S1	T	50	45	-5	0	Negligible
SGJA-64-S2	T	49	43	-6	-2	Negligible
SGJA-65-S1	T	50	46	-5	1	Negligible
SGJA-65-S2	T	49	43	-6	-2	Negligible
SGJA-66-S1	T	50	45	-5	0	Negligible
SGJA-66-S2	T	51	47	-4	2	Negligible
SGJA-66-S3	p	50	46	-5	1	Negligible
SGJA-66-S4	t	50	44	-5	-1	Negligible
SGJA-67-S1	T	50	44	-5	-1	Negligible
SGJA-67-S2	T	49	43	-6	-2	Negligible
SGJA-67-S3	p	49	43	-6	-2	Negligible
SGJA-67-S4	T	49	42	-6	-3	Negligible
SGJA-68-S1	T	50	44	-5	-1	Negligible
SGJA-68-S2	t	57	49	2	4	Small
SGJA-70-S1	p	57	51	2	6	Medium
SGJA-71-S1	P	57	49	2	4	Small
SGJA-71-S2	P	57	48	2	3	Small
SGJA-73-S1	P	57	49	2	4	Small
SGJA-73-S2	t	57	49	2	4	Small
SGJA-74-S1	p	57	49	2	4	Small
SGJA-74-S2	t	57	49	2	4	Small
SGJA-74-S3	T	57	49	2	4	Small
SGJA-74-S4	T	57	49	2	4	Small
SGJA-74-S5	T	57	49	2	4	Small
SGJA-74-S6	p	57	49	2	4	Small
SGJA-74-S7	p	56	48	1	3	Small
SGJA-75-S1	p	57	49	2	4	Small
SGJA-75-S2	p	57	49	2	4	Small

SGJA-78-S1	p	56	48	1	3	Small
SGJA-77-S1	t	57	49	2	4	Small
SGJA-79-S1	p	57	49	2	4	Small
SGJA-79-S2	T	57	50	2	5	Small
SGJA-79-S3	T	57	49	2	4	Small
SGJA-79-S4	p	51	46	-4	1	Negligible
SGJA-80-S1	p	50	45	-5	0	Negligible
SGJA-80-S2	T	50	45	-5	0	Negligible
SGJA-81-S1	T	52	48	-3	3	Small
SGJA-81-S2	T	51	47	-4	2	Negligible
SGJA-81-S3	T	51	46	-4	1	Negligible
SGJA-81-S4	T	51	46	-4	1	Small
SGJA-85-S1	T	53	51	-2	6	Medium
SGJA-85-S2	T	51	47	-4	2	Negligible
SGJA-85-S3	T	50	44	-5	-1	Negligible
SGJA-85-S4	T	50	44	-5	-1	Negligible
SGJA-85-S5	p	51	45	-4	0	Negligible
SGJA-85-S6	p	51	46	-4	1	Negligible
SGJA-86-S1	T	50	45	-5	0	Negligible
SGJA-86-S2	T	51	47	-4	2	Negligible
SGJA-86-S3	T	51	47	-4	2	Negligible
SGJA-87-S1	T	51	46	-4	1	Negligible
SGJA-88-S1	p	51	47	-4	2	Negligible
SGJA-89-S1	T	51	42	-4	-3	Negligible
SGJA-90-S1	p	52	46	-3	1	Negligible
SGJA-91-S1	t	51	45	-4	0	Negligible
SGJA-91-S2	p	52	46	-3	1	Negligible
SGJA-91-S3	t	52	47	-3	2	Negligible
SGJA-91-S4	p	52	47	-3	2	Negligible
SGJA-92-S1	T	52	47	-3	2	Negligible
SGJA-92-S2	p	52	47	-3	2	Negligible
SGJA-92-S3	T	51	44	-4	-1	Negligible
SGJA-92-S4	T	51	45	-4	0	Negligible
SGJA-93-S1	T	51	44	-4	-1	Negligible
SGJA-93-S2	p	52	47	-3	2	Negligible
SGJA-94-S1	T	51	45	-4	0	Negligible
SGJA-94-S2	T	51	45	-4	0	No Impact
SGJA-95-S1	T	51	43	-4	-2	Negligible

SGJA-95-S2	T	52	49	-3	4	Small
SGJA-96-S1	T	52	49	-3	4	Small
SGJA-97-S1	T	51	47	-4	2	Negligible
SGJA-102-S1	T	50	44	-5	-1	Negligible
SGJA-104-S1	T	50	44	-5	-1	Negligible
SGJA-106-S1	T	51	47	-4	2	Negligible
SGJA-107-S1	T	50	44	-5	-1	Negligible
SGJA-107-S2	T	51	47	-4	2	No Impact
SGJA-107-S3	T	50	44	-5	-1	Negligible
SGJA-109-S1	p	51	46	-4	1	Negligible
SGJA-110-S1	T	50	44	-5	-1	Negligible
SGJA-110-S2	T	51	47	-4	2	Negligible
SGJA-110-S3	T	50	44	-5	-1	Negligible
SGJA-111-S1	T	51	45	-4	0	Negligible
SGJA-111-S2	T	50	44	-5	-1	Negligible
SGJA-111-S3	T	51	45	-4	0	Negligible
SGJA-111-S4	T	50	44	-5	-1	Negligible
SGJA-113-S1	T	50	44	-5	-1	Negligible
SGJA-113-S2	t	51	45	-4	0	Negligible
SGJA-114-S1	p	50	44	-5	-1	Negligible
SGJA-114-S2	p	51	45	-4	0	Negligible
SGJA-115-S1	T	51	46	-4	1	Negligible
SGJA-115-S2	T	51	45	-4	0	Negligible
SGJA-115-S3	T	52	48	-3	3	Small
SGJA-115-S4	p	51	46	-4	1	Negligible
SGJA-115-S5	T	51	46	-4	1	Negligible
SGJA-116-S1	p	51	46	-4	1	Negligible
SGJA-116-S2	T	51	45	-4	0	Negligible
SGJA-118-S1	T	51	45	-4	0	Negligible
SGJA-118-S2	p	51	47	-4	2	Negligible
SGJA-118-S3	p	49	44	-6	-1	Negligible
SGJA-118-S4	T	49	44	-6	-1	Negligible
SGJA-120-S1	T	50	45	-5	0	Negligible
SGJA-120-S2	T	49	45	-6	0	Negligible
SGJA-121-S1	T	52	49	-3	4	Small
SGJA-122-S1	T	50	46	-5	1	Negligible
SGJA-126-S1	p	50	48	-5	3	Small
SGJA-126-S2	p	49	43	-6	-2	Negligible

SGJA-127-S1	T	49	43	-6	-2	Negligible
SGJA-127-S2	T	49	44	-6	-1	Negligible
SGJA-127-S3	T	49	45	-6	0	Negligible
SGJA-127-S4	T	50	45	-5	0	Negligible
SGJA-127-S5	T	49	44	-6	-1	Negligible
SGJA-127-S6	T	49	43	-6	-2	Small
SGJA-128-S1	T	51	49	-4	4	Small
SGJA-128-S2	p	51	47	-4	2	Negligible
SGJA-128-S3	T	50	46	-5	1	Negligible
SGJA-128-S4	T	50	46	-5	1	Negligible
SGJA-128-S5	T	51	47	-4	2	Negligible
SGJA-128-S6	T	50	45	-5	0	Negligible
SGJA-128-S7	T	49	44	-6	-1	Negligible
SGJA-128-S8	p	50	46	-5	1	Negligible
SGJA-128-S9	T	49	45	-6	0	Negligible
SGJA-129-S1	T	52	47	-3	2	Negligible
SGJA-130-S1	T	50	46	-5	1	Negligible
SGJA-130-S2	T	51	47	-4	2	Negligible
SGJA-131-S1	T	50	47	-5	2	Negligible
SGJA-131-S2	T	51	48	-4	3	Small
SGJA-131-S3	T	50	46	-5	1	Negligible
SGJA-134-S1	T	50	45	-5	0	Negligible
SGJA-136-S1	T	49	45	-6	0	Negligible
SGJA-137-S1	T	49	44	-6	-1	Negligible
SGJA-138-S1	T	49	45	-6	0	Negligible
SGJA-138-S2	T	50	47	-5	2	Negligible
SGJA-139-S1	p	50	46	-5	1	Negligible
SGJA-140-S1	p	50	44	-5	-1	Negligible
SGJA-141-S1	p	49	44	-6	-1	Negligible
SGJA-141-S2	T	49	44	-6	-1	Negligible
SGJA-143-S1	T	49	43	-6	-2	Negligible

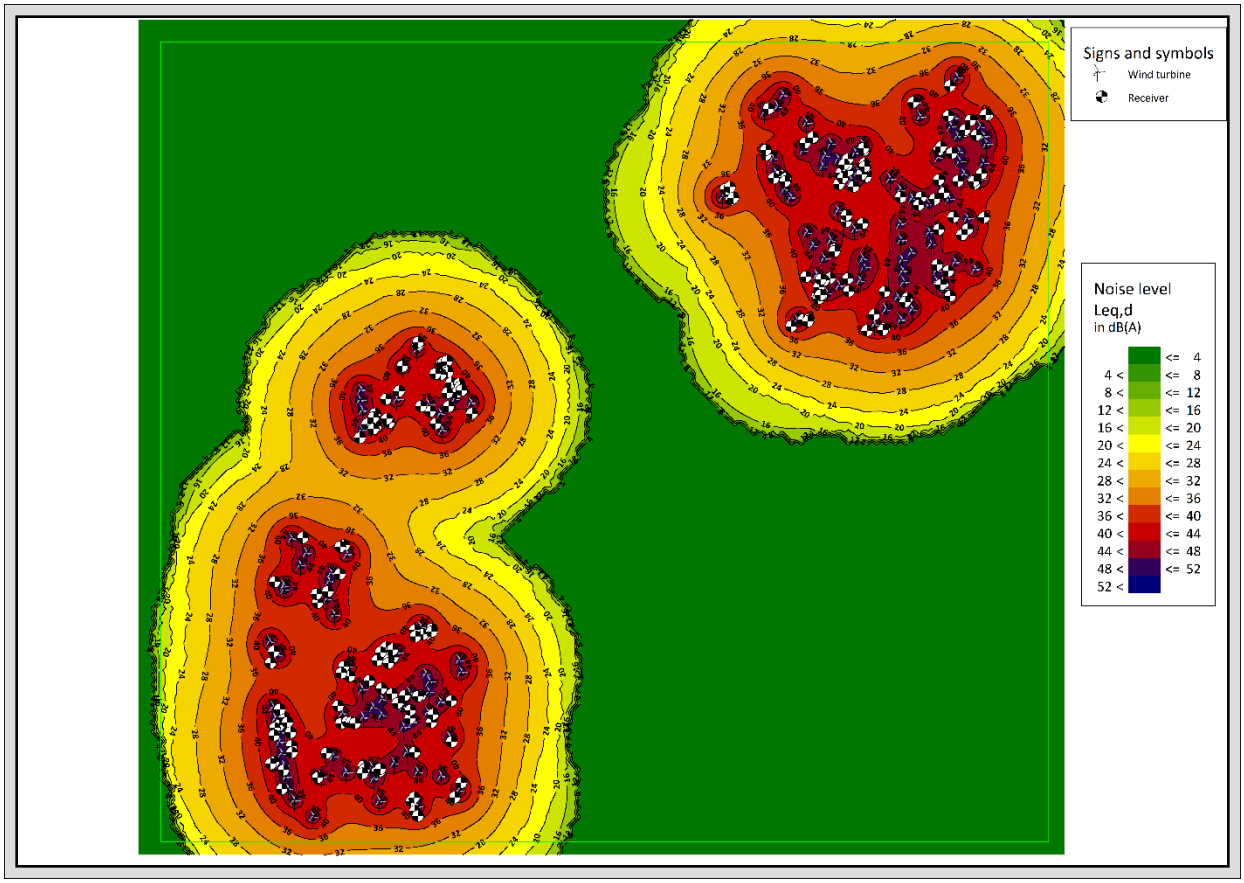


Figure 6-6: Noise Mapping Contours – Day Time

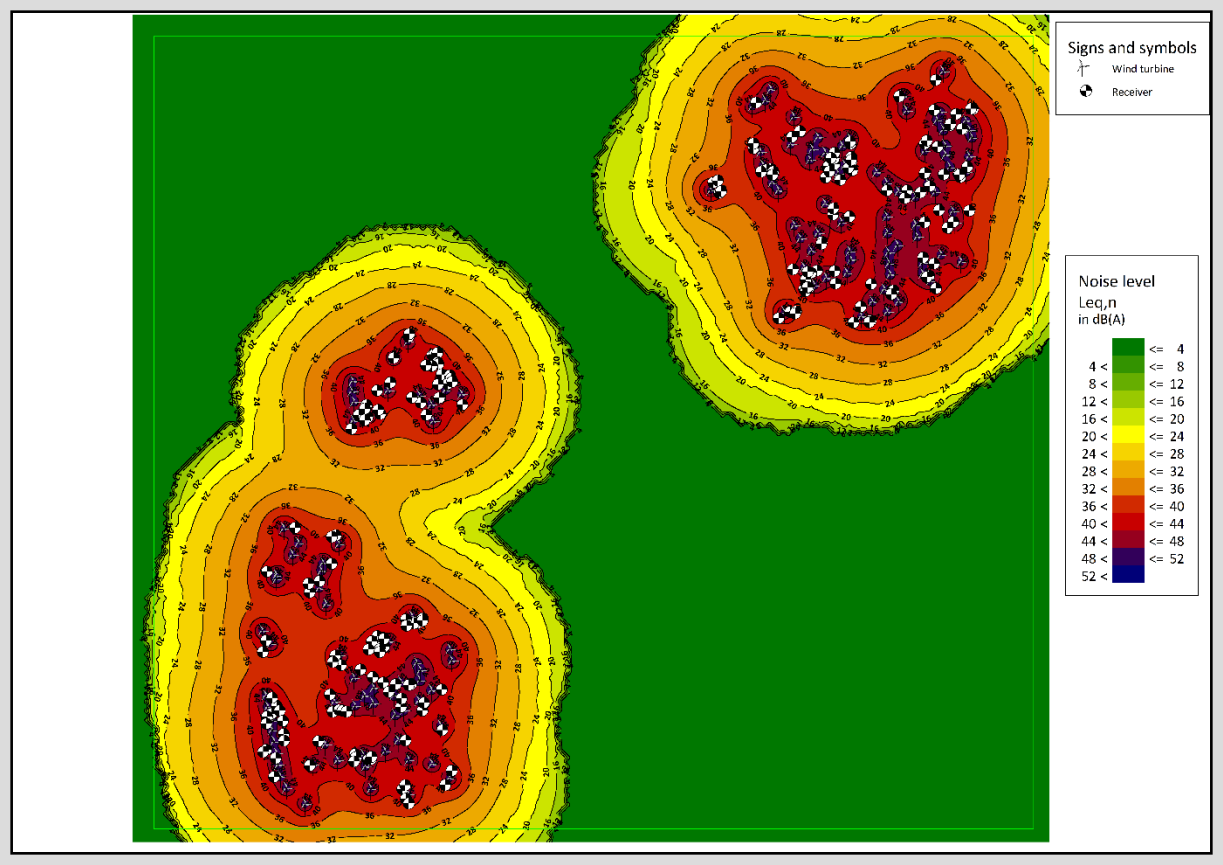


Figure 6-7: Noise Mapping Contours- Night Time

The overall predicted noise levels (baseline + incremental noise) is exceeding during both day and night time and the impact difference is exceeding from 3 dB(A) to 6 dB(A) which result in small to medium impact near receptors in proximity of permanent receptors near SGJA-71, SGJA-73, SGJA-74, SGJA-75, SGJA-77, SGJA-78, SGJA-79. The overall noise level is high due to higher baseline noise levels at NQ8 monitoring location (Guttidurga village) which is located near SH-65 connecting village road and due to heavy traffic movement at highway lead to high noise baseline values. The baseline monitoring value at NQ8 on these receptors is ranges from 56-57 dB(A) during day time and ranges from 48 to 50 dB(A) during night time. It is observed from the baseline hourly results at NQ 8 location that noisiest hour extends throughout the day and in the night it is from 10:00 pm to 2:00 am, therefore considering the impact on permanent receptors, as the WTGs (SGJA 71, SGJA 73, SGJA 74, SGJA 75, SGJA 77, SGJA 78, SGJA 79) which are in a planning phase and not yet finalized till date therefore it is advised to shift these WTG locations. Therefore, the overall noise impact at these permanent receptors will be moderate if these locations will not be shifted.

Table 6-31: Noise Modelling Results and Impact Significance near Permanent receptors

Receptors	Monitoring Locations	Receptor type (T/P)	Overall Noise Level		Impact
			Leq Day (dBA)	Leq Night (dBA)	
SGJA-01-S1	NQ1	T	54	48	Small
SGJA-04-S3	NQ1	T	55	50	Small
SGJA-06-S1	NQ1	T	54	48	Small
SGJA-14-S1	NQ1	T	54	48	Small
SGJA-20-S1	NQ1	T	53	51	Medium
SGJA-22-S2	NQ1	T	53	51	Medium
SGJA-27-S1	NQ1	T	52	49	Small
SGJA-28-S2	NQ1	T	51	48	Small
SGJA-49-S1	NQ1	T	51	48	Small
SGJA-51-S1	NQ1	T	52	49	Small
SGJA-58-S1	NQ1	T	51	48	Small
SGJA-68-S2	NQ8	T	57	49	Small
SGJA-70-S1	NQ8	T	57	51	Medium
SGJA-71-S1	NQ8	P	57	49	Small
SGJA-71-S2	NQ8	P	57	48	Small
SGJA-73-S1	NQ8	P	57	49	Small
SGJA-73-S2	NQ8	P	57	49	Small
SGJA-74-S1	NQ8	T	57	49	Small
SGJA-74-S2	NQ8	P	57	49	Small
SGJA-74-S3	NQ8	T	57	49	Small
SGJA-74-S4	NQ8	T	57	49	Small
SGJA-74-S5	NQ8	T	57	49	Small
SGJA-74-S6	NQ8	T	57	49	Small
SGJA-74-S7	NQ8	P	56	48	Small
SGJA-75-S1	NQ8	P	57	49	Small
SGJA-75-S2	NQ8	P	57	49	Small
SGJA-78-S1	NQ8	P	56	48	Small
SGJA-77-S1	NQ8	P	57	49	Small
SGJA-79-S1	NQ8	T	57	49	Small
SGJA-79-S2	NQ8	P	57	50	Small
SGJA-79-S3	NQ8	T	57	49	Small
SGJA-81-S1	NQ2	T	52	48	Small
SGJA-81-S4	NQ2	T	51	46	Small
SGJA-85-S1	NQ2	T	53	51	Medium
SGJA-95-S2	NQ3	T	52	49	Small

SGJA-96-S1	NQ3	T	52	49	Small
SGJA-115-S3	NQ5	T	52	48	Small
SGJA-121-S1	NQ6	T	52	49	Small
SGJA-126-S1	NQ6	T	50	48	Small
SGJA-127-S6	NQ6	T	49	43	Small

Further, the receptors located at WTG locations (SGJA 68, SGJA 70, SGJA 74, SGJA 79), the overall predicted noise levels (baseline + incremental noise) is exceeding during both day and night time and the impact difference is exceeding from 3 dB(A) to 6 dB(A), which result in small to medium impact. The overall noise level is high due to higher baseline noise levels at NQ8 monitoring location (Guttidurga village) which is located near SH-65 connecting village road and due to heavy traffic movement at highway leads to high noise baseline values. The baseline monitoring value at NQ8 on these receptors is 57 dB(A) during day time and ranges from 49 to 51 dB(A) during night time. However, all the receptors at these WTG locations are temporary in nature, therefore the impact will be minor.

The overall predicted noise levels (baseline + incremental noise) is exceeding during night time and the impact difference is exceeding from 3 dB(A) to 6 dB(A), which result in small to medium impact near receptors located in proximity of WTG locations SGJA-1, SGJA 4, SGJA 6, SGJA 14, SGJA 20, SGJA 22, SGJA 27, SGJA 28, SGJA 49, SGJA 51, SGJA 58, SGJA 81, SGJA 85, SGJA 95, SGJA 96, SGJA 115, SGJA 121, SGJA 126, SGJA 127. The overall increase in noise decibel at these receptors is due to contribution of WTG's noise level. However, all the receptors at these WTG locations are temporary in nature, therefore the exposure at these receptors will be for few hours. Hence, the overall impact at these receptors will be minor.

Mitigation Measures

Noise mitigation measures, to mitigate operational noise impacts at locations where the noise decibel is exceeding the limits, are proposed as follows:

- Shifting WTG SGJA 71, SGJA 73, SGJA 74, SGJA 75, SGJA 77, SGJA 78, SGJA 79 to other locations due to moderate impact of noise determined during Operation Phase during day as well as night-time;
- Regular maintenance of WTGs;
- Periodic monitoring of noise near to the sources of generation to ensure compliance with design specification; and
- Quarterly monitoring of ambient noise levels (during day and night time) at identified residential receptors for determination of actual impact due to operation of WTGs

Significance of Impact:

It is evident from the Table 6-30 and Table 6-31 that daytime and night time, predicted noise levels at identified noise sensitive areas are well within the applicable standards except the few temporary and permanent receptors where the overall noise level is exceeding the limits during both day and night time. Therefore, impact difference due to WTGs and baseline will be small to medium at these locations. But, considering the impact significance for operation phase for the permanent receptors will be moderate and for the temporary receptors it will be minor. However, the overall residual impact significance will be minor for the project after implementing the mitigation measures.

Table 6-32: **Impact Significance –Noise Quality**

Impact	Ambient Noise level				
Impact Type	Direct	Indirect	Induced		
Impact Duration	Short-term		Medium	Long Term	
Spread	Local	Medium	High		
Impact Scale	Project area and vicinity				
Frequency	Operation Phase				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/ Receptor Senstivity/ Intensity	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Moderate**				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Minor**				

6.4.4 WASTE GENERATION, STORAGE AND DISPOSAL

Impacts

The operation of Wind Turbine for power generation do not have any direct impact on soil. Once the plant is commissioned there will be limited disturbance to soil, however repair and maintenance of underground cables and associated utilities will lead to generation of hazardous wastes such as used transformer oil. Improper storage and disposal can lead to unhygienic conditions and contamination of soil.

Mitigation

- O & M Contractor should ensure that no unauthorized dumping of used oil and other hazardous waste is undertaken at the site;
- Receptacles and designated areas for daily collection should be periodically disposal in a designated municipal facility;
- Hazardous waste should be properly labelled, stored onsite at a location provided with impervious surface and in a secondary containment system; and
- Waste bins should be proper covered and protected from the elements (wind, rain, storms, etc.) and placed away from natural drainage channels.

Significance of Impact

The impact on soil will have medium intensity with a local spread for a long duration (of activity) which will result in an overall moderate impact without mitigation

Table 6-33: Impact Significance- Waste Disposal

Impact	Impact on soil environment due to waste generation (hazardous and non- hazardous)				
Impact Type	Direct	Indirect	Induced		
Impact Duration	Short-term		Medium	Long Term	
Spread	Local	Medium	High		
Impact Scale	Limited to project area				
Frequency	Operation Phase				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/ Receptor Senstivity/ Intensity	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Moderate**				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **negligible**				

6.4.5 WATER RESOURCE AND QUALITY

Impacts

The receptor sensitivity has been assessed as low for environmental criteria but high for social criteria. The groundwater resources vary from safe to critical in the talukas wherein

proposed project is located. The receptor sensitivity for ground water resources has therefore been assessed as high taking into account the chances of a semi critical/overexploited source of water, general scarcity of water in the region. During operation phase, water will be procured from borewell for domestic use and for drinking purpose from water cans (20 litres).

Mitigation

Local water sources including ground water sources and irrigation canals leading to the nearby villages should be avoided in area. If OKPPL is abstracting water from the borewell, then it should take permission from KGWA prior groundwater use.

The water requirement during operation phase will be considerably lesser and only limited to domestic and drinking water consumption. In the operation phase, water should be sourced from Water Resources Department for firm source of water allocation for the project. The project site should be provided with adequate drainage facility to drain off wash wastewater and prevent any waterlogging at site or in the surroundings.

The site office is provided with septic tanks followed by soakpits for the management of wastewater generated at the site. OKPPL is recommended to take permission from Karnataka Groundwater Authority (KGWA) for the abstraction of ground water. Also, 200% in-situ rainwater harvesting should be carried out since the project area is falling under overexploited zone.

Significance of Impact

The impact on water resources will have medium intensity with a local spread for a long duration which will result in an overall moderate impact without mitigation. Utilisation of ground water will leave a minor residual impact on the water resources even after control of intensity

Table 6-34: Impact Significance - Water Resources

Impact	Water resource availability				
Impact Type	Direct	Indirect	Induced		
Impact Duration	Short-term		Medium	Long Term	
Spread	Local	Medium	High		
Impact Scale	Limited to project area				
Frequency	Operation Phase				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/ Receptor Senstivity/ Intensity	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Moderate**				

Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Minor**				

6.4.6 ECOLOGY

Displacement Due to Disturbance

The most commonly reported indirect effect of wind farms is the displacement of species to undisturbed and suitable habitats due to noise and visual disturbance associated with wind farm operation and maintenance. However, the scale and degree of disturbance varies according to the site and species-specific factors. The wind farm may act as a barrier which leads to connectivity issues and access to resources.

Barrier Effect

The barrier effect is of concern because birds have to change the routes and fly further to avoid a large array of turbines, which potentially disrupt linkages between distant feeding, roosting and breeding areas. The effect depends on the species, bird movement type, flight height, wind force and direction, etc.

Barotrauma

Barotrauma is a significant cause of bat mortality due to wind Project. It occurs when bats chase the turbine blade (their echolocation detects a moving object). As the bat gets close to the blade, it is pulled into a low-pressure area immediately behind the blade. This low-pressure area causes the bat's lungs to expand into its body cavity, exploding the blood capillaries in the bat's lungs.

Behavioural avoidance

Birds adjust to the presence of the wind farm by changing their behaviour. Flight deviation, alternate resource utilization, dispersion from the wind farm area and changing flight heights are types of behavioural changes that the birds can utilize to adjust to the wind farm. These avoidance behaviours however, can still result in night collisions, foggy conditions and collisions due to sudden change in wind speeds. The energy expenditure to avoid the wind farm can be a strain on birds and decrease energy reserves for foraging, hunting, socializing and breeding. The avoidance and dispersion can also lead to loss of foraging resources, habitats and migration pathways

Impacts on Birds

The wind farms are known to affect birds particularly when they are placed in important bird breeding or nesting areas, bird sanctuaries or large water bodies known to harbour large populations of birds. Birds are affected in following ways by wind turbines.

- Birds are displaced due to construction of wind turbines in their habitats and their habitats are destroyed or fragmented.
- Birds are known to collide with operational wind turbine blades and die.
- The bird's mortalities are reported due to collision with power lines. Birds get electrocuted on power lines while attempting to sit on power lines or poles.

The WTG zone and AoI does not have presence of any rare, endangered and important birdlife. Further, the migratory pathway of birds does not coincide with project site. All the WTG points constructed are within rainfed agricultural land. This project area is presently covered with shrubs and grasses which are attract mostly common resident birds. Also, there is no Important Bird Area (IBA), Bird migratory paths and congregatory birds locations within study area. However; the peacock corridor is located at a distance of 1.63 km in NE direction from SGJA 06; 1.57 km in NNE direction from SG JA-07; 1.28 km in SW direction from SG JA-70 and at a distance of 4.68 km in SW direction from PSS Phase I.

None of the species observed during the primary survey falls under IUCN species of conservation category "Critically endangered" and "Endangered" species. Further, it is also inferred that the core and buffer zone of the project does not fall within Great Indian Bustard; Vulture and Lesser Florican species priority areas as per the site specific investigations and discussions undertaken with Forest and Wildlife Department, Davanagere. Also, sightings of Great Indian Bustard and florican have not been observed in the Study Area.

As per vantage point survey observations Shikra, Red-rumped Swallow, Black-shouldered Kite, Common Kestrel, Wire-Tailed Swallow, Rose-ringed Parakeet and Eurasian Collared Dove has higher risk of turbine collision as they have more sightings as well as occurrence percentage and fly frequently through flight zone-2. However; maximum number of species observed are below risk zone. Hence the impact on birds during operation phase of the project is envisaged to be moderate. The WTG blade tips should be painted with red/orange colour as per International Standards measure by OKPPL to isolate from the sky and mitigates risk of bird collisions.

Impact on Migratory birds

As per the primary survey; 2 migratory bird species were observed in buffer zone of study area however they belong to Least Concern category as per IUCN categorization. However, no migratory bird species were observed in core zone of WTG locations and transmission line. As per IUCN Red List Categories there are no critically endangered and endangered species present in core zone of study area.

There are 3 village lakes present within the study area. Chinna Hagari river is 2.4 km from SGJA 43 WTG location, Jagalur lake is 4.1 km from SGJA 77 WTG location, Sangenahalli lake is 9.7 km from SGJA 108 WTG location, Anaji lake is 14.5 km from SGJA 102 WTG location and Katlalu lake is 9.8 km from SGJA 118 WTG location. These water bodies are seasonal and do not retain water for longer duration. Presence of migratory birds near water bodies may lead to moralities by wind turbines. However; there are no major water bodies in proximity of WTG and only few seasonal waterbodies are present in the vicinity of the project. There are no waterbodies in the immediate vicinity from project footprint. The birds observed of migratory nature are given below in **Table 6-35.**

Table 6-35 Migratory birds observed in study area

S.No	Scientific Name	Common Name	IWPA Status	IUCN Status
1	*Falco tinnunculus*	Common Kestrel	IV	Least Concern
2	*Saxicola torquatus*	Common Stonechat	IV	Least Concern

Impacts on Bats

One of the major and direct impacts of wind farm on mammals is on bats. Although bat collisions can occur, recent scientific studies indicate that barotrauma may be a significant cause of bat deaths at wind farms. Baratrauma occurs as bats chase the turbine blade (their echolocation detects a moving object). As the bat gets close to the blade, it is pulled into a low-pressure area immediately behind the blade. This low pressure area causes the bat's lungs to expand into its body cavity, exploding the blood capillaries in the bat's lungs.

Two roosting site of Indian Flying Fox were identified in buffer zone of study area. No other bat roosting-sites were observed during the study period. The fruit bats are less known to be affected by wind turbines as they do not use eco-location or chase moving objects. The insectivorous bats tend to make collision with wind turbines. Lesser Short-nosed Fruit Bat and Schneider's Leaf-nosed Bat is reported in buffer zone of study area and the population of Lesser Short-nosed Fruit Bat and Schneider's Leaf-nosed Bat are very less this are habituated far away from the WTG points. Therefore, impact of the WTG locations and transmission line on this species at population level would be negligible.

Cumulative impact assessment

Definition of cumulative effects

Cumulative effects may be defined as the additional changes caused by a proposed development in conjunction with other similar developments or as the combined effect of a set of developments, taken together.

Although the term “cumulative impact” is often used to refer only to landscape and visual effects, cumulative effects of wind energy development can relate to a wider range of natural heritage effects, including impacts on birds and habitats, as well as social and economic effects.

Cumulative effects may be complex. They require clear and detailed assessment to identify and distinguish the overall cumulative effects which may arise from a group of projects and the contribution of each individual project to these. A transparent assessment process is therefore essential to understand the potential additional changes which may be brought about by any given proposed development in the context of those already existing, consented or at application stage.

Cumulative impact is sometimes loosely described as ‘positive’ or ‘negative’, but this use is discouraged as there is room for ambiguity. It is preferable to refer to ‘an additional cumulative effect’, that is additional to the impact to be expected from the developments taken individually.

An assessment of cumulative effects may be undertaken either:

- in strategic planning, as part of the preparation of a strategic framework for the future planning of windfarms within a particular geographic area; or
- in development management, in the context of a site specific assessment, usually in support of a planning application as part of an ESIA.

Although the two forms of cumulative assessment share common principles it is important to distinguish between the two distinct processes. An assessment of cumulative effects associated with a specific development proposal should be limited to the effects of the proposal in combination with:

- existing development, either built or under construction;
- approved development, awaiting implementation; and
- proposals awaiting determination within the planning process, and thus for which design information is in the public domain.

Cumulative landscape effects

Cumulative effects on landscape character arise from two or more windfarm developments. Windfarms introduce new features into the landscape. In this way, they can change the landscape character to such an extent that they can create a different landscape character type, in a similar way to large scale afforestation. That change need not be adverse; some derelict or degraded landscapes may be enhanced as a result of such a change in landscape character. The cumulative effects on landscape character may include other changes, for example trends or pressures for change over long time periods, which should form part of any consideration of a particular project.

Windfarms may also have a cumulative effect on the character of landscapes that are recognised to be of special value. These landscapes may be recognised as being rare, unusual, highly distinctive or the best or most representative example in a given area. This recognition may take the form of local or national designations, citations in development plans, community plans or other documents, or be less formally recognised, such as search areas for wild land

Cumulative effects on visual amenity

Cumulative effects on visual amenity consist of combined visibility and sequential effects. Combined visibility occurs where the observer is able to see two or more developments from one viewpoint. When considering the cumulative effects arising from combined visibility, it is necessary to consider, for each of the viewpoints within the ZTV of the windfarm concerned, the combined effect of all windfarms which are (or would be) visible from these viewpoints. Combined visibility may either be in combination (where several windfarms are within the observer's arc of vision at the same time) or in succession (where the observer has to turn to see the various windfarms).

Sequential effects occur when the observer has to move to another viewpoint to see different developments. Sequential effects should be assessed for travel along regularly-used routes like major roads or popular paths. The occurrence of sequential effects may range from frequently sequential (the features appear regularly and with short time lapses between, depending on speed of travel and distance between the viewpoints) to occasionally sequential (long time lapses between appearances, because the observer is moving very slowly and / or there are large distances between the viewpoints.)

Cumulative visual effects will vary in degree with:

- the sensitivity of visual receptors in terms of the context (For example, a vast open landscape with wide panoramic views will be different to a small-scale, intimate landscape with enclosed views), activity and number of receptors;
- the magnitude of cumulative change in terms of the scale, nature, duration, frequency of combined and sequential views (glimpses or more prolonged views; oblique, filtered or more direct views; time separation between sequential views); and
- the relative impact of each individual windfarm, with regard to visual amenity.

Sequential visual assessment and selection of routes for analysis

Sequential cumulative effects on visibility occur when the observer would see the proposed windfarm with other developments, either simultaneously or in succession, when moving through the landscape.

Importance of Cumulative scoping assessments

They should be carried out where the proposed wind turbine development may be seen in conjunction with other wind turbine developments. These developments will include existing, under construction and consented wind turbines and those 'in planning' i.e. at planning application stage.

Detailed cumulative impact assessments are only required where it is considered that the proposal could result in significant cumulative impact which could affect the eventual planning decision. The scale and complexity of assessments should be proportionate to the impacts.

The number of small and medium sized turbines proposed in rural parts of the area may have limited landscape and visual effects on their own but together they are starting to have significant cumulative effects on landscape character as well as on visual amenity, particularly in sensitive areas such as the Reserve forests.

Within the Project area and its surrounding there are four existing wind farm projects.

The key cumulative impacts that are relevant include: (i) biodiversity, bats and avi-fauna (ii) noise and (iii) landscape and visual. As for the other impacts, there is no data available from all adjacent projects and therefore and cumulative studies would need a approval by the relevant parties to provide data for such analysis.

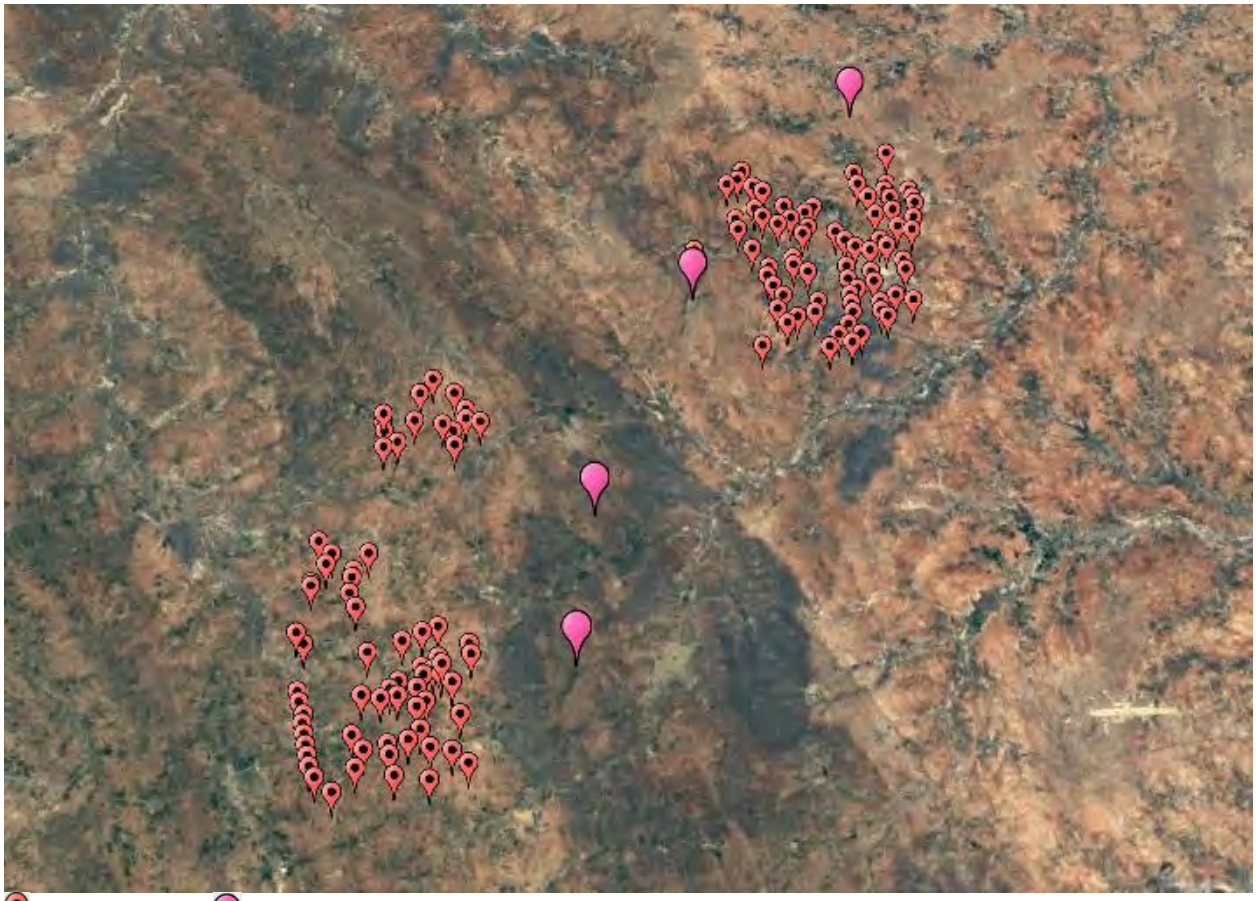


Figure 6-8: Wind Farm Projects in the Area

Mitigation Measures

Though it appears that there is only minimal impact on the avifauna and bats from the wind turbines based on the observations and estimates during the present study, following precautionary measures are recommended for further minimizing the chance of avian mortality in the wind farm.

Monitoring of Bird hits and Mortality:

During the present study, sampling and observation did not suggest any higher chances of mortality or damage to the birds by the proposed project. However, these observations were for a short duration, therefore, it is suggested that monitoring of bird hits and mortality may be carried out annually for a period of at least two years with a frequency of monitoring once in every season in order to understand if there are any significant mortality of birds or

disturbance to them by windmills in the project area. It is important that proposed sites should be monitored properly and specifically for bird mortalities.

Recommended minimum requirements for Bird and Bat Monitoring are as follows:

- Flight-activity monitoring conducted throughout the year with an increased level of monitoring effort during the spring and autumn migration periods.
- Implementation of an observer-led shutdown on demand system to mitigate for collision between turbine rotors and high conservation status/collision vulnerable bird species.
- Conducting of 'carcass search surveys' to assess bird collision fatalities
- Conducting of 'bias correction trials' to calibrate carcass search surveys for search efficiency and carcasses removal rates.
- Monitoring of livestock movements within the site to help identify elevated risks to Vulture and other scavenging bird species that may be attracted to the site by the periodic presence of livestock on site.

A reporting schedule described in detail in ESMMP will be followed. This should include:

- Immediate reporting of fatalities.
- Monthly review of carcass search results and
- 6 monthly review of all mitigation measures as part of adaptive management process.

Table 6-36: Carcass Survey Monitoring Record Keeping formats

Date: **Name of Observer from OKPPL:**
Start Time: **End Time:**

Temperature (^{0}C):
***Visibility** **Low<150m** ☐ **Medium 150-500m** ☐ **High>500m** ☐
***Wind Speed (km/hr):** **Wind Direction:**
***Precipitation** **None** ☐ **Rain** ☐ **Snow** ☐ **Fog** ☐

Turbines Operating (Y/N): **Rotation Speed: rpm**

*When performing carcass searches details regarding the visibility, wind speed, and precipitation of the previous night (or suspected time of bird collision) should also be provided

CARCASS SURVEY RECORDS

ID #	Species	Sex	Age	ID Procedure*	Turbine No.	Relation of the carcass to the turbine (transect or quadrant)	Carcass condition	Probable cause of death	Evidence for cause, additional comments

Code	Description
I	Injured or dying
F	Freshly dead with little or no decay or scavenging by insects; likely died within 48 hours
R	Recently dead but with noticeable decay or scavenging; likely died within 2-7 days.
D	Decomposed carcass, may not be identifiable to species; likely died more than 1 week ago.
U	Unknown; impossible to determine because only feathers remain.

*Identification procedure should be recorded as Observer ID, Collected, or Photographed (if one of the latter two, identification may take place sometime after the carcass has been found). Carcass condition should be recorded according to Table A. Cause of death should be noted (see text) and can be filled out after a necropsy if necessary

Precautions to avoid disturbance to wildlife

Though, endemic or threatened bird and bat species have not been reported in and around the proposed project area. On a precautionary principle, the company staff should check for the presence of any wildlife or bird habitat. If any of the unknown / new species are found in the project area, with ecologist advice, the company staff should immediately stop the WTG operation (till the bird leaves the area safely or completes the nesting activities) in order to minimize disturbance to the birds.

Regular removal of carcasses from the project areas

A dead animal (cow, buffalo, dog etc.) carcass attracts large number of vultures and raptors. The project staff should monitor the project area for any presence of such large animal carcasses. If there is any communal dumping ground of such carcasses present in and around the project site, they should be removed away from the project site. The villagers should be convinced and the dumping ground of cattle carcasses could be taken at least 5-10 km away from the project site boundary.

Training of Project Personals

In order to avoid any accidents, poaching or harassments to any bird species by the project staff involved in operation, such as labourers, drivers or any other employees, a training

program should be carried out. During training they should be made aware of the presence of various bird species in the project area and surrounding area. They should be trained in identification of endangered and rare birds and animals.

The other mitigation measures to be adopted are as follows:

- The WTG blade tips should be painted with orange or red colour as per International Standards measure to isolate from the sky and mitigates risk of bird collisions.
- Daytime visual markers shall be provided on transmission lines and Blades to enhance visibility for bird. Visibility enhancement objects such as marker balls, bird deterrents, or diverters shall also be installed along the transmission line to avoid avian collision
- Use of reflectors and bird flappers to be used at suitable intervals to avoid easy visibility of transmission wires and the risk of electrocution
- Any dead animals/carcass shall be removed in time from the site so that it does not attract movement of raptors near to the WTGs
- Power lines should be made visible by placing bird reflectors/red sphere balls on power lines passing close to water bodies (Halekallahalli and Lingavarahatti etc.).
- Spike guards should be installed on transmission line poles to avoid any bird sitting on them thereby reducing the chances of electrical shocks
- Jumpers on the electric poles should be covered by HDPE pipes to insulate conductors which would prevent electrocution of birds.
- Maximum distance should be maintained between conductors on overhead lines up to 200 cms so that it would enable passage of small and medium birds through them and also avoid fatalities of long tailed birds like Peafowl.
- Switching off the lights below the turbines whenever not required at night to avoid attracting the insects and associated nocturnal birds and bats to the turbines.
- Clearing of the weeds or grasses underneath each WTG needs to be carried out to prevent raptors flying in close vicinity of wind farm to prey on rodents. Herbaceous/grass layers may offer protection to rodents which will make burrows near them for breeding and resting purpose.
- Any dead animals/carcass should be removed in time from the site so that it does not attract movement of raptors near to the WTGs.
- Towers should regularly checked to avoid any nesting in any suitable gaps or platforms.
- Measures need to be taken to create awareness among the villages in and around turbine site for careful burial of the cattle carcasses to avoid the attraction of scavenging birds such as vultures into the turbine area.

- A participatory approach towards advocating and popularizing various measures in the human habitations located in and around the wind farm areas mainly for discouraging the feeding of pigeons and other human associated avifaunal species may be adopted. This can help minimize bird collision risk directly at the turbines, and also indirectly through avoiding the raptors getting attracted to the area.
- Vehicle movements in the turbine sites may be reduced and appropriately managed to minimize disturbances and road mortalities.
- The installation of turbines may be avoided in the area within 500 m radius of water bodies to further minimize the collision risk especially for migratory avifauna.
- Plantation of fruit bearing trees (such as guava, mango, banana, fig) and flowering plants, which may attract bird and bat near project area need to be avoided.
- Waste materials especially food waste, if any should not be left lying around the WTG's and if any waste is found it should be cleared immediately so that it does not attract birds near the WTG blades

Mitigation Measures for Electrocution of birds on poles and power lines

- This mainly occurs to long tailed birds such as Peafowls. In the study area the occurrence of such birds are at moderate number. Hence the following measures to be taken in change of design and other aspects given here:
- Cables & electric wires originating from wind turbine should be made either underground or under concealed pipes when sent to DP Yard adjoining to turbine.
- This DP Yard must be protected by animal proof walls/fence on all four sides.
- Use coiled barbed fencing (concertina coil) to avoid any animal jumping above the wall as an extra protection measure
- The poles in DP yard shall be kept at the height of 10m above ground.

All out door electrical equipments shall be kept in compact sub-station (which is a cubical, metal box, consisting of CT, PT, VCB and meter) which can reduce chances of electric shock to wildlife which can accidently enter fenced yard. A model Critter guard for protecting the birds from electrocution of birds can be arrangedas shown in the **Figure 6-3.**

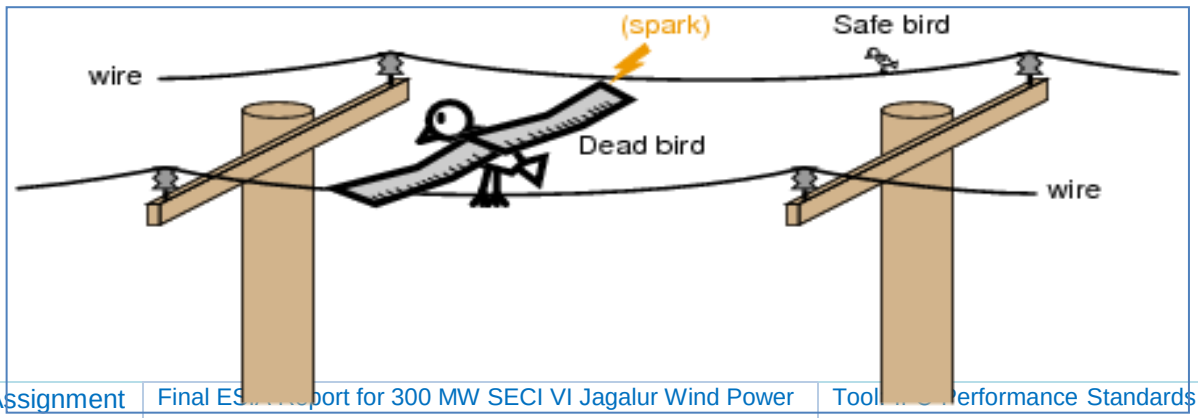


Figure 6-9: A model Critter guard for protecting the birds from electrocution in the site

Significance of Impact

The impact on ecology will be of medium intensity, local spread and will be for a short duration (of activity) which will result in minor impact with implementation of mitigation measures.

Table 6-37: Impact Significance - Ecology

Impact	Impact on Ecology				
Impact Type	Direct	Indirect	Induced		
Impact Duration	Short-term		Medium	Long Term	
Spread	Local	Medium	High		
Impact Scale	Limited to study area				
Frequency	Operation Phase				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/ Receptor	Low	Medium	High		

Senstivity/ Intensity					
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Minor**				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Minor**				

6.4.7
6.4.7
6.4.7

6.4.7 OCCUPATIONAL HEALTH AND SAFETY

Anticipated Impacts

During the operation phase, the risks will be quite limited due to nature of operation activities; the activities will be limited to guarding and on call and\or onsite technical support (maintenance and cleaning). There will be potential impacts on personnel' health and safety during operation phase due to exposure to risks such as:

- Slipping and tripping;
- Falling during working at height;
- Exposure to hazards such as electric shock and thermal burn hazards;
- Exposure to chemicals, hazardous and flammable materials; and
- Maintenance activities are expected to be carried out in hot weather conditions, thus workers are exposed to dehydration, heat exhaustion and heat stroke.
- COVID 19 spread among employees working at site

Mitigation Measures

OKPPL will prepare and implement Occupational Health and Safety Plan. It will clearly identify roles and responsibilities of the personnel involved within the project. The OHSP to include but not limited to the following: site specific safety plan, electrical safety, fire safety, heat stress, personnel protective equipment, emergency response plan, reporting and investigation and others.

Mitigation measures that will be followed include the following:

- Regular electrical safety training to workers;
- Implement Lock out/ Tag Out (LOTO) system;
- Use work equipment or other methods to prevent a fall from occurring. Collective protection systems, such as edge protection or guardrails, should be implemented before resorting to individual fall arrest equipment. In addition, safety nets or airbags can be used to minimize the consequences of a fall should it occur.

- Personal Protective Equipment (PPEs) e.g., shock resistant rubber gloves, shoes, other protective gear etc. should be provided to workers handling electricity and related components;
- The transformer yard should be provided with fire extinguishers and sand buckets at all strategic locations to deal with any incident of fire;
- Employees involved in electrical works shall be trained in and familiar with the safety-related work practices, safety procedures and other safety requirements that pertain to their respective job assignments; and
- An accident reporting and monitoring record shall be maintained.
- OKPPL is required to ensure maintaining HSE documentation for all workforce engaged at Site along with COVID-19 Precaution training records at Site.

Significance

The impact on health and safety will have medium intensity with a local spread for a long duration which will result in an overall moderate impact without mitigation. However, with proper health and safety measures the intensity of impact can be reduced to low resulting in an overall minor impact.

Table 6-38: Impact Significance – Health and Safety

Impact	Health & Safety in windfarm operation				
Impact Type	Direct	Indirect	Induced		
Impact Duration	Short-term		Medium	Long Term	
Spread	Local	Medium	High		
Impact Scale	The project will employ local workers primarily on a contractual basis, including semi-skilled and unskilled workers. Skilled workers may be migratory workers as and when needed by contractors				
Frequency	Operation Phase				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/ Receptor Senstivity/ Intensity	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Moderate**				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Minor**				

6.4.8 BLADE THROW

Anticipated Impacts

A failure of the rotor blade can result in the "throwing" of a rotor blade, or part thereof, which may affect public safety. Blade throw is a potential safety hazard which involves dropping of a rotor blade or the blade being thrown from the nacelle of the wind turbine in a high wind zone. The occurrence of blade throw can be due to two types of infrastructure failure:

- The whole blade detaching from the rotor and falling away from the turbine; or
- Part of the blade breaking off and falling away from the turbine;

Occurrences of these two scenarios could be caused by the factors such as:

- Design or manufacturing defect;
- Poor maintenance regime;
- Excessive winds during a storm;
- Exceeding maximum design loads;
- Rotor over-speed; or
- Lightning or fire.

Blade throw occurs when the entire blade is separated from the hub at the root joint. This could occur if there is an instantaneous failure of the bearing or hub/root flange fastening system. If these systems fail, the progression is usually slow enough that the control system will detect an abnormality (vibration, imbalance, under power, etc.) and the machine will fault and shut down. If this control function does not happen then the blade could be thrown from the hub and propelled at a distance.

Blade throws are more likely on small machines with fast rotating blades compared to large turbines. Also, meteorological conditions like dust storm or storms can aid blade throw but suchmeteorological conditions are not prevalent in the project region.

The safety buffer zone as specified by World Bank EHS Guidelines state that the minimum setback distance is 1.5 x turbine height (tower + rotor radius) which is computed to be 1.5 x (127 + 57) = 276 m. So, minimum setback of 276 m needs to be considered for this project.

The communities lying in close proximity to the WTG are receptors of blade throw impact. Blade throw risk for public safety is treated as extremely low as in the event of failure the blade can reach between 15-100 m from the wind turbine. In accordance with the WTG profiling carried out, 27 temporary receptors and 6 permanent receptors were observed to be falling within the setback zone are identified to be at risk in case of blade throw.

Mitigation Measures

The following mitigation measures should be taken by OKPPL to minimize the impact in case of blade throw:

Adopting Blade throw risk management strategies

- Minimize the probability of a blade failure by selecting wind turbines that have been subject to independent design verification/certification (e.g., IEC 61400-1), and surveillance of manufacturing quality.
- Ensure that lightning protection systems are properly installed and maintained.
- Carry out periodic blade inspections and repair any defects that could affect blade integrity.
- Equip wind turbines with vibration sensors that can react to any imbalance in the rotor blades and shut down the turbine if necessary.
- Ensuring that in order to curb Rotor over-speed, as soon a cut-out wind speed is reached the turbine should automatically shut down in a safe state
- Wind turbines can also be equipped with vibration sensors that can react to any imbalance in the rotor blades and automatically shut down the turbine if necessary, to avoid any chance of blade throw.
- Placing fences and warning signs as appropriate for the protection of site personnel and the public.
- Communicating the local community about the accidental risks and safety features of the WTGs within the wind farm;
- Communicating the local community on the 'dos' and 'don'ts' during emergency scenarios;
- Involving the district disaster management cell and the nearest fire service station while preparing for emergency situations.

Significance of Impact

The overall risk of blade throw will be very less . However, the impact significance will be considered to be "Moderate" during operation phase which reduces to Minor with adoption of mitigation measures. The Impact value for probable impacts during the Operation phase has been presented below:

Table 6-39: Impact Significance – Accidental impacts through Blade throw

Impact	Accidents			
Impact Type	Direct	Indirect	Induced	
Impact Duration	Short-term		Medium	Long Term
Spread	Local	Medium	High	
Impact Scale	All communities and livestock inhabiting with a radius of 200-300 meters			

	from the WTG sites are likely to be impacted.				
Frequency	Throughout the operation Phase				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/ Receptor Senstivity/ Intensity	Low	Medium	High		
	The nearest settlement is about 335 m from the project				
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Minor**				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Minor**				

6.4.9 SOCIO-ECONOMIC IMPACTS

Anticipated Impacts

Impacts on Local Economy

During the operational phase of the project, the impact on socio economic environment is likely to be positive as the project will lead to increase in local employment opportunities and increased demand for materials and services through local contracting. The power generated from the Project will be transmitted to the local grid and likely to increase the power supply situation in the region.

Up-gradation of Local Infrastructure

Although the project is not likely to involve any creation of additional infrastructure, OKPPL is likely to engage in community development activities like improvement of the school, support to the health center and other such activities in coordination with the local Panchayat. This will lead to a beneficial impact on the upgrading of local infrastructure.

Mitigation Measures

- OKPPL should wherever possible engage the locals for unskilled jobs.
- The project affected families should be provided first preference in any initiatives adopted by the project proponent before catering to the entire community.
- The Grievance Redressal Mechanism (GRM) should be adhered for addressing complaints and closure of issue within a week.

Significance of Impact

The Impact value for probable impacts during the Operation phase has been presented below:

Table 6-40: Impact Significance – Local Economy and up gradation of infrastructure

Impact	Community health and safety Impact on local employment opportunities during the project life cycle				
Impact Type	Direct	Indirect	Induced		
Impact Duration	Short-term		Medium	Long Term	
Spread	Local	Medium	High		
Impact Scale	Limited to project footprint Locals will mostly have short term employment opportunities during construction phase of the project. However, people in limited numbers, from the neighbouring districts of Davanagere, Bellary, and Chitradurga and from the bordering regions of Karnataka are likely to be engaged in the project, especially in the highly skilled category of manpower.				
Frequency	Operation Phase				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
	The impact magnitude will be positive as people from the locality will definitely be employed, especially during the operation phase of the project. However, the exact figures of local people benefitting from the employment opportunities cannot be estimated				
Resource/ Receptor Senstivity/ Intensity	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Minor** in case of community health and safety and **Moderate (beneficial)** in case of local employment opportunities due to proposed project.				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Negligible**				

6.5 IMPACT ASSESSMENT – TRANSMISSION LINE

Anticipated Impacts

Reportedly, there is no requirement for acquiring land for the transmission line. The RoW permission will be required for transmission line connectivity to the 400/220 kV grid substation at Hiriyur taluka, Chitradurga district. The adequate compensation shall be paid as per Ministry of Power "Guidelines for payment of Compensation towards damages in regard to Right of Way for Transmission Lines". As per this guidelines, Compensation towards diminution of land value in the width of Right of Way (RoW) Corridor due to laying of transmission line and imposing certain restriction would be decided by the States as per

categorization/type of land in different places of States, subject to a maximum of 15% of land value as determined based on Circle rate / Guideline value / Stamp Act rates.

The approach route identified for the transmission line is based on a criterion to reduce the environmental and socioeconomic footprint of the transmission line. The shortest feasible route after considering following factors has been selected for the transmission line:

- Transmission line route does not fall under any habitations and thick vegetation
- No households or community structures are in the route of the transmission line
- All environmentally sensitive sites, archaeologically significant sites, areas of ecological and cultural significance have been avoided while selecting the route

A relatively small area of 6mx6m will be acquired by paying a one-time compensation to the land owner (which includes the compensation for crops in the Right of Way).
Possible aspects of activity with potential to cause environmental impacts include but are not limited to:

- Getting RoU/ RoW permit;
- Consumption of water, generation of garbage, storage of fuel and lighting in the base camp;
- Access road construction involving cutting of trees or clearing of vegetation;
- Vehicular emission and noise pollution by transportation of equipment and workforce to site;
- Soil movement, air emissions and noise pollution while excavation and digging of pits;
- Air emission/ noise pollution by structural and mechanical work;
- Use of water resources (nominal quantity) for construction activities;
- Crossing of Transmission line over road or water bodies using Horizontal Directional Drilling (HDD) will have impact on soil, groundwater, air, noise, flora and fauna;
- Storage, handling and transportation of material will lead to air pollution and noise pollution.

Mitigation Measures
Mitigation measures shall include:

- Follow standard norms and practices in acquiring RoU /RoW;
- Adequate compensation will be provided as per norms;
- Toilets will be constructed at the site and the sanitary wastewater will be disposed of through septic tanks;
- Drinking water for the workers will be procured to the site from outside;
- Safety precautions will be put in place;
- Existing roads/ infrastructure to be used to the extent possible;

- Minimum trips for transportation of material/workforce to be worked out;
- Proper maintenance of transportation vehicles to be undertaken;
- Water sprinkling will be restored to in case of excessive dust emission;
- Care to be taken to bring the land to the near original condition so that, soil erosion is avoided;
- PPEs is to be used by operators of heavy machinery and also by workers;
- Effective water, wastewater and solid waste management at site;
- Transportation of hazardous waste to be as per hazardous waste management rules.

The preliminary responsibility for implementation of mitigation measure is with Transmission line contractor. OKPPL shall ensure that these are implemented and followed strictly.

Significance

Impact value for transmission line is assessed to be moderate without mitigation and minor with preventive measures.

Table 6-41: Impact Significance –Transmission Line

Impact	Impact on transmission line route				
Impact Type	Direct	Indirect	Induced		
Impact Duration	Short-term		Medium	Long Term	
Spread	Local	Medium	High		
Impact Scale	Throughout the project cycle				
Frequency	Operation Phase				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/ Receptor Senstivity/ Intensity	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Moderate**				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Minor**				

6.6 IMPACT ASSESSMENT – DECOMMISSIONING PHASE

Anticipated Impacts

Typical activities during the Wind energy facility decommissioning and site reclamation phase include facility removal, breaking up of concrete pads and foundations, removal of access roads that are not maintained for other uses, re-contouring the surface, and re-vegetation.

Dismantling operation however will have impact on environment due to noise and dust arising out of it. During de-installation, a specific strategy shall be adopted in order to handle each type of item to keep the impact during the actual activity low. The decommissioning will also have social impact. The impact due to decommissioning on power, social and environmental scenario will be guided by applicable laws and guidelines. The key issues associated with demobilization phase will include:

- Issue of loss of job when the workers will be asked to leave;
- Improper disposal of demolition waste and obsolete machineries will lead to contamination of soil and discontent of community;
- Demolition activity is anticipated to generate dust and exhaust emissions which can be carried downwind to habitations;
- Risks associated with health and safety issues such as trip and fall, electrical hazard etc.;
- The decommissioning activities of dismantling the Wind power plant and removing the ancillary facilities can lead to increased noise levels;
- During the dismantling of the Wind power plant, visual intrusions will be likely by removal of ancillary facilities but their consequence will be negligible due to fact that such impact would be temporary (over a short period);
- If the wind turbine rotar blades are not handled or disposed of appropriately during the decommissioning phase, any toxic substances contained within them are likely to escape into the surrounding air, water or soil, creating serious environmental and public health risks.

Mitigation Measures

Demobilization will require removal of machinery, workers and other structures. The mitigation measures for decommissioning shall include:

- The proponent shall inform the workers and local community about the duration of work;
- The workers shall be clearly informed about the expected schedule and completion of each activity;
- A transparent mechanism shall be prepared wherever choice is to be made between individuals of similar capability;
- All waste generated from decommissioning phase shall be collected and disposed off at the nearest municipal disposal site;
- All necessary Personal Protection Equipment (PPE) shall be used by the workers during demolition work;

- Diesel generator use should be restricted to emergencies and power back-up only to mimize emissions. DG set should be placed with enclosures and have an adequate stack height;
- OKPPL will be committed to ensure all health and safety measures are in place to prevent accidents and\or reduce the consequences of non-conformance events;
- Institution of suitable training modules for project-personnel and labor contractors involved in the dismantling process to ensure avoidance or minimization of rotor blade damage as far as possible and adherence to appropriate decontamination protocols in the event of any unavoidable damage and adhere to proper safe disposal methods.

Significance

Impact value for decommissioning is assessed to be moderate without mitigation and minor with preventive measures.

Table 6-42: Impact Significance –Decommissioning Phase

Impact	Impact due to decommissioning of WTGs and associated facilities				
Impact Type	Direct	Indirect	Induced		
Impact Duration	Short-term		Medium	Long Term	
Spread	Local	Medium	High		
Impact Scale	Project Area and vicinity				
Frequency	Regular during Decommissioning				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/ Receptor Senstivity/ Intensity	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Moderate**				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Minor**				

6.7 CUMULATIVE IMPACT ASSESSMENT

Cumulative impacts associated with the project

Cumulative impacts are those that may result from the incremental impacts of an action considered additively with the impacts of other past, present, and reasonably foreseeable future projects. Cumulative impacts are considered regardless of the agency or person undertaking the other actions and can result from the combined or synergistic effects of actions that are minor when considered individually over a period of time.

The Enercon and Clean Max Wind power project is present in Alur, Hosahalli villages at a distance of more than 0.5 km from proposed WTG locations.

The cumulative impact of the present wind project in light of the existing wind power farms in the vicinity is expected to be moderate as the existing wind farm is located in visible radius of the proposed SECI VI project. Also, there are ecologically sensitive area in the buffer zone of wind power project.

Land Use and Visual Resources

The land acquired for the project is majorly rainfed agriculture land devoid of any trees and few land acquired are dry land and barren land in nature. With regard to visual impacts, the operation of the project will substantially alter the visual landscape during the life of the wind project.

Air Quality

Operational emissions associated with the wind project will not likely to contribute adversely to any long-term cumulative impacts. In fact, the use of emission-free alternative energy generated by the wind project would likely serve to offset emissions from electricity that is currently generated by conventional power plants.

Noise

Noise caused by the movement of the WTGs would lead to temporarily elevated noise levels in the immediate vicinity of the project area. However, since there are no sensitive noise receptors in the area, the cumulative impacts would not be significant.

Noise associated with the operation of wind turbine generators may accumulate with other similar noise sources as existing wind projects located in the visual radius of the proposed SECI VI wind project will lead to the cumulative increase in noise level at the site area.

Geology and Soils

The wind project would adhere to regulatory and permitting requirements, including those for sewage discharges and waste discharge associated with operation activity and associated best management practices for soil erosion and sediment control, which would minimize soil loss and water quality impacts associated with the proposed project.

Biological Resources

The land acquired for the project is majorly an rainfed agricultural land and rest are dry or barren land. The ground cover occupied by grasses, shrubs and herbs were mostly seasonal and the level of impact generated from removal of this seasonal understorey (ground cover) can be termed as negligible as the species are very common and have least conservation value.

There is no critical habitat with high biodiversity value within project premises, AoI and buffer zone of 15 km radius. Further; no migratory bird pathway and corridors were observed near the project site and in the Study Area. Also no nesting and breeding grounds of birds were observed in Tranmsission Line Route and in the area earmarked for Wind Power Project.

There are no biosphere reserves, national parks, tiger reserves, Important Bird Areas (IBA), nesting or breeding grounds for any of the rare species within the study area of 15 km radius. Rangayyanadurga Four Horned Antelope Wildlife Sanctuary boundary is located at 1.4 km of project area (WTG SGJA-73) and Eco-sensitive zone of Rangayyanadurga Four Horned Antelope Wildlife Sanctuary falls partially within the project area. 2 WTGs (SGJA-78 and SGJA-73) fall within the ESZ area of Rangayyanadurga Four Horned Antelope Wildlife Sanctuary. This sanctuary consists of common flora and fauna.

Two migratory species are observed during primary survey they are Common Kestrel and Common Stonechat. These species are very common, have least conservation value and widely distributed in India. Therefore, impacts of wind farm and transmission line on migratory birds would be negligible.

The peacock corridor is located at a distance of 1.63 km in NE direction from SGJA 06; 1.57 km in NNE direction from SG JA-07; 1.28 km in SW direction from SG JA-70 and at a distance of 4.68 km in SW direction from PSS Phase I. NOC from Forest and Wildlife Department is required to be obtained for laying WTG's and associated facilities for the project due to presence of WTGs SGJA-78 & SGJA-73 within the ESZ boundary of the Rangayyanadurga Four Horned Antelope Wildlife Sanctuary.

Hence the cumulative impacts of the proposed wind project will have moderate impact on faunal habitat in the region.

Socioeconomics Impact

The project area already has existing wind farm projects which have generated avenues of income to the local population who were deprived of any significance means of livelihood due

to nature of land and rainfed agriculture activities. The upcoming of these renewable projects in the area will led to increase in land price.

The current project will enhance the income generation potential of the local population in the form of land provided by them for the project and also employment potential during the operation phase.

As noted in the social consultation section of the report the villagers expressed positive opinion of the project hence the cumulative impact of the present project will be positive.

7 ANALYSIS OF ALTERNATIVES

This section of the report presents the analysis of the alternatives considered for the proposed wind power project. The following scenarios have been considered:

1. No Project Scenario;
2. Alternate Location for Project Site;
3. Alternate Source for Power Generation;
4. Alternate Technology for the project; and
5. Alternate Route for Transmission Lines

7.1 NO PROJECT SCENARIO

As per the Load Generation Report 2016-2017, Ministry of Power, Government of India, peak power demand for the state of Karnataka for year 2015-2016, was 10,202 MW against the availability of 9,508 MW and hence experienced power deficit of 6.8%. The anticipated peak power requirement for the state of Karnataka for the year 2016-2017 is 11,152 MW against the availability of 9,905 MW. Hence, indicating a power deficit of 1247 MW (11.2%) during 2016-2017. The forecasts for the power requirement for the state of Karnataka as per Central Electricity Authority (CEA)[10] have been presented in **Table 7-1** below.

Table 7-1: Power Forecasts for Karnataka (2016-17)

Parameter	Requirement	Availability	Surplus (+)/Deficit (-)	%
Peak Electric Load (MW)	11,152	9,905	-1,247	-11.2%

Source: Central Electricity Authority

The current power supply scenario and the future forecasts indicate a progressive deficit in supply. In order to bridge this gap between the demand and supply, Renewable/ non-conventional sources of power are required to supplement the conventional sources. The proposed project being a nonconventional source of power generation intends to contribute towards bridging the demand supply deficit as projected.

As of December 2020, Karnataka had thermal generation capacity of 10.17GW comprising 5.02GW of coal-fired capacity and 4.16 MW of cola-gas based capacity. This formed 33.67% of the total generation in Karnataka.

In terms of Renewable energy, Karnataka is one of the top states for wind with 4.89 GW installed as of FY2019/20. Another 7.37 GW of solar and 0.14 GW of biomass capacity

makes the total Renewable capacity 18.83 GW. Renewables make 62.36% of total consumption in Karnataka.

7.2 ALTERNATE SOURCE OF POWER GENERATION

India is a large and fast growing economy, and according to Planning Commission of India, the country's primary energy use is expected to increase by four to five times by 2031-32. Even though India's energy basket has a mix of all resources such as coal, lignite, oil, natural gas, LNG, nuclear, hydro, and wind power, the dominance of coal is conspicuous with a prominent share of approximately 50%.

The efficiency of fuels is compared on the basis of their energy content and oil is considered as the standard for this comparison. One tonne of oil can generate 42 billion Joules or 10 Billion calories of energy whereas one tonne of Indian thermal coal can generate only 4.1 Billion calories. Thus 1 Mt of Indian coal is 0.41 Mtoe (Million tonnes of oil equivalent). Taking the thermal efficiency of the power plant and other losses in the system into consideration, in the case of coal-fired boilers, the equivalence between electricity and fossil fuels is 1 Billion kWh = 0.28 Mtoe. Electrical energy in kWh can be converted to kJ or kcal and can be expressed as Mtoe. One billion KWh of energy generated from wind power is equivalent to 0.086 Mtoe, since the intermediate stages of energy production don't generate any heat.

Table 7-2: Life-cycle Emissions from Power Sources

LCA Emissions (g CO_2 equivalent/kWh)	Wind	Solar	Nuclear	Coal
Implementation	13.7	37.5	1.2	3.6
Operation	4.7	12.0	12.4	918.8
Decommissioning	0.6	0.5	0.4	52.2
Total	19	50	14	975.3

Source: Report on developmental impacts and sustainable governance aspects of Renewable energy projects, Ministry of New and Renewable Energy

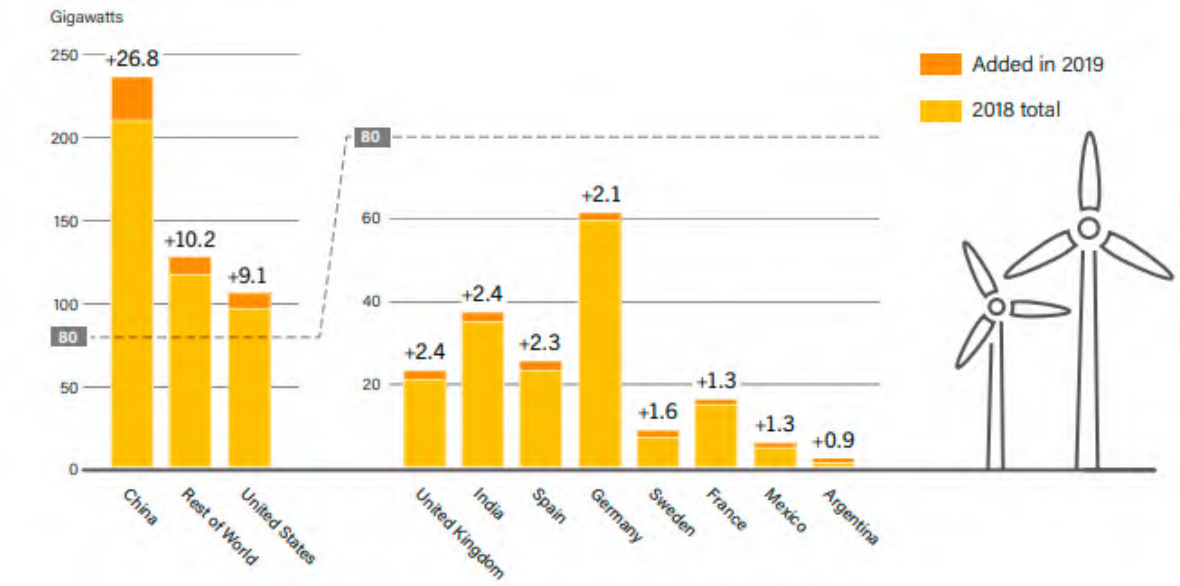
As vident from the Table above, the emission of CO_2 per kWh of energy generated from a Coal based power plant is more than 50 times that of the emission from a wind based power plant. The only emissions from the Renewable energy technologies are the emissions from fossil sources used in the production and manufacturing of equipment, waste disposal during construction, recycling etc. These life-cycle emissions are significantly lower as indicated in the table above.

As wind turbine don't produce any emissions that pollute the environment during its operation, unlike other power generating processes like burning of fossil fuels such as coal or natural gas, it is a clean fuel source and a power solution for remote areas like Anantapur.

Wind is the only energy form which doesn't require water for the production of electricity and also the one which generates negligible amount of waste, i.e. only during the construction period. A recent International Renewable Energy Association (IRENA) study found that countries like India would be able to greatly reduce water withdrawals and use in the electricity sector by increasing the share of Renewables.

Rapidly falling costs per kilowatt-hour (both onshore and offshore) have made wind energy ever more competitive and allowed onshore wind power to compete head-to-head with fossil fuel generation in a large and growing number of markets around the world, often without financial support. The economics of wind energy have become the primary driver for new installations. While falling prices are opening new markets, the global transition to auctions and tenders has resulted in intense price competition. Poorly designed tenders, permitting delays and lack of available land and grid access are challenging wind developers in many countries and causing attrition among turbine manufacturers. The industry is working to meet new challenges with improved technologies and other advances to further reduce costs and better integrate wind energy into existing energy systems. Offshore wind power is playing an increasingly important role and accounted for a record 10% of 2019 installations. Interest in hybrid projects, combining wind power with solar and/or energy storage, is increasing to reduce energy prices while mitigating impacts of variability and expanding revenue opportunities. (Source: Renewables 2015 Global Status Report)

Recognizing the importance of Renewable energy and its role in sustainable development, the United Nations General Assembly declared 2014 the first year of a decade of Sustainable Energy for All (SE4All), which aims to double the share of Renewable energy in the global energy mix from a baseline share of 18% in 2010 to 36% by 2030.



Source: Renewables 2020 global status report

Figure 7-1: Wind Power Capacity and Additions, Top 10 Countries, 2019

Figure 7-1 clearly points to the fact that as compared to developed nations such as China and United states, the wind power capacity addition in India is less. Although India stands fifth in wind power generation, it generates less than 24% of China's wind energy production.

In India, the Ministry of New and Renewable Energy has announced generation based incentive for grid connected wind power projects. The total potential for wind power generation in the country as on 31.03.2019 is estimated to be 302251.49 MW, which is approximately 69.6% of the Renewable power. The Karnataka Government is keen to promote clean energy and has a welcoming approach towards wind power generation. The state's Wind power policies has always been generous and hence have always attracted the wind power companies for turbine siting to regions like Chitradurga.

As per the prevailing Ministry of Environment and Forest laws, (the Schedule 1 of Ministry of Environment and Forests (Government of India) notification dated January 19, 2009), 38 activities are required to undertake environmental impact assessment studies. Since wind is one of the cleanest sources of energy, Environmental Impact Assessment study is not required for wind mill projects as there is no negative environmental impact due to the project activity. According to the International Renewable Energy Association (IRENA), wind power sector has generated 48,000 jobs (direct and indirect) in India.

Considering all the above mentioned favorable scenarios existing nationally and locally for wind power generation, there is no requirement of an alternative method. Wind power is the most suitable and environmental friendly option for power generation.

7.3 ALTERNATE LOCATION FOR THE PROJECT

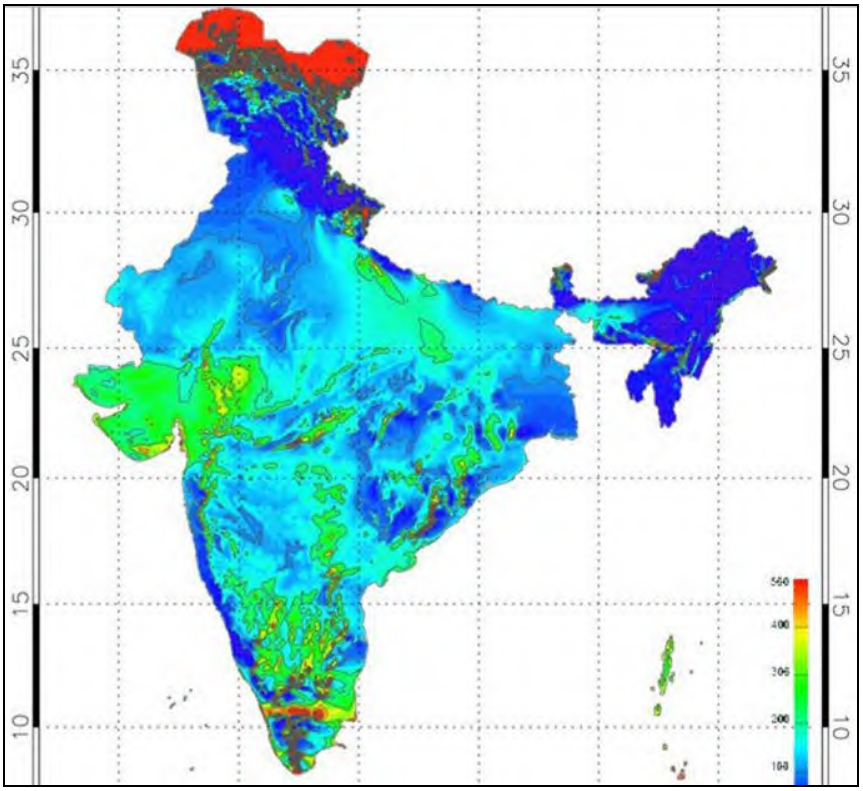
The location of any wind based power generating project is finalised based on several factors which allow the project to operate in a technically and economically viable manner. Some of these factors include:

- Availability of optimum wind speed, which is the primary requirement for a wind power project;
- The distance between the transmission line route and project area should be less, for easy transportation of energy;
- No substantial negative impact on environment or socio-economic conditions of the region;
- Ability to build the project on a site fulfilling national and state compliances;
- India's Ministry of New and Renewable Energy (MNRE) estimates Karnataka's Renewables potential to be 18.83 GW, equally balanced between solar and wind energy potential.

It also mentions that a region like Chitradurga is one of the ear-marked zones because of its high wind power potential. The region is dry as it faces scarcity of rainfall, wind is a naturally available resource, and farming is the main occupation of people in the region.

Karnataka is one of the States in India having windy locations, identified for wind power generation. Through the forest officials of project region, there was neither a requirement to relocate the native people nor any destruction of flora-fauna occurred as part of the project.

The local community has a positive approach towards upcoming wind energy projects in the region as there are similar projects by the same company as well as other companies, which have already made ingress into the neighbouring villages and are functioning without any encumbrance. They have helped improve quality of local infrastructure like construction of new roads. Apart from these factors, the villagers are of the expectation that such projects will elevate the standard of economy and provide them jobs like that of a security guard and other contractual opportunity of providing building materials and man-power.



Source: Data on estimation of Installable Wind Power Potential at 80 m level in India, National Institute of Wind Energy

Figure 7-2: Wind Power Density map at 80 m level

7.4 ALTERNATE ROUTE FOR TRANSMISSION LINES

The construction of transmission line has potential impacts associated with ecology and socio-economics, which can further be minimized by careful selection of route.

The multiple components that are interlinked with the selection of route for transmission lines include landowners' concerns, habitats of local species, seasonal water bodies or any other topographical or cultural features that could pose conflict. A careful multifarious approach is taken to reach a consensus on the routes that will do least damage and contain costs.

The following factors were considered by OKPPL while selecting the route for transmission line:

- The line should not infringe with any area of natural resources, forest lands;
- Any route which has the presence of a monument of cultural or historical importance, community structures, or houses is exempted;
- If selection of an area involves extensive removal of vegetation, that is averted;

- No environmentally sensitive sites are to be damaged during the process of installing transmission lines and access roads;
- Right of way/access roads to the substation will be shared with local residents and other users;
- The proposed route should not affect any public utility service such as schools, playgrounds, etc;
- There should not be threat to the survival of any community, while selecting the route.

The following map shows final routes for the transmission line from PSS II to PSS I with 26.47 Km and PSS I to GSS corridor on each side. The route selected has avoided all the sensitive areas like reserved forest, water bodies, large settlements etc.

Figure 7-3: Transmission Line Route for the proposed project (PSS I to GSS)

Figure 7-4: Transmission Line Route for the proposed project (PSS II to PSS I)

Private land has been procured on a willing buyer / willing seller basis (please refer to Section 3.6 for more details on the land procurement process). The project area is rain fed region and agriculture is limited during rainy season only, and it was reported that habitations, community structures, or residential areas have been avoided and bypassed during the procurement stage. The transmission route therefore has been chosen considering the above social conditions, in addition distance to be covered, financial benefits.

7.5 CONCLUSION

United Nation's Intergovernmental Panel on Climate Change (IPCC) has projected that Renewable energy can provide approximately 77% of global primary energy supply by 2050. The state level incentives provided by the new government of Karnataka are attractive enough to influence the wind power companies.

As mentioned in the sections above, the project has many advantages like elevating the standard of rural economies, increasing the power supply of the energy deficit state of Karnataka in an environmentally friendly manner. The project with existing options for site, mode of power generation, route of transmission line etc., is the appropriate alternative and is beneficial for the region.

8 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

8.1 ESMP

Environmental & Social Management Plan (ESMP) is an implementation plan for mitigation and offsetting the potential adverse environmental & social impacts of the project and enhance the positive impacts. Based on the environmental baseline conditions, planned project activities and impacts assessed earlier, this section enumerates the set of measures to be adopted to minimize the adverse impacts. Process of implementing mitigation and compensatory measures, execution, agencies responsible for their implementation and indicative costs is discussed in this chapter. The ESMP also shows how mitigation and management measures will be scheduled.

The key objectives of the ESMP are to:

- Formalize and disclose the program for environmental and social management;
- Provide a framework for the implementation of environmental and social management initiative.

The ESMP describes the mitigation measures for all the identified potential impacts associated with the project during its construction and operation phases. ReNew Power has already developed a Health, Safety and Environmental and Social Management System Manual applicable for both Solar and Wind Power Projects. This ESMP in integration with ReNew Power's ESMS will bridge the gaps on environment and social aspects of solar power projects. The environment and social management plan (ESMP) delineates the monitoring and management measures to avoid and/or minimize such impacts by allocating management responsibility and suggesting skill requirement for implementation of these measures. Also the ESMP shall ensure a continuous communication process between ReNew Power, their workers (including sub-contractors), local community and other stakeholders.

OKPPL has an obligation to ensure compliance to all the commitments towards Environment, Social, Health and Safety Standards while executing all the project related activities for the project. OKPPL is committed to implement an effective Environmental and Social Management System (hereinafter referred as ESMS) to continuously manage and communicate the potential social and environmental impacts and risks imposed on the project employees (direct and indirect) and the local communities residing in the immediate vicinity of the project area. Also, OKPPL shall ensure that all the contractors of this project

are brought under the umbrella of the ESMS and it shall implement the provisions of this Environment and Social Management Plan.

ESMS establishes ReNew Power's commitment to put in place adequate Environmental, Health Safety and Security (EHSS) and Social management protocols that will help manage the EHSS and social risks arising from its activities as well as carrying out business in a more sustainable manner. This is in conformance with its broader corporate objective as established in the Quality Health Safety & Environment (QHSE) policy of ReNew Power. This ESMS has been benchmarked against internationally accepted standards including the likes of International Financial Corporation (IFC) Performance Standards (PS) on Environmental and Social Sustainability, 2012, the Asian Development Bank (ADB) Safeguard Policy Statement (SPS), 2009, Equator Principle III, Japan International Cooperation Agency (JICA) and the World Bank Group Environmental, Health and Safety (EHS) Guidelines. ReNew Power is committed in simultaneously fulfilling the business objectives by remaining compliant to prevalent local laws, statutory and regulatory requirements as well as the aforementioned international policies and reference frameworks.

Furthermore, the ESMS would be modulated in accordance with requirements arising out of changes in business models intend by ReNew Power in the future. ESMS will be applicable to ReNew Power's businesses and operations that it carries out either directly or in association with turnkey contractors and subcontractors throughout the life cycle of the projects.

The key objectives of ESMS are as follows:

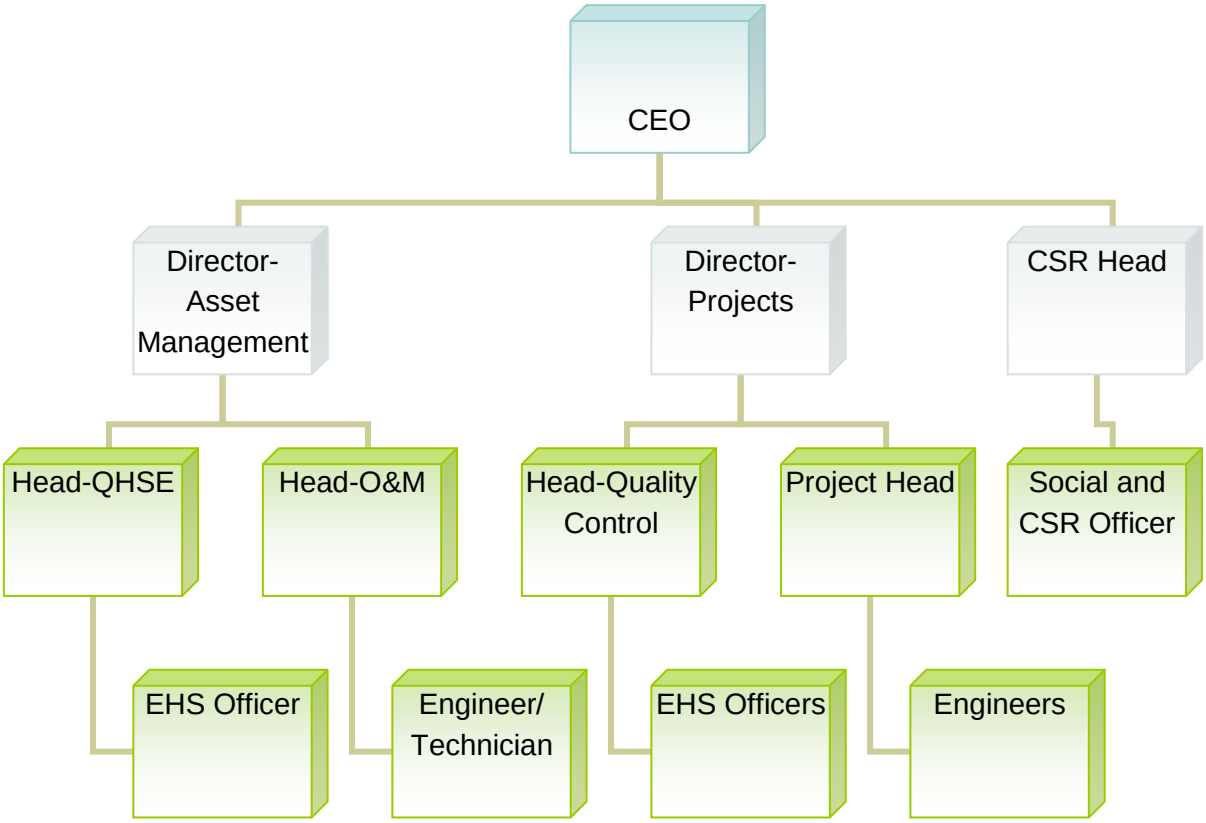
- Aligning ReNew Power's existing Environment, Social and Health & Safety Policies, Systems and Protocols in accordance with applicable regulatory requirements and lenders requirements
- Establishing a set of policies highlighting the ReNew Power's commitment in managing EHSS relevant issues throughout the life cycle of projects;
- Establishing tools and guidelines for screening, categorization, and assessment, of environmental and social impacts of ReNew Power's projects;
- Defining appropriate mitigation standards and management protocols for guiding management and minimization of impacts from ReNew Power's projects and their activities;
- Establishing a robust information disclosure and participation mechanism for communication of relevant environmental and social information to relevant stakeholders, and especially to those directly impacted from the projects such as the host communities, labour, contractors and other local stakeholders;

- Setting up an institutional arrangement at the corporate and project levels and provisioning of resources at both for the successful implementation of the ESMS along with a commitment for training and capacity building of these internal resources; and
- Establishing a monitoring and auditing protocol mechanism for analysis of ESMS implementation in order to make the system more efficient and effective.

8.2 ORGANISATION STRUCTURE

The overall management and coordination of the project will be managed through CEO, ReNew Power who will be supported by Head of Operation and the QHSE head looking after Health, Safety and Environment. The Head – QHSE will overview, monitor and control the activities of Project Manager and the safety officers at the site. The contractors will be controlled by the Project Manger during construction phase.

The overall project management entities as shown in the following diagram



The project will not lead to any significant adverse social impacts or risks as indicated in the previous sections. Given the project footprint area being limited to the immediate vicinity and the range of stakeholders as well as their levels of influence on the project, OKPPL should appoint one person to manage social (including labour and community) issues. The "Social Officer" will report to the QHSE Head.

8.2.1 ROLES AND RESPONSIBILITIES

CORPORATE LEVEL

QHSE Head and Safety officers

The QHSE head and his/her team will have the following responsibilities:

- Ensuring availability resources and appropriate institutional arrangements for implementation of ESMP;
- Compliance of legislative and IFC's requirements;
- Carryout audits, and inspection of all the project activities;
- Preparation of necessary documents and record keeping system; and
- Review and updating of ESMP for effective its implementation.

Social Officer

The social officer will have the following responsibilities

- Liaison with the government authorities and all project stakeholders;
- Managing all grievances of the project and their outcomes;
- Implementing, monitoring and updating the ESMP;
- Undertaking community development initiatives in the affected villages;
- manage all the human resource issues, contractor and training issue;
- Address training needs of contractors and other employees for social and community issues

SITE LEVEL

Site EHS In-charge

The Site EHS In-charge will have the following responsibilities:

- Ensuring availability of resources and appropriate institutional arrangements for implementation of ESMP;
- Ensuring compliance with legislative, IFC's requirements;
- Carrying out audits, and inspection of all the project activities at regular intervals and rectify non-compliances if any;
- Preparation of necessary documents and record keeping system;
- Reviewing and updating of ESMP for its effective implementation.
- Acting as a point of contact for local residents and community members;

- The contractor should develop a code of conduct to guide the employees on how to behave with the community to avoid conflicts;
- Develop a Grievance Redressal Mechanism in lines with informing the local community about the Grievance Redressal Mechanism and ensuring effective implementation; and
- Conducting periodic meetings with local community for understanding their grievances and outcomes of the CSR activities; and
- Address training needs of contractors and other employees for social and community issues

The HSE officer shall be responsible for checking compliance of the contractor(s) with the requirements of this EMP and any other relevant environmental legislation for all activities associated with the contract. The general duties of the HSE officer are as follows:

- Third Party HSE Officer will be responsible for conducting of an EHS audit during the construction phase of the project on a monthly basis according to the provisions of the Environmental Management Plan.
- Conduct independent environmental audits;
- Submit audit reports to the HSE Specialist/ Head HSE and if required, relevant authority.

Training and capacity building

Training is one common method of supplying individuals with additional skills and knowledge. In order to be successful in EHS management, training programs need to be thought out carefully and systematically. A robust social and environmental, health and safety training plan is important for effective implementation of ESMS.

The Corporate Head-QHSE at ReNew Power will ensure that the job specific training and EHS induction training needs are identified based on the specific requirements of the ESMS and existing capacity of site and project personnel (including the Contractors and Sub-contractors) to undertake the required actions and monitoring activities. Some of the specific trainings that will be carried out on routine basis are as follows:

- ESMS Checklists and procedural guidance
- Occupational Health & Safety
- Fire Safety and Prevention
- Emergency Response Preparedness
- Operational Training
- HR Induction Training
- PPE Training
- Driver Safety

- Implementation of Environmental and Social Management/Action plans

The above listed trainings are the preliminary trainings which will be undertaken at the inception stage once the employee/worker joins the company and/or Project. Post that, monthly refresher trainings will be undertaken, especially for the workers. Other training will be identified and implemented during the project lifecycle as per the need assessment, as part of mitigation measure and also capacity building of the staffs.
An environmental and social management training program will be conducted to ensure effective implementation of the management and control measures during construction and operation of the project. The training program will ensure that all concerned members of the team understand the following aspects:

- Purpose of action plan for the project activities;
- Requirements of the specific Action Plans;
- Understanding of the sensitive environmental and social features within and surrounding the project areas; and
- Aware of the potential risks from the project activities.

In case of contractors or turnkey contractors having sufficiently well-developed standards on EHS management, the training can be sub-let to the same for their respective employees and ReNew Power will monitor the completion and sufficiency status of these programs. In case of subcontractors, the training and capacity building will be done by the site level ESMS's officers along with the contractor's EHS manager to ensure such trainings of the contracted staffs either directly or through trainers of ReNew Power. Subsequently the responsibility can be passed on to the sub-contractors for all future training programs.

8.3 HEALTH SAFETY & ENVIRONMENT (HSE) PLAN

Health Safety & Environment (HSE) plan is applicable to all of ReNew Power Ventures Private Limited (ReNew Power) current businesses, which includes Wind and Solar energy, that it carries out either directly or in association with turnkey contractors and subcontractors throughout the life cycle of the project. The aim of the HSE plan is to inculcate excellence in Health, Safety and Environment at work and to all stakeholders. This plan would be used in association to the Environment Social Management System (ESMS) manual established by ReNew Power for managing Environmental and Social management of its operations and projects.

The objectives of this HSE Plan are as follows:

- To minimise health and safety hazards to our stakeholders and all others influenced by our activities;
- To minimise environmental impact from our operations
- To ensure compliance with all applicable occupational health safety & environment regulations and other requirements;
- To integrate health, safety and environment procedures and best practices into every operational activity;
- Encourage employees in maintaining a safe and healthy work place through periodic reviews of operational procedures and safe method of work;
- Develop a safety culture through active leadership;
- Incorporate appropriate health and safety criterion into business decision; and
- Ensure availability of resources to fully implement health and safety policy of the company.

Roles and Responsibilities

The Head QHSE along with the corporate level ESMS Manager at OKPPL with support from the regional level ESMS Managers will ensure the implementation of this HSE plan. For more details on their roles and responsibilities please refer to Section 9 of the Environmental and Social Management System (ESMS) manual.

Competence and Training

The Corporate ESMS Manager along with recommendations from ESMS officers will ensure that the HSE induction training needs are identified based on the specific requirements of this HSE plan and existing capacity of site and project personnel (including the Contractors and Sub-contractors) to undertake the required actions and monitoring activities. Some of the specific trainings that will be carried out on routine basis are as follows:

- HSE Control Procedures (ECP) and Operational Control Procedures (OCP)
- Occupational Health & Safety
- Fire Safety and Prevention
- Emergency Response Preparedness
- Onsite waste Management
- PPE Training
- Driver Safety
- Implementation of Environmental and Social Management/Action plans

The above list of trainings are not exhaustive and any other training as per requirement as mentioned above would be identified by the QHSE head and Corporate ESMS officers with inputs from local site level ESMS officers or contractors.

Site Level HSE Implementation

ReNew Power at every site level will appoint/nominate an ESMS officer who will also oversee the implementation of the HSE plan. The ESMS officer with support from relevant personnel from the project development teams and representatives from the contractors and sub-contractors will oversee the day to day HSE operations and will coordinate with the regional and corporate ESMS officer. The ESMS officer will provide information of Key Performance Indicators (KPI) and feedback related to HSE implementation back to the ESMS officer at the corporate level, through regional ESMS officer, where they would be discussed in periodic ESMS committee meetings.

Documentation and Legal Requirements

Applicable laws, regulations, permits, codes, standards, practices, and other requirements are identified and complied with, and documentation is managed through formally controlled processes. Records are maintained and readily available. All personnel, including contractors, are required to comply with the legal and other requirements applicable to the Project / Contract.

Development of Operational Control Procedures for Health and Safety

All project sites to develop their own operational control procedures and formats for smooth working and maintenance of HSE aspects of the sites.

Performance Monitoring, Assessment, Review and Improvement

HSE performance and systems are monitored, audited, and reviewed to identify trends, measure progress, assess compliance, drive continuous improvement, and provide assurance that governing processes are working effectively.

8.4 CONTRACTORS MANAGEMENT PLAN

The overall responsibility of the project will be of OKPPL regardless of the entity assigned for the EPC. OKPPL shall thus ensure that the ESMP is implemented by its contracts through contractual arrangements. General environmental awareness will be increased among the project's team to encourage the implementation of environmentally sound practices and compliance requirements of the project activities. The same level of awareness and commitment will be imparted to the contractors and sub-contractors prior to the commencement of the project.

OKPPL shall ensure that the job specific training and EHS Induction Training needs are identified based on the specific requirements of ESMP and existing capacity of site and project personnel (including the Contractors and Sub-contractors) to undertake the required actions and monitoring activities. Special emphasis will be placed on traffic management and operation of Cranes.

An environmental and social management training program will be conducted to ensure effective implementation of the management and control measures during construction and operation of the project. The training program will ensure that all concerned members of the team understand the following aspects:

- Purpose of action plan for the project activities;
- Requirements of the specific Action Plans;
- Understanding of the sensitive environmental and social features within and surrounding the project areas; and
- Aware of the potential risks from the project activities;

A basic occupational training program and specialty courses should be provided, as needed, to ensure that workers are oriented to the specific hazards of individual work assignments. Training shall be provided to management, supervisors, workers, and occasional visitors to areas of risks and hazards. Workers with rescue and first-aid duties shall receive dedicated training so as not to inadvertently aggravate exposures and health hazards to themselves or their co-workers.

Through appropriate contract specifications and monitoring, the employer should ensure that service providers, as well as contracted and subcontracted labour, are trained adequately before assignments begin.

ReNew Power has a contractor management and vendor procurement policy its key objectives are:

- OKPPL will ensure all contractors are suitably qualified and competent to undertake the intended task;
- All its contractors comply with applicable statutory and regulatory requirements and reasonable workplace practices across the operations and services;
- OKPPL engages contractors solely on the basis of meritocracy (including education, formal training, and experience) and as per requirements. It does not engage in any form of nepotism or favouratism as part of its contractor selection process;
- OKPPL will not employ and contractor held liable in the past for major labour rights violation as per national or international laws including child, forced, or bonded

labour, trafficked labour etc. The services of contractor shall be terminated immediately in case such violations or activities comes in to notice of the company during project activities;

- OKPPL will ensure that contractor understands the scope of work to be completed and is aware of any specific safety or operational conditions identified;
- OKPPL will ensure availability of risk assessment and method statement detailing how the work will be done where significant hazard have been identified;
- OKPPL expects high moral and ethical standards of integrity and physical conduct from its contractors and their employees across services and operations.

8.5 STAKEHOLDER ENGAGEMENT PLAN

OKPPL shall adhere to Stakeholder Engagement Plan (SEP) for engagement with community, government bodies during the lifecycle of the project and to assess the efficiency of the communication process in meeting the objectives of the SEP and ensuring the projects' 'social license to operate'.

Stakeholder Group Categorization

Stakeholder Groups	Primary Stakeholders	Secondary Stakeholders
Community	Sub contractors, local labours	Local community, agricultural labour, vulnerable communities
Institutional Stakeholders	Gram panchayat, Project Investors	Village Institutions, (schools, health centers etc)
Government Bodies	Regulatory Authorities, District Administrations	
Other Groups	-	Media, other industries, projects

Aims and Objectives of SEP

The engagement plan is to guide all the stakeholders' engagement during construction phase and operations phase.

The objectives of the SEP are:

- Enable management to develop effective stakeholder management strategies for various projects in order to build long term relationship so as to ensure smooth functioning of the projects;

- To define and standardize the process that the project will use to communicate with respective stakeholders;
- To ensure regular and timely sharing of information with project team to spruce up their understanding and skills of engaging with the stakeholders;
- Ensuring coordination in approach and message to be shared with the community regarding the company and the projects;
- To assess the efficiency of the communication process in meeting the objectives of the SEP and ensuring the projects' 'social license to operate.'

The community engagement process is informally managed by the QHSE Head and is limited to liaison with local authorities and the Panchayat. In order to ensure the implementation of the ESMP and engage all the stakeholders identified, this process will need to be formalized through the Social officer defined as above.

The two important elements of community engagement will be disclosure and consultation. This implies that as a first step, the findings of the ESIA, especially the ESMP will have to be disclosed to the community. The ESMP should be finalized through consultation with the community and an action plan shall be developed. Further, the community should be regularly updated about the implementation of the ESMP and all other relevant information pertaining to the construction phase, activities, health and safety risks etc. The community shall also be made aware of the available job opportunities from time to time.

The project will engage with the affected community (if any) to understand the stakeholders on the common property resources (roads, grazing areas etc.) which would be impacted. It shall work closely with the Panchayat and local administration to identify and develop alternate areas for common resources (fodder,) if required.

In order to understand community expectations and manage any local concerns, ReNew Power will constitute a Grievance Redressal Mechanism to be managed by the Social Officer. This grievance mechanism will respond to the concerns and grievances of local communities, NGOs, Panchayats and any other aggrieved party or stakeholder. The project will share information about these mechanisms to the stakeholders through locally appropriate communication tools.

The Grievance Redressal procedure will also outline the process and steps to be taken and the time limit within which the issue would need to be resolved to the satisfaction of the complainant. The project will endeavor to get all complaints recorded and addressed in a uniform and consistent manner. For disputes that cannot be internally resolved, the project will set up an independent mechanism with representation from community, Panchayats and

locally respected citizens of the area to sort these conflicts. If it has a legal implication the district administration will be approached.

ESMP REVIEW AND AMENDMENTS

The project ESMP is a social and environment management tool which shall be reviewed periodically (at least once in 2 years or earlier) to address changes in the project design, life cycle processes and activities, organization and regulatory requirements.

Inspection, Monitoring & Audit

In order to implement the ESMP, the on-site team will develop a time-bound and action-oriented Environmental and Social Action Plan to implement the mitigation measures provided for each of the identified environmental and social impacts. This ESMP will have to be monitored on a regular basis, quarterly or half-yearly and all outcomes would need to be audited in accordance with existing EHS commitments.

The monitoring process will cover all stakeholders including contractors, labourers, suppliers and the local community impacted by the project activities and associated facilities. Inspection and monitoring of the environmental and social impacts of construction and operation phase activities will increase the effectiveness of suggested mitigations. Through the process of inspection, audit, and monitoring OKPPL will ensure that all the contractors comply with the requirements of conditions for all applicable permits including suggested action plans. The inspections and audits will be done by OKPPL's trained team and external agencies/experts. The entire process of inspections and audits will be documented. The inspection and audit findings will be implemented by the contractors in their respective areas.

8.5.1 Reporting and Review

OKPPL will develop and implement a programme of reporting through all stages of the project - construction and commissioning, operation and decommissioning. Contractors will be required to fully comply with the reporting requirements in terms of timely report submission with acceptable level of details. Reporting will be done in form of environmental, health, safety and social check list, incident record register, environmental, health, safety and social performance reports (weekly, monthly, quarterly, half yearly, yearly etc).

8.5.2 External Reporting and Communication

All complaints and enquiries are to be appropriately dealt with and records be maintained in a Complaint/Enquiry Register by QHSE Head or other delegated staff.

8.5.3 Internal Reporting and Communication

Inspection and audit observations along with their improvement program are to be regularly reported to the senior management for their consideration. The same are also to be communicated within the staff working on the project. To maintain open communication between the staff and management on EHS&S issues the following shall be used:

- Team Briefings,
- On-site work group meetings;
- Key Incidents/accidents and lessons learnt
- Work Specific Instructions; and
- Meeting with stakeholders.

8.6 LABOUR MANAGEMENT PLAN

The construction of the project has been started along with land acquisition for the project. Locals will be hired for the project during construction phase. However, in case of hiring migrant labour; OKPPL needs to adhere to implementation of Labour Camp Management Plan Guidelines as provided under "Worker's Accomodation Processes and Standards: A Guidance Note by IFC and EBRD[8]" and ensure that the worker's accommodation should be at a neat and clean, safe place and, at a minimum, should meet the basic needs of workers.

In particular, the provision of accommodation should meet national legislation and international good practice in relation, but not restricted, to the following: the practice for charging for accommodation; the provision of minimum amounts of space for each worker; provision of sanitary, laundry and cooking facilities and potable water; the location of accommodation in relation to the workplace; any health, fire safety or other hazards or disturbances and local facilities; the provision of first aid and medical facilities; and heating and ventilation. Workers' freedom of movement to and from the employer-provided accommodation should not be unduly restricted.

Drinking Water Resources and Monitoring Water Quality

- Access to an adequate and convenient supply of free potable water should be always available to workers.
- Depending on climate, weather conditions and accommodation standards, 80 to 180 litres per person per day are available.
- Drinking water should meet national/local or WHO drinking water standards.

[8]https://www.ifc.org/wps/wcm/connect/60593977-91c6-4140-84d3-737d0e203475/workers_accomodation.pdf?MOD=AJPERES&CACHEID=ROOTWORKSPACE-60593977-91c6-4140-84d3-737d0e203475-jqetNIh

- All tanks used for the storage of drinking water should be constructed and covered as to prevent water stored therein from becoming polluted or contaminated.
- Drinking water quality should be regularly monitored.

Wastewater and solid waste

- Arrangements for discharge of wastewater, sewage, and disposal of food, kitchen waste and any other waste materials should be made without causing any impact on biophysical environment or surrounding communities.
- Specific containers for rubbish collection should be provided and emptied on a regular basis.
- Adequate number of rubbish containers to providing leak proof, non-absorbent, rust and corrosion-resistant containers protected from insects and rodents needs to be provided.
- The garbage/rubbish containers should be 30 metres from each shelter on a wooden, metal, or concrete stand. Such containers must be emptied at regular intervals (to be determined based on temperatures and volumes generated) to avoid unpleasant odours associated with decaying organic materials.
- Pest extermination, vector control and disinfection should be carried out throughout the living facilities in compliance with local requirements and/or good practice. Where warranted, pest and vector monitoring should be performed on a regular basis.

Labour Camp Room/ Dormitory Facilities

- Rooms/dormitories should be kept in good condition
- Rooms/dormitories should be aired and cleaned at regular intervals.
- Rooms/dormitories are built with easily cleanable flooring material.
- Sanitary facilities should be located within the same buildings and provided separately for men and women. Usual standards range from 10 to 12.5 cubic metres (volume) or 4 to 5.5 square metres (surface).
- A minimum ceiling height of 2.10 metres is provided.
- In collective rooms, which are minimised, in order to provide workers with some privacy, only a reasonable number of workers are allowed to share the same room. Standards range from 2 to 8 workers.
- All doors and windows should be lockable and provided with mosquito screens where conditions warrant.
- There should be mobile partitions or curtains to ensure privacy.
- Every resident should be provided with adequate furniture such as a table, a chair, a mirror and a bedside light.
- Separate sleeping areas should be provided for men and women, except in family accommodation.

Bed arrangements and storage facilities

- A separate bed for each worker should be provided. The practice of “hot-bedding” should be avoided.
- There should be a minimum space between beds of 1 metre.
- Double deck bunks are not advisable for fire safety and hygiene reasons, and their use is minimised. Where they are used, there must be enough clear space between the lower and upper bunk of the bed. Standards range from to 0.7 to 1.10 metres.
- Each worker should be provided with a comfortable mattress, pillow, cover, and clean bedding.
- Bed linen should be washed frequently and applied with repellents and disinfectants where conditions warrant (malaria).
- Facilities for the storage of personal belongings for workers should be provided.
- Separate storage for work boots and other personal protection equipment need to be provided

Sanitary and toilet facilities

- Sanitary and toilet facilities should be constructed of materials that are easily cleanable.
- Sanitary and toilet facilities should be cleaned frequently and kept in working condition.
- Sanitary and toilet facilities should be designed to provide workers with adequate privacy, including ceiling to floor partitions and lockable doors.
- Sanitary and toilet facilities should not be shared between men and women, except in family accommodation.
- An adequate number of toilets should be provided to workers. Standards range from 1 unit to 15 persons to 1 unit per 6 persons. For urinals, usual standards are 1 unit to 15 persons.
- Toilet facilities should be conveniently located and easily accessible. Standards range from 30 to 60 metres from rooms/dormitories. Toilet rooms shall be located so as to be accessible without any individual passing through any sleeping room. In addition, all toilet rooms should be well-lit, have good ventilation or external windows, have sufficient hand wash basins and be conveniently located.

Showers/bathrooms and other sanitary facilities

- Shower/bathroom flooring should be made of anti-slip hard washable materials.
- An adequate number of handwash facilities should be provided to workers. Standards range from 1 unit to each 15 persons to 1 unit per 6 workers. Handwash facilities should consist of a tap and a basin, soap and hygienic means of drying hands.
- An adequate number of shower/bathroom facilities need to be provided to workers. Standards range from 1 unit to 15 persons to 1 unit per 6 persons.
- Showers/bathrooms should be conveniently located.

- Shower/bathroom facilities should be provided with an adequate supply of cold and hot running water.

Cooking facilities

- Places for food preparation should permit good food hygiene practices, including protection against contamination between and during food preparation
- Kitchens should be provided with facilities to maintain adequate personal hygiene including a sufficient number of washbasins designated for cleaning hands with clean, running water and materials for hygienic drying.
- Wall surfaces adjacent to cooking areas should be made of fire-resistant materials. Food preparation tables are also equipped with a smooth durable washable surface. Further, in order to enable easy cleaning, it is good practice that stoves are not sealed against a wall, benches and fixtures are not built into the floor, and all cupboards and other fixtures and all walls and ceilings have a smooth durable washable surface.
- All kitchen floors, ceiling and wall surfaces adjacent to or above food preparation and cooking areas are built using durable, non-absorbent, easily cleanable, non-toxic materials.
- Wall surfaces adjacent to cooking areas should be made of fire-resistant materials. Food preparation tables are equipped with a smooth, durable, easily cleanable, non-corrosive surface made of non-toxic materials. Further, in order to enable easy cleaning, it is good practice that stoves are not sealed against a wall, benches and fixtures are not built into the floor, and all cupboards and other fixtures have a smooth, durable and washable surface.
- Adequate facilities for cleaning, disinfecting and storage of cooking utensils and equipment should be provided.
- Food waste and other refuse are to be adequately deposited in sealable containers and removed from the kitchen frequently to avoid accumulation.

Medical facilities

- A number of first aid kits adequate to the number of residents should be available.
- First aid kits should be adequately stocked.
- An adequate number of staff/workers (1 first aider for every 50 persons) should be trained to provide first aid.
- Where possible and depending on the medical infrastructures existing in the community, other medical facilities should be provided (nurse rooms, dental care, minor surgery)

Leisure, and social facilities

- Basic collective social/rest spaces should be provided to workers. Standards range from providing workers multipurpose halls to providing designated areas for radio, TV, cinema.
- Recreational facilities should be provided for the workers

Security of workers' accommodation

- A security plan including clear measures to protect workers against theft and attack should be implemented.
- Security staff should be checked to ensure that they have not been implicated in any previous crimes or abuses. Where appropriate, security staff from both genders should be recruited.
- Security staff should have a clear mandate and have received clear instruction about their duties and responsibilities, in particular their duties not to harass, intimidate, discipline or discriminate against workers
- Security staff should have received adequate training in dealing with domestic violence and the use of force.
- Security staff should have a good understanding about the importance of respecting workers' rights and the rights of the communities.
- Workers and the locals residing in nearby areas in villages should have specific means to raise concerns about security arrangement and staff.

OKPPL should also also adhere to Standard Operating Procedure for Work Resumption after Lockdown and ensure compliance w.r.t. following measures:

- Maintaining Social Distancing in Labour Accommodation (2 meter)
- Soap solutions / hand sanitizers to be placed in all quarters / wash rooms places where ever required and replenished periodically.
- Ensuring that all doors / windows/fittings are sanitized frequently.
- Special attention to be given for the wash rooms / toilets by periodical cleaning, Swabbing, disinfecting and maintaining dry.
- Emergency Facilities to be available for 24 X 7 and displayed emergency key contacts.
- Soap solutions / hand sanitizers to be placed in all quarters / washrooms places where ever required and replenished periodically.
- To ensure that all the workers who are coming for work are healthy and not having any symptoms of COVID-19 (Fever, Dry cough, breathing problem).
- Arrangements to be made to supply all essential items like rice, wheat, groceries, water, etc to colony itself so as to restrict movements of labourers.
- Appropriate masks to be distributed to all labourers.

- All labour engaged at Site shall be advised to wear mask always while at colony, movement outside and during duty timings.
- Ensuring availability of the following at all times
    1. Sanitizer
    2. Face mask
    3. Hand gloves
    4. Hand Wash
    5. Dettol
    6. Soap
    7. Thermometer
    8. BP checking machine
    9. First Aid Box

- Tie up with nearest Hospital/Covid 19 Rescue Team shall be made for getting medically examination of all people for any Covid-19 symptoms.
- Quarantine hall or room shall be established in labour colony for the said purpose.
- Contractor shall display precautions measures - do's and don'ts at colony premises in all languages spoken by the workers.
- Vehicle shall be kept ready or tip up for vehicle shall be made for emergency purpose.
- Minimum social distancing shall be ensured in keeping occupants in a single room.
- Disinfecting spray done at all the areas of colony after workers are left for work daily.
- A team comprising OKPPL Admin, HSE and Contractor site in charge shall visit labour colony daily to ensure availability of essential things and regarding no off occupants, cleanliness, sanitization status, etc. and submit a report to Construction Manager and Project Manager.
- Feedback in written form or through personal interaction regarding labour colony requirements shall be obtained from contract labours on weekly basis.

8.7 WASTE MANAGEMENT PLAN

The project should handle all incoming waste materials, all waste generated on site and both the disposal, and potential recycling of such materials. The exact quantities need to be detailed once agreed packaging and quantities of incoming material is identified. The project waste is primarily related to civil works, and packaging of incoming materials. The following principles are put in place to reduce the amount of waste generated:

- Packaging will be optimized to reduce non-recyclable content
- Orders of cables and other consumables will be kept to a minimum
- The amount of earth works is kept to a minimum, including optimized road works to reduce required import of material to site

8.8 HEAVY MACHINERY USAGE PLAN

The project will use heavy machinery in a way that minimizes the potential negative effects of such use. The following three effects are mitigated as described. Other negative effects will be mitigated as they become identified. The construction/sub-EPC supplier will be responsible for both identifying and mitigating such effects.

All use of heavy machinery will be done at low speeds to ensure safety on site, and reduce any negative impact they might have.

Dust
During dry periods sprinkling of water on the roads and construction areas will be done regularly to avoid dust spreading.

Mud
During rainy seasons the use of such machinery will be avoided if possible. During random showers the water will be allowed to drain before machinery is moved across the site.

Noise
Heavy and noisy machines will only be used during daytime. Noisy machines are machines which leads to measurable noise levels above 55dB at the outer perimeter of the site.

All employees in the proximity of machines producing noise above 70dB shall wear ear protection such as ear plugs.

8.9 DRAINAGE PLAN

During the construction of the site will at times consist of loose and/or un-compacted soil, and removed or destroyed vegetative cover. During this phase temporary drainage system will have to be installed. This will consist of landforms, both trenches, and deep pits to collect and dissipate water.

The temporary drainage will either be converted into permanent drainage with masonry (where co-located), or closed off after completion of the planned system.

8.10 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

The project ESMP is a social and environment management tool which shall be reviewed periodically (at least once in 2 years or earlier) to address changes in the project design, life cycle processes and activities, organisation and regulatory requirements.

Inspection, Monitoring & Audit

In order to implement the ESMP, the on-site team will develop a time-bound and action-oriented Environmental and Social Action Plan to implement the mitigation measures provided for each of the identified environmental and social impacts. This ESMP will have to be monitored on a regular basis, quarterly or half-yearly and all outcomes would need to be audited in accordance with existing EHS commitments.

The monitoring process will cover all stakeholders including contractors, labourers, suppliers and the local community impacted by the project activities and associated facilities. Inspection and monitoring of the environmental and social impacts of construction and operation phase activities will increase the effectiveness of suggested mitigations. Through the process of inspection, audit, and monitoring OKPPL will ensure that all the contractors comply with the requirements of conditions for all applicable permits including suggested action plans. The inspections and audits will be done by OKPPL's trained team and external agencies/experts. The entire process of inspections and audits will be documented. The inspection and audit findings will be implemented by the contractors in their respective areas.

Reporting and Review

OKPPL will develop and implement a program of reporting through all stages of the project - construction and commissioning, operation and decommissioning. Contractors will be required to fully comply with the reporting requirements in terms of timely report submission with acceptable level of details. Reporting will be done in form of environmental, health, safety and social check list, incident record register, environmental, health, safety and social performance reports (weekly, monthly, quarterly, half yearly, yearly etc).

External Reporting and Communication

All complaints and enquiries are to be appropriately dealt with and records be maintained in a Complaint/Enquiry Register by QHSE Head or other delegated staff.

Internal Reporting and Communication

Inspection and audit observations along with their improvement program are to be regularly reported to the senior management for their consideration. The same are also to be

communicated within the staff working on the project. To maintain open communication between the staff and management on EHS&S issues the following shall be used:

- Team Briefings,
- On-site work group meetings;
- Key Incidents/accidents and lessons learnt
- Work Specific Instructions; and
- Meeting with stakeholders.

8.11 DOCUMENTATION AND RECORD KEEPING

Documentation and record keeping system has to be established to ensure updating and recording of requirements specified in ESMP. Responsibilities have to be assigned to relevant personnel for ensuring that the ESMP documentation system is maintained and that document control is ensured through access by and distribution to identified personnel in form of the following:

- Documented Environment and Social Management System;
- Legal Register;
- Operation control procedures;
- Work instructions;
- Incident reports;
- Emergency preparedness and response procedures;
- Training records;
- Monitoring reports;
- Auditing reports; and
- Complaints register and issues attended/closed.

8.12 PROPOSED ENVIRONMENT AND SOCIAL MANAGEMENT PLAN

An Environment and Social Management Plan has been developed following the delineation of impacts and mitigation measures. These measures will be adopted by the project proponent and imposed as conditions of contract of the sub-contractor employed for respective phases of the power project. The mitigation measures suggested during operation will be made part of the regular maintenance and monitoring schedule.
The ESMP includes the following:

- Mitigations suggested for adverse environmental and social impacts and associated risks;

- Institutional arrangement - management tools and techniques for the implementation of environmental impacts and risk mitigations;
- Monitoring and reporting of requirements and mechanisms for the effective implementation of the suggested mitigations;
- Monitoring arrangements for effective implementation of suggested mitigations for the proposed project; and
- Reporting requirement to the regulatory agencies and funding institutes

Table 8-1: Environment and Social Management Plan

Impact Identified	Impact Significance without mitigation	Suggested Mitigation	Impact Significance with mitigation	Monitoring / Training	Frequency	Management Responsibility
CONSTRUCTION PHASE						
Soil Resources and Quality						
Erosion and compaction Contamination of soil Construction/ strengthening of access roads; Vehicular movement; and	Minor	• Use of existing roads for transport of man and material to the extent possible • Loose soil to be protected from wind and runoff • All construction material to be kept within the footprint of the area acquired. • Stripping of top soil will be conducted only when required and if conducted then will not be carried out in monsoon season or during heavy winds to minimize erosion and runoff.	Negligible	Contractor representative to make daily observations on storage and handling of soil and construction material. Workers handling painting activity to be briefed about the need to prevent contamination. Drivers to be instructed about use of dedicated tracks within the site	• Drivers training to be imparted to all Drivers during Induction and Refresher training to be conducted on quarterly basis • Fortnightly basis • Re-vegetated area and oil spill monitoring on fortnightly basis • Undertaking EHS Inspections on fortnightly basis and Monthly EHS Reporting • Conducting training on soil	Site supervisor To be mentioned in the contract with OKPPL

		• Loose construction material to be covered to avoid being carried into adjoining areas by wind. • Switchyard structures to be undertaken after covering the land beneath with a sheet of impervious material. • Fuel storage for DG sets to be done on paved surfaces • Soil should be ploughed in compacted areas after completion of construction work; and • Site should be restored at the end of the Project life cycle to pre-Project levels.			contamination for project team, vehicle fleet operators, and Sub Contractor staff on monthly basis	
Visual Amenities						
Construction activities viz. materials lay down,	Minor	During construction phase, the project would include a temporary	Minor	Workers to be instructed about handling of construction	Undertaking EHS Inspections on fortnightly basis and	Site supervisor To be mentioned in the

excavation, backfilling, and spoil create a visual intrusion and disruption		barricading to avoid disruption to aesthetics. The construction period will be limited to 6-7 months and the workers will be restricted to work during 8 to 10 hours. The labor camps will be designed to be located to avoid direct shadows of the wind turbine.		activities	Monthly EHS Reporting	contract with OKPPL
Land Use						
Construction and strengthening of access road; Site clearance and preparation for WTGs, PSS and EHV line Establishment and operation of batching plant; and Transient storage of WTG components	Minor	OKPPL has considered all aspects of siting and design prior to selection of the sites. Construction activities will be restricted to within the allotted land and immediate surroundings only. Existing roads will be used for access to the wind farm components with the exception of a	Minor	On completion of construction activities, land used for temporary facilities such as stockyard, batching plant and labour camps should be restored to the extent possible. The land use in and around permanent project facilities should not be disturbed.	Fortnightly basis	OKPPL

		small connection from the main village road to the foundation of each individual WTG.				
Topography and Drainage						
Changes in Topography and Drainage	Minor	• Waterbodies and hilly terrain should be particularly avoided when constructing access roads or planning the transmission line pathway. • Levelling and grading operations should be undertaken with minimal disturbance to the existing contour thereby maintaining the general slope of the site; and • Disruption/alteration of micro-watershed drainage pattern should be minimized	Minor	• The contracted labor will be instructed to avoid any unnecessary changes in the topography. • Waterbodies and hilly terrain should be particularly avoided when constructing access roads or planning the transmission line pathway. Appropriate number of cross drainage channels should be provided during access road construction to maintain flow in existing	Monthly monitoring	Site supervisor To be mentioned in the contract with OKPPL

		to the extent possible. • Appropriate number of cross drainage channels should be provided during access road construction to maintain flow in existing natural channels, if required.		natural channels, if required.		
Waste Generation, Storage and Disposal						
Accumulation of construction waste Runoff into rain water channels Unhygienic condition for labours Monitoring of waste management plan	Minor	• Disposal of sewage shall be made through a septic tank – soak pit arrangement. Arrangements for collection of garbage in dustbins and daily disposal to the nearest dumpsite shall be made • Other wastes like wood packaging material, metal jute etc. will be sold to scrap dealers.	Negligible	Workers to be instructed to use dustbins and toilets at the site Contractors will be briefed about the need for proper storage and disposal construction waste	• Visual inspection on fortnightly basis • Contractors staff HSE training during Induction and Refresher training on quarterly basis • Monthly record-keeping procedures for Waste Generation, Disposal and	Site manager To be mentioned in the contract with the construction contractor Site supervisor to make observations and convey it to the contractors Training need to be mentioned in the contract with the construction contractor

		• Provision of segregated toilets for male and female workers in the ratio of 1:15 and 1:10 (toilet to workers) respectively; • Waste/ Used oil shall be stored on paved surfaces • Empty paint containers shall be stored in earmarked area and sold to authorised vendors by CPCB/KSPCB • Specific containers for rubbish collection should be provided and emptied on a regular basis. • Adequate number of rubbish containers to providing leak proof, non-absorbent, rust and corrosion-resistant containers			Management needs to be maintained	

		protected from insects and rodents needs to be provided • Low lying areas prone to accumulation of water should be sprayed with mosquito repellents on regular basis to prevent health hazards to workers and community. • The garbage/rubbish containers should be 30 metres from each shelter on a wooden, metal, or concrete stand. Such containers must be emptied at regular intervals (to be determined based on temperatures and volumes generated) to avoid unpleasant odours associated with decaying organic				

		materials. • Construction debris and excavated material will be stored in a confined area to prevent spread by wind, rain, storms, etc and away from natural drainage channels and will be used for backfilling of excavated areas and for foundation works at site and excess soil will be given to the local villagers for filling up of low lying areas in the vicinity. • Pest extermination, vector control and disinfection should be carried out throughout the living facilities in compliance with local requirements and/or good practice. Where				

		warranted, pest and vector monitoring should be performed on a regular basis.				
Water Resource and Quality						
Ground water extraction Runoff into rain water channels Wastage of water	Moderate	• Water for construction to be arranged by the construction contractors through authorised private tanker water suppliers • Domestic water requirement of the workers at site to be met through borewell and for drinking purpose packaged 20 litre water cans will be provided. • The approval from Gram Panchayat is required in case water will be obtained from water tankers drawn from villages having authorized borewells	Minor	NOC from KGWA needs to be obtained Daily consumption of water to be recorded and assessed on weekly basis for wastage Workers to be instructed about optimal use of water Storm water arrangements to be monitored for clogging on weekly basis	• Water consumption records along with quantitative estimates needs to be maintained on daily basis. The water consumption records needs to be maintained in Register and assessed on monthly basis • Water conservation and efficiency training to all at start of the project and Refresher training on	Site manager To be mentioned in the contract with the construction contractor Site supervisor to make observations and convey it to the contractors

		• NOC needs to be obtained from Karnataka Ground Water Authority for abstraction of water from borewell at PSS Phase-I and water meter needs to be installed for monitoring water consumption. • Adequate arrangement for storm water management during construction period to be made to avoid sediment runoff from the site. • Optimal utilization of water to be ensured throughout the construction phase • Storm water flow during monsoons to be directed to the existing channels with silt traps to avoid			quarterly basis • Fortnightly Inspections • Weekly monitoring during monsoon	

		sedimentation of the channels or the receiving water body. • Proper drainage needs to be provided near Canteen at project site and labour camp and near bathing areas at Labour Camp, if any to avoid deterioration of groundwater quality and runoff in adjoining land parcels. • Water conservation to be practiced to reduce water requirement.				
Ecology						
Clearing of vegetation Cutting of trees Disturbance to avifauna	Minor	• Tree cutting will be limited to those directly affecting the WTGs placement. • Workforce to be instructed to avoid any other activity likely to affect the local flora &	Minor	Construction contractor to instruct and inform workers about need to refrain from activities that may adversely affect the ecology	Implementation of Monitoring Measures to be ensured during Construction Phase on monthly basis	Site supervisor To be mentioned in the contract with the construction contractor

		fauna. • The construction activities will not be carried out in night. The use of artificial lighting at night shall also not be carried out to avoid impacts if any on fauna due to illumination. • Transportation to be undertaken along identified paths • Limit construction activities within the wind farm site; • Existing roads are utilize for access to the project site therefore clearance of vegetation limited for road construction; • Store the natural soil at special sites and reuse it when back-fill activities are needed; • Shift natural				

		vegetation and nutrient rich soil of the construction sites to nearby areas. • Replant natural vegetation and transfer rich soil of the construction sites to nearby areas • No blasting should be carried out within 1 km from the boundary of protected area during the work. • There should be no high mast / beam / search lights high sounds within 1 km from the boundary of protected area				
Impacts on avifauna associated with general construction activities including Transmission Lines		• Wind turbine blades shall be made visible to birds by painting their tips with orange or red colour to isolate from the sky and				Site Supervisor of Contractor and EHS Officer, OKPPL

along the WTG footprint		mitigates risk of bird collisions • Power lines shall be made visible by placing bird reflectors/red sphere balls on power lines passing close to water bodies (Halekallahalli and Lingavarahatti etc.). • Spike guards should be installed on poles/channels to avoid any bird sitting on them and reduce the chances of electrical shocks • Construction work and anthropogenic movement should be restricted in proximity of water bodies and forest areas near WTG locations and transmission line to reduce the impact on				

		flora and fauna. • During construction of SGJA-78 and SGJA-73 WTG in order to minimize impacts on Rangayyanadurga Four Horned Antelope Wildlife Sanctuary the project staff shall be instructed to take care so that they do not blow horns, do not park their vehicles inside the Eco Sensitive Zone of Rangayyanadurga Four Horned Antelope Wildlife Sanctuary and shall not disturb any flora and fauna etc. • NOC from Forest and Wildlife Department is required to be obtained for laying WTG's and associated facilities for the project due to presence of				

		WTGs SGJA-78 & SGJA-73 within the ESZ boundary of the Rangayyanadurga Four Horned Antelope Wildlife Sanctuary. • Construction work and anthropogenic movement should be restricted at Indian Peafowl corridor at a distance of 1.63 km in NE direction from SGJA 06; 1.57 km in NNE direction from SG JA-07; 1.28 km in SW direction from SG JA-70 • The transportation should be avoided during peak ecological activity i.e. dawn (5:30 am to 7:30 am) and dusk (5:00 pm to 7:00 pm). Night time activities should be				

		kept to a minimum. • Excavated areas should be adequately fenced and security should be deployed to prevent wildlife intrusion into these areas. • All out door electrical equipments shall be kept in compact sub-station (which is a cubical, metal box, consisting of CT, PT, VCB and meter) which can reduce chances of electric shock to wildlife which can accidently enter fenced yard..				
Hazards associated with turbine blade. Movement Bird collisions, increased energy expenditure and		• Inter-turbine distance should be large enough that birds can avoid turbine blades and utilize minimal energy while doing so		Training to be imparted to Site Personnel on Waste Management		Contractor and OKPPL

barrier effects		• Construction work and anthropogenic movement should be restricted at water bodies and forest areas near WTG locations and transmission line to reduce the impact on flora and fauna. • WTGs should be sited in areas that are visible from a manoeuvrable distance for flying species and shouldn't be located near sudden changes of elevation, large trees or be blocked by any manmade/natural structures. • Flash lamps on the WTGs will prevent bird collisions at night • Waste generated from the wind farm and				

		transmission line during construction should be stored in covered containers within the site premises. Uncovered waste may attract fauna to the wind farm and transmission line. • Hazardous materials and waste should not be stored any drainage channels or cliff-sides to prevent contamination of the surrounding environment and impact on local flora/fauna				
Temporary increase in dust, odor, from construction vehicle emissions indirectly affect avifauna		Dust will be controlled by watering where necessary All combustion engine equipment should be appropriately maintained to meet emission standards		Water sprinkling and monitoring records of PUC and Fitness Certificate of vehicles		HSE Officer- Contractor

Traffic and Transport						
Arbitrary movement of vehicles leading to congestion and accidents Improper parking of vehicles used by workers and for movement of material can lead to discomfort to other users. Monitoring of traffic management plan	Moderate	Only trained drivers are to be recruited. Training programs for all the drivers for raising awareness about road safety and adopting best transport and traffic safety procedures once in every six months. Vehicle movement and parking within the Project premises shall be manned properly to avoid accidents Routes for use by construction traffic to be planned to minimize impact on adjoining activities. Dedicated path within the	Minor	Necessary training to the driver of construction vehicles for speed restrictions and to crewmembers on do's and don'ts during construction vehicles movements, adopting limits for trip duration and arranging driver roster to avoid overtiredness and avoiding dangerous routes and times of day to reduce risk of accident shall also be implemented. Drivers to be assessed for their knowledge on traffic rules before engagement. Organizing eye checkups for all the drivers on a yearly basis	Induction training at the start of construction and quarterly refresher training	Site supervisor To be mentioned in the contract with the construction contractor

		site for exclusive entry and exit of the construction vehicles to be provided. Regular maintenance of vehicles to be taken up. All the kaccha access road to the site will be made paved, widened and strengthened for heavy movement of trailers and cranes. OKPPL will need to develop access road to individual WTGs from the available village road. In case village road is used for the transportation of construction material it should be done with proper traffic management plan and should be continually repaired in case the road				

		is damaged. The speed limit should not excced 20 km/hr and 10 km/hr in proximity of settlements and habitation in villages. Records of vehicles viz. PUC, registration certificate, driving license and fitness certificate needs to be maintained at site.				
Atmospheric Emissions						
Fugitive dust Emissions from diesel engines and DG sets	Minor	• Dust generating activities to be avoided in conditions of very high wind and covers to be provided for loose construction material at construction site. • Stock piling and storage of construction material will be oriented after considering the	Negligible	• Dust deposition in adjoining areas to be physically monitored by OKPPL personals on weekly basis. • Undertake ambient air quality monitoring at the construction site when construction work is ongoing.	On weekly basis Air Pollution monitoring on quarterly basis at construction site and nearest receptor for standard AAQM parameters like	Site supervisor To be incorporated in the contract with contractor

		prominent wind direction. • It is to be ensured that construction equipments are properly maintained to minimise smoke in the exhaust emissions. • Machinery to be turned off when not in use. • Housekeeping of the area to be maintained and open burning of solid waste or packaging material will be strictly prohibited in the vicinity of project area • The impact of emissions from vehicles bringing construction material to be minimised by proper upkeep of maintenance of vehicles, sprinkling of water on unpaved		• Monitor the pollution levels at the nearest sensitive receptor. • Record keeping of PUC Certificates for all vehicles engaged at Site and Site Vehicles entering the project premise	PM10 , PM2.5 SO2 NOX and CO Inspection of records for all vehicles at the gate on monthly basis	

		roads at the construction site and planned movement of such vehicles. • Vehicle speed to be restricted to 10km/hour at site to minimize potential for dust generation in the surroundings • Trucks /dumpers to be covered by tarpaulin sheets during off site transportation of friable construction materials and spoil • All the vehicles entering the site to be asked to have updated PUC (Pollution under control) certificate. • Generator to be optimally used with proper orientation and adequate stack height • All the kaccha access				

		road will be made paved prior construction for smooth movement of vehicles which lead to less gaseous and dust emissions around the site. • During construction, temporary barricading should be provided around the construction site to restrict the emissions. • Also, temporary greenbelt which are dust absorbents should be proposed at the site to minimize the dust emissions.				
Noise and Vibration						
Disturbance to habitations Disturbance to fauna Occupational	Minor	• Use of inherently quiet plant and equipment as far as reasonably practicable and regular maintenance to ensure	Minor	• Monitoring of arrangements for noise reduction and records need to be monitored on	Noise monitoring on quarterly basis • PPE Inspections and Record keeping for PPE issues, PPE	Site manager Construction Contractor

Hazard		noise emissions are maintained at design levels. • Mobile noise sources such as cranes, earth moving equipment and HGVs shall be routed in such a way that there is minimum disturbance to receptors. • Integral noise shielding to be used where practicable and fixed noise sources to be acoustically treated, for example with silencers, acoustic louvres and enclosures. • All loud and sudden noises will be avoided wherever possible and fixed noise sources to be located at least 50m away from the site boundary. • Provision of rubber		weekly basis • Schedule of activities to be discussed and finalised between site manager and the contractor • Undertake ambient noise level monitoring at the construction locations when construction work is ongoing on. • Monitoring of usage of PPE by staff and contractors. • Monitoring of working of construction equipment that are restricted to day time only	Inventory and PPE Compliance to be maintained on fortnightly basis	

		paddings/noise isolators at equipment/machinery used for construction • Construction vehicles to be well maintained and not idling equipment or vehicles when not in use. • Provision of make shift noise barriers near high noise generating equipment to minimise horizontal propagation of noise • Noise prone activities will be restricted to the extent possible during night time 2200 to 0600 hours to reduce the noise impact. • Site workers working near high noise equipment use personal protective devices to minimise				

		their exposure to high noise levels • All the kaccha access road to the site will be made paved for the smooth movement of vehicles which will minimize the noise and vibration in the area.				
Health and Safety Hazards						
Accidents leading to injuries fatalities Occupational health hazards	Moderate	• All the required safety measures based on individual job profile to be provided (as per working guidelines, use of personal protective equipments like gloves, helmets, ear muffs, safety belts etc.) for construction worker through the contractors. • Ensure effective work permit system for hot work, electrical work, working at height,	Minor	• Proper training of the workers regarding health and safety procedures • Workers to be trained through sub contractors regarding use of Personal protection equipment and its importance. • Permit to work system to be implemented • Incident accident investigation to done and communicated to	• HSE training to all employees and contractor workers at the start of the project and quarterly refresher training • Monitoring of Permit to work system implementation once in a month • Incident/accident to be monitored on daily basis and reports along with	Site Manager Safety Officer To form part of the contractor's contract.

		working in confined space etc. • Ensure personal protective equipment for all personnel present at site are made available. • Arrangement for fire control measures • Display of phone numbers of the city/local fire services, etc. at site. • Ensure good housekeeping at the construction site to avoid slips and falls. • Dropping/lowering of construction material or tool to be restricted and undertaken only under strict supervision, if required. • Provision of proper sanitation at the labour camp.		all for future recurrence of same accidents. • Structural integrity should be checked before undertaking any work. • A safety or emergency management plan should be in place to account for natural disasters, accidents, and any emergency situations. • The nearest hospital, ambulance, fire station and police station should be identified in the implemented emergency management plan.	details, actions taken and closure records need to be maintained in Accident Incident Investigation (AIR) Register on monthly basis	

		• A Job Hazard Analysis (JHA) has been maintained at Site comprising of risks/job hazards along with its severity, probability, control measures and preventive action measures • The construction work will be carried out in adherence w.r.t. COVID mitigation strategies suggested by the State labor department guidelines, Karnataka State for the migrant workers and for construction workers. • OKPPL is further required to ensure maintaining HSE documentation for all workforce engaged at Site along with COVID-19 Precaution				

		training records at Site. • OKPPL should ensure undertaking adequate measures while overlaying internal transmission lines as at few WTG locations, existing WTGs are located in visual range of proposed WTGs. • The project proponent for laying transmission lines, preventive action measures in case of blade throws from existing WTGs and avoid of construction works during maintenance works of existing WTGs in the area needs to be considered. • An up to date first aid box should be				

		provided at all construction sites and a trained person should be appointed to manage it. • Security should be deputed at potential accident sites to restrict entry and prevent near miss or fatal incidents;				
Socio Economic Impacts						
Land Acquisition Loss of land Loss of livelihood Loss of grazing land	Minor	• Employment opportunities should be given to locals and family members of land losers • OKPPL can simultaneously take up CSR activities in the project area through livelihood improvement schemes and training programs that will improve the skills of the local	Negligible	Stakeholder Engagement Plan to be implemented and Grievance redressal mechanism shall be formulated for project affected families to express their concerns.	Monitoring of land records at the end of land procurement process Employment record of locals on monthly basis Fortnightly basis	Site Manager

		population and increase their employability or make them self employed. • Stakeholder engagement needs to be carried out and community consultations should be ensured prior to land acquisition and records need to be maintained • Proper fencing and adequate lightning arrangements needs to be provided for community safety and security. • Although the community expressed satisfaction over the compensation of land and functioning of the project there is a need for implementation of			NOC from Gram Panchayat and from ST community in case of land acquisition from ST coomunity	

		Grievance Redressal Mechanism for addressing their concerns associated with the project, if any • The land acquisition for ST land parcels should be avoided and alternative locations should be considered for procurement • In case ST land acquisition is the last option and is being carried out for remaining land parces to be acquired; a separate consultation with ST community should be carried out in presence of Sarpanch • NOC from Gram Panchayat and separately from ST community needs to				

		be obtained • In case of land being acquired from members of the Scheduled Tribes, at least one-third of the compensation amount due shall be paid to the affected families at the outset as first installment and the rest shall precede the taking over of the possession of the land • Additional compensation should be paid to PAP's from ST community • Employment opportunities should further be provided to locals including members of ST community from whom land has been acquired				

Access to Common Property Resources Access to grazing lands; Common village approach road to the site; Access to fuelwood sourcing areas.	Minor	The project shall avoid using community /village roads for project activities. Alternative access roads will be constructed and used;	Negligible	The site personnel is to ensure that that during the construction phase there are no additional encumbrances to block access to alternative areas due to material storage etc.	Awareness training to all employees and contractor workers at the start of the project Site Head On-site personnel and and quarterly refresher training	OKPPL On-site personnel and contractors
Increased Community Expectations Heightened community expectations for employment and other local benefits	Negligible	The project will initiate an early dialogue with the local community to understand their concerns as well as expectations from the project; The project will communicate and discuss with the community in a transparent manner about employment/contract and other opportunities on a regular basis and demonstrate the efforts being made to	Negligible	Increased Community Expectations Heightened community expectations for employment and other local benefits A formal consultation should be undertaken to apprise the villagers of the project activities. Grievance redressal mechanism shall be formulated for project affected families to express their concerns. GRM Register to be	Stakeholder consultation meeting at the start of the project and regular interaction on monthly basis to apprise the villagers of the project activities Monitoring of GRM Status and its closure records in Grievance Register on fortnightly basis • Inspection of GMR	Social Officer

		accommodate as many people as possible. The projects will ensure that there is a transparent process of giving jobs/contracts and other benefits.		made available and closure of issues in time bound manner needs to be ensured	notice boards on fortnightly basis	
Influx of Migrant Workers Social Impacts; Health Impact; Economic Impacts.	Moderate	• The Contractor needs to ensure construction of labour camp as per IFC Guidelines in case of hiring migrant labour for the ptroject. The following measures shall be ensured: • Accommodation: It shall be ensured that a minimum space of 4-4.5 m^2 is allocated per person. • Common latrines and bathing facilities duly segregated for male and female labour - Number of toilets and sanitary fittings shall be	Minor	OKPPL shall ensure that the onsite administration team to look after contractors will monitor all compliances to the terms and conditions. In addition, personnel will need to be aware of the applicable regulatory requirements for ensuring compliance to good working and labour law compliance.	Monitoring of laboour camp and its facilities once in a fortnight. Awareness training to all employees and contractor workers at the start of the project and Refresher training on quarterly basis	OKPPL, the local procurement team and the labour contractors.

		considered as 1 toilet, 1 urinal and 1 bathroom per 15 male workers. Arrangement for female workers shall be 1 toilet and 1 bathroom per 10 female workers. • Water supply through borewells and tankers sourced from authorized borewells- Adequate provisions of water with about 150 litres per capita per day shall be made. • Disposal of sewage through a septic tank – soak pit arrangement. • Arrangements for collection of garbage in dustbins and disposal through daily collection. • Provisions of food – it shall be ensured that the food provided to workers contains an				

		appropriate level of nutritional value and shall take into account the different religious/cultural backgrounds; • Supply of fuel wood and LPG cylinders in order to avoid encroachment in adjoining areas • IFC Labor guidelines need to be followed • The construction work will be carried out in adherence w.r.t. COVID mitigation strategies suggested by State labor department guidelines, Karnataka State for the migrant workers and for construction workers. OKPPL is further required to ensure maintaining HSE				

		documentation for all workforce engaged at Site along with COVID-19 Precaution training records at Site.				
Community Health Safety and Security Common approach road to the site; Nuisance from air emissions and noise due to transportation; Traffic impacts like accidents.	Minor	• Ensure proper training of drivers and planning for transport of construction machinery, material and manpower. • All workers whether local or migrants will be instructed to follow strict code of conduct • Local security personnel shall preferably be engaged at site. • To the extent possible, labour to be housed in camps, with good living conditions and access to amenities. • Health and safety training of the labour,	Negligible	OKPPL to provide training to drivers, workers and security personnel	Awareness training to all employees and contractor workers at the start of the project and Refresher training on quarterly basis	OKPPL /Contractor

		raising awareness about STDs, and HIV, and maintaining behaviour standards while moving in the community should be a priority; • Any complaints or concerns with respect to labour should be addressed without delay. • OKPPL will ensure maintaining HSE documentation for all workforce engaged at Site along with COVID-19 Precaution training records at Site. • Proper fencing and adequate lightning arrangements needs to be provided for community safety and security.				

Impact on adjacent lands Crop loss during construction; Encroachment.	Minor	• Ensure that all the project activities are restricted to the existing site boundary. The use of land outside the boundary for purposes like parking of vehicles, storage of material during construction etc warrants prior consent of the owner of that land as well as adequate compensation for such a use; • The project should proactively discourage any encroachment around the project area and involve the local panchayat authorities in the same; • Any structures which	Negligible	OKPPL will need to monitor the compliance of the contractor to these measures and ensure that any non-compliance is adequately addressed.	Once in a fortnight	OKPPL /Contractor

		are constructed outside the boundary should be dismantled after use.				
OPERATION PHASE						
Soil Impact						
Defunct/damaged WTGs parts disposal on unpaved ground repair and maintenance of underground cables and associated utilities will lead to generation of hazardous wastes such as used transformer oil	Minor	OKPPL will ensure proper restoration of soil. OKPPL shall explore the option of buyback agreements for defunct rotor, blades and for replacement and disposal of transformer oil by the supplier, otherwise will make arrangements for disposal of defunct rotors/blades and waste oil by KSPCB/CPCB authorized recyclers. Fuel and used oil will be stored in demarcated storage areas with adequate secondary containment and	Negligible	OKPPL staff to be briefed about the need for proper restoration of soil	Awareness training to all employees and contractor workers at the start of the project and quarterly refresher training Soil sample testing once in every three years	Plant Manager EHS Officer

		appropriate capacity. Spill control and prevention mechanism will be developed, and all the staff will be trained.				
Waste Disposal						
Domestic waste from staff quarters Waste transformer oil	Moderate	Transformer oil to be replaced and retained by the supplier of transformers Buyback agreements for defunct rotor, blades and for replacement and disposal of transformer oil by the supplier Proper segregation of different kind of waste and disposal of hazardous waste through KSPCB/ CPCB authorised vendors	Negligible	OKPPL staff to be briefed about the need for proper storage and disposal waste oil	Awareness training to all employees and contractor workers at the start of the project and quarterly refresher training Ground water sample and soil sample testing once in every three years	Plant Manager EHS Officer
Aesthetics and Visual Impact						
Visual intrusion Glare	Moderate	During shadow flicker modelling, it was found that all the residential permanent structures	Minor			

		have shadow flicker below 30 h/year The turbines will be arranging in a systematic manner which will give an aesthetic sense to it.				
Noise Impact						
Noise from a wind turbine	Moderate	• Shifting WTG SGJA 71, SGJA 73, SGJA 74, SGJA 75, SGJA 77, SGJA 78, SGJA 79 to other locations due to moderate impact of noise determined during Operation Phase during day as well as night-time; • Regular maintenance of WTGs; • Periodic monitoring of noise near to the sources of generation to ensure compliance with design	Minor	Ambient noise monitoring records on quarterly basis		Plant Manager EHS Officer

		specification; and • Quarterly monitoring of ambient noise levels (during day and night time) at identified residential receptors for determination of actual impact due to operation of WTGs				
Water Resource and Quality						
Water requirement for cleaning Waterlogging	Moderate	Alternate arrangement of water through authorised tanker water suppliers to be made Agreement with vendor and water consumption records need to be maintained in case of water requirement being met from tankers The plant site will be provided with adequate drainage facility to drain off wash wastewater and prevent any water-logging	Minor	Daily consumption of water to be recorded and assessed on weekly basis for wastage Workers to be instructed about optimal use of water		EHS Officer Plant manager

		at site or in the surroundings. Adequate storm water drainage OKPPL should adopt 200% groundwater recharge initiatives as part of CSR initiatives. This is due to secondary impacts that the project development would cause on the water resources in the district which is categorised as semi critical.				
Ecology						
Distraction to avifauna Routine clearance	Minor	Clearing of vegetation to be limited to removal of undergrowth or shrubs at the plant site Waste materials especially food waste, if any should not be left lying around the WTG's and if any waste is found it should be cleared	Negligible	-	Driver's training on monmthly basis and quarterly refresher training	EHS Officer Plant manager

		immediately so that it does not attract birds near the WTG blades				
Bird & bat collisions with Operational turbines		• Annual monitoring study for birds and bats in the Core Zone should be developed and implemented to understand the effects of potential bird collisions with the rotors during the operational phase. Annual Bird and Bat Monitoring Study in operational phase need to be carried out for two continuous years for determining the scale of impacts on birds and bats. Upon finding significant bird & bat mortality mitigation measures could be suggested including that		Annual Bird and Bat Monitoring Study (once in Winter season) for monitoring impact of the project on avifauna in Core Zone by a third party agency for study of mortality of birds/bats in the area for a minimum period of two years Carcass Survey. to be carried out by O&M Staff and Carcass Survey Monitoring records need to be maintained		EHS Officer/Plant Manager/Corporate Head

		of curtailment or cut off the generation during certain identified period identified when maximum impact occurs. • The WTG blade tips should be painted with orange or red colour as per International Standards measure to isolate from the sky and mitigates risk of bird collisions. • Daytime visual markers shall be provided on transmission lines and Blades to enhance visibility for bird. Visibility enhancement objects such as marker balls, bird deterrents, or diverters shall also be installed along the transmission line to avoid avian				

		collision • Use of reflectors and bird flappers to be used at suitable intervals to avoid easy visibility of transmission wires and the risk of electrocution • Any dead animals/carcass shall be removed in time from the site so that it does not attract movement of raptors near to the WTGs • Power lines should be made visible by placing bird reflectors/red sphere balls on power lines passing close to water bodies (Halekallahalli and Lingavarahatti etc.). • Spike guards should				

		be installed on transmission line poles to avoid any bird sitting on them thereby reducing the chances of electrical shocks • Jumpers on the electric poles should be covered by HDPE pipes to insulate conductors which would prevent electrocution of birds. • Maximum distance should be maintained between conductors on overhead lines up to 200 cms so that it would enable passage of small and medium birds through them and also avoid fatalities of long tailed birds like Peafowl. • Switching off the lights				

		below the turbines whenever not required at night to avoid attracting the insects and associated nocturnal birds and bats to the turbines. • Clearing of the weeds or grasses underneath each WTG needs to be carried out to prevent raptors flying in close vicinity of wind farm to prey on rodents. Herbaceous/grass layers may offer protection to rodents which will make burrows near them for breeding and resting purpose. • Any dead animals/carcass should be removed in time from the site so				

		that it does not attract movement of raptors near to the WTGs. • Towers should regularly checked to avoid any nesting in any suitable gaps or platforms. • Measures need to be taken to create awareness among the villages in and around turbine site for careful burial of the cattle carcasses to avoid the attraction of scavenging birds such as vultures into the turbine area. • A participatory approach towards advocating and popularizing various measures in the human habitations located in and around				

		the wind farm areas mainly for discouraging the feeding of pigeons and other human associated avifaunal species may be adopted. This can help minimize bird collision risk directly at the turbines, and also indirectly through avoiding the raptors getting attracted to the area. • Vehicle movements in the turbine sites may be reduced and appropriately managed to minimize disturbances and road mortalities. • The installation of turbines may be avoided in the area within 500 m radius of				

		water bodies to further minimize the collision risk especially for migratory avifauna. • Plantation of fruit bearing trees (such as guava, mango, banana, fig) and flowering plants, which may attract bird and bat near project area need to be avoided. • Waste materials especially food waste, if any should not be left lying around the WTG's and if any waste is found it should be cleared immediately so that it does not attract birds near the WTG blades • For minimizing impacts on bats, a random survey should be conducted for				

		carcass bat searches at a representative sample of turbines to determine the level of bat mortality around wind turbines. This is especially important during the periods March to May and September to December when bats are migrating between summer and winter roosts. • Carcass searches should be made early in the morning to minimize the effect of scavengers (which remove carcasses). • Plantation of fruit bearing trees (such as guava, mango, banana, fig) and flowering plants, which may attract bird and bat near project area				

		need to be avoided. • Towers are regularly checked to avoid any nesting in any suitable gaps or platforms • Switching off the lights below the turbines whenever not required at night to avoid attracting the insects and associated nocturnal birds and bats to the turbines. • Jumpers on the electric poles should be covered by HDPE pipes to insulate conductors which would prevent electrocution of birds.				
Bird Collision with Powerlines		• Align power lines as far as possible. • Monitor power lines passing near by the water bodies for collisions. If found frequent mortality more		Monitoring powerlines		EHS Officer/Plant Manager

		efforts to increase visibility of power line could be suggested • The impacts of over-ground transmission systems could be mitigated by use of visual markers on cables to render them relatively more visible. • Daytime visual markers shall be provided on transmission lines and Blades to enhance visibility for bird. Visibility enhancement objects such as marker balls, bird deterrents, or diverters shall also be installed along the transmission line to avoid avian collision • Use of reflectors and bird flappers to be used at suitable intervals to avoid easy visibility of				

		transmission wires and the risk of electrocution • Any dead animals/carcass shall be removed in time from the site so that it does not attract movement of raptors near to the WTGs				
Habitat destruction of birds and animals		Collect all wastes in sealed containers to be disposed in proper disposal sites; Prohibit leaving the roads and crane pads with vehicles unless major maintenance works will have to be performed; Prohibit workers from hunting and produce awareness materials such as: • Signs • Training manuals and material.		Monitoring waste management and habitat loss if any near WTG		Safety Officer/Plant Manager

		• Posters. • Brochures. • Reduce vehicle movements to a minimum; Reduce footprint as much as possible; Minimize intervention as much as possible;				
Electrocution of birds on Poles and Powerlines		Cables & electric wires originating from wind turbine should be either made underground or under concealed pipes when sent to DP Yard adjoining to turbine. This DP Yard must be protected by animal proof walls/fence on all four sides. The poles in DP yard shall be kept at the height of 10m above ground.		Monitoring electrical installations and ensuring safety/security		EHS Officer/Plant Manager

		Use coiled barbed fencing (concertina coil) to avoid any animal jumping above the wall as an extra protection measure All out door electrical equipments shall be kept in compact sub-station (which is a cubical, metal box, consisting of CT, PT, VCB and meter) which can reduce chances of electric shock to wildlife which can accidently enter fenced yard.				
Environmental Monitoring						
Ambient Air Quality and Noise	Moderate	The Ambient Air Quality Monitoring (PM2.5, PM10, SO2, NOX, CO) and Ambient Noise Monitoring should be carried out on annual basius for atleast 2 years during O&M Phase of the project	Negligible	Monitoring environmental parameters	Annual Basis	To be conducted by an appointed NABL accredited Lab
Health & Safety						

Electromagnetic field Accidents leading to injury/fatality	Moderate	EMF generated to be of weak in intensity Personal protective equipment to be provided for all personnel at road construction and transmission line. The transformer yard should be provided with fire extinguishers and sand buckets at all strategic locations to deal with any incident of fire; Employees involved in electrical works shall be trained in and familiar with the safety-related work practices, safety procedures and other safety requirements that pertain to their respective job assignments;	Minor	Proper training of the workers regarding health and safety procedures Workers to be trained for use of Personal protection equipment and its importance. An accident reporting and monitoring record shall be maintained. Regular electrical safety training to workers; Lock out/ Tag Out (LOTO) system shall be implemented Maintaining HSE documentation for all workforce engaged at Site along with COVID-19 Precaution training records at Site.	Driver's training on monmthly basis and quarterly refresher training Accident reporting record monitoring once in a month LOTO record checking once in a month	Site Manager
Social						
Impacts on Local	Moderate	In case of development of	Insignificant	Any community	Records for CSR	Procurement team

Economy	(beneficial)	local enterprise in the vicinity of the project, these should be encouraged through sourcing opportunities.	(beneficial)	development activities will be guided and implemented in accordance with the CSR Policy A CSR Plan with details of CSR Initiatives month-wise and budget allocation needs to be prepared and Need Based CSR Measures needs to be implemented Maintain record of employment given to locals	implementation Status, CSR cost incurred vis-à-vis CSR Plan needs to be maintained on monthly basis Monitoring of local's employment record once in a month	
Upgrades to Local Infrastructure	Minor	Collaborate with local govt. and industry for any community development programs to share the resources and cut cost; Avoid duplicating existing infrastructure and emphasize on improving or upgrading the quality and quantity of the same.	Negligible	--		OKPPL

DECOMMISSIONING PHASE						
Health and Safety						
Fugitive dust generation during construction and decommissioning phase	Moderate	• Decommissioning activities will be done in a manner which minimises dust generation; • Dampening (using water or some other environmentally benign dust suppressant material) may be undertaken to prevent dust re-suspension during hot, dry weather conditions with relatively high wind speeds; • Lorries will be sheeted during transportation of friable construction materials and wheel wash facilities made available during adverse conditions; • Drop heights will be	Minor			OKPPL/ O&M Contractor

		minimised during material transfer activities, such as unloading of friable materials.				
Combustion and decommissioning emissions	Moderate	Diesel powered construction equipment and vehicles will be well maintained to minimise exhaust emissions; and, Idling reduction awareness activities for onsite diesel-powered equipment and mobile vehicles.	Minor			OKPPL/ O&M Contractor
Generation of GHG emissions associated with transport movements.		Development of management plans and procedures to ensure traffic flow is minimised as far as possible and that all transportation vehicles used throughout the project are fit for purpose and adequately maintained High-efficiency low emission		Training to drivers on traffic management		OKPPL/ O&M Contractor

		vehicles to be preferentially used where possible.				
Generation of noise by construction vehicle movements	Moderate	Scheduling of road traffic movements to avoid noise sensitive periods (e.g. nighttime). Route traffic away from noise sensitive receptors.	Minor	Scheduling of road traffic movements to avoid noise sensitive periods (e.g. nighttime). Route traffic away from noise sensitive receptors.		OKPPL/ O&M Contractor
Waste Disposal						
Potential to harm human health and environment through uncontrolled disposal of wastes.	Moderate	Permanent segregation facilities will be provided (e.g. separate receptacles for food wastes, plastics, metals). The receptacles will be clearly marked and suitable to hold the Permanent segregation facilities will be provided (e.g. separate receptacles for food wastes, plastics, metals). The receptacles will be clearly marked and suitable to hold the type of waste they will contain.	Minor	Necessary training on Waste Handling, Disposal and Management to the contractors		OKPPL/ O&M Contractor

		There will be frequent emptying of waste receptacles and transfer to appropriate storage facilities on site and/ or transfer and disposal by suitable waste disposal contractors. Waste storage will be within designated areas located on hard surfacing and covered where appropriate to ensure containment and prevent ingress of rain. There will be special provisions for the storage of any hazardous wastes and these will be segregated from non-hazardous wastes. Staff will be fully trained in the handling and suitable disposal of waste streams and provided with PPE where appropriate				

Traffic and Transport						
Risk of accidents and congestion	Moderate	Training of drivers about road safety to be organized; Vehicle movement and parking within the Project premises shall be manned properly to avoid accidents Routes for use by construction traffic to be planned to minimize impact on adjoining activities. Dedicated path within the site for exclusive entry and exit of the construction vehicles to be provided. Regular maintenance of vehicles to be taken up.	Minor	Necessary training to the driver of construction vehicles for speed restrictions; Drivers to be assessed for their knowledge on traffic rules before engagement.		OKPPL/ O&M Contractor
Water Resource and Quality						
Protection of local watercourses	Moderate	Decommissioning phase impacts on the local water environment will largely be controlled through the	Minor			OKPPL/ O&M Contractor

		management of construction site drainage and appropriate sediment segregation / run off controls and appropriate control and storage of potential pollutants such as fuels or cement material used in the construction process.				
Contamination of groundwater and surface waters following spillages.	Moderate	All workers will be trained in the handling, storing, and disposal of hazardous materials. Emergency procedures will be in place so that in the event of an accidental release the spill can be contained, and effects mitigated. Emergency spill containment material and clean-up equipment will be distributed and stored in appropriate places so that any spill can be	Minor			

		cleared up as quickly as possible to minimize any adverse effects.				
Ecology						
Impact on land environment	Moderate	Sealing and / or re-vegetation of completed earthworks will be undertaken as soon as reasonably practicable;	Minor			OKPPL/ O&M Contractor
Landscape and Visual						
Visual aesthetics	Moderate	Landscaping of the site to be done to achieve close to prior to project condition. Soils excavated during decommissioning could be used for landscaping if suitable.	Minor			

9 CONCLUSIONS AND RECOMMENDATIONS

The Environmental and Social Assessment study for the proposed 300 MW SECI VI Wind power project in Jagalur, Kudligi and Chitradurga Talukas, Dist. Davanagere, Bellary & Chitradurga of Karnataka state has been undertaken in accordance with IFC's Performance Standards, Equator Principles 4, World Bank's Environment Health and Safety (EHS) Guidelines.

The ESIA study aimed to identify and evaluate potential environmental impacts associated with all aspects of the proposed project. The cumulative impact assessment of the SECI VI Project footprint pertaining to Environmental, Health, Safety and Social aspects have been elaborated in the present ESIA Report.

The conclusion and recommendations of this study are result of on-site inspections, the evaluation of impacts identified by specialists, and the process of stakeholder consultation. The project is assessed to generate limited environmental and social impacts owing to construction related activity which will not extend beyond wind power foot prints, and leasing of government land and acquisition of private land based on' willing buyer-willing seller' for project development and ecological impacts which can be mitigated by appropriate mitigation measures as suggested in ESMP. Mitigation measures for potential impacts on various environmental and socio-economic have been specified through:

- Follow up of best practice of compensation, stakeholder engagement, and grievance management;
- Planning & designing of wind Power plant, site preparation and access route, construction, drainage, traffic movement etc.;
- Application of standards for Health and Safety; and
- Clearances and permits required for each sub activity

The proposed Environmental and Social Management Plan describe implementation mechanism for recommended mitigation measures together with monitoring to verify overall project performance. The implementation of the mitigation measures including monitoring schedule will provide a basis for ensuring that the potential positive and negative impacts associated with the establishment of the Power Plant are taken care off. This ESIA study together with mitigation measures and follow up of recommendations on management actions will help OKPPL and the EPC contractor in complying with the environmental standards and meet the IFC performance standards and Equator Principles 4.

The Project is a renewable energy project which uses wind energy for power generation. Renewable energy projects are considered to be cleaner compared to fossil fuel based energy projects. In accordance to the screening criteria of IFC, TÜV SÜD has categorized Project as ***Category B***, which specifies that the project can cause potential and limited adverse social or environmental impacts which are generally site-specific, largely reversible and readily addressed through mitigation measures.

OKPPL is advised to to develop all the existing roads being used for the construction period to avoid any inconvenience either to the farm owners nearby. Also, client needs to assess the power lines passing near by the water bodies to avoid bird collisions. The rainfed private agriculture land has been procured for the project in name of six different land aggregators which will further transferred in the name of Ostro Kannada Power Private Limited.

Stakeholder engagement needs to be carried out and community consultations should be ensured prior to land acquisition and records need to be maintained. Although the community expressed satisfaction over the compensation of land and functioning of the project there is a need for implementation of Grievance Redressal Mechanism for addressing their concerns associated with the project, if any.

The land acquisition is in progress and land acquisition for ST land parcels should be avoided and alternative locations should be considered for procurement. In case ST land acquisition is the last option and is being carried out for remaining land parces to be acquired; a separate consultation with ST community should be carried out in presence of Sarpanch. NOC from Gram Panchayat and separately from ST community needs to be obtained for the 3 nos. ST land parcels acquired till date and any further ST land parcels being acquired if any.

In case of land being acquired from members of the Scheduled Tribes, at least one-third of the compensation amount due shall be paid to the affected families at the outset as first installment and the rest shall precede the taking over of the possession of the land. Additional compensation should be paid to PAP's from ST community and employment opportunities should further be provided to locals including members of ST community from whom land has been acquired

NOC from Forest and Wildlife Department is required to be obtained for laying WTG's and associated facilities for the project due to presence of WTGs SGJA-78 & SGJA-73 within the ESZ boundary of the Rangayyanadurga Four Horned Antelope Wildlife Sanctuary.

Also, it is advised to OKPPL to submit the intimation letter to KSPCB for the proposed project.

The approval from Gram Panchayat is required in case water will be obtained from water tankers drawn from villages having authorized borewells. NOC needs to be obtained from Karnataka Ground Water Authority for abstraction of water from borewell at PSS Phase-I and water meter needs to be installed for monitoring water consumption.

It is advised to shift WTG locations SGJA 71, SGJA 73, SGJA 74, SGJA 75, SGJA 77, SGJA 78, SGJA 79 due to moderate impact of noise determined during Operation Phase during day as well as night-time.

The specific management plan and mitigation measures required for compliance by OKPPL are given below:

Proposed Monitoring Plan	Frequency	Follow up Measures (if required)
• The Bird and Bat Monitoring needs to be carried out annually to understand the impact of potential bird collisions with the rotors. This study should be carried out for minimum two years' period with a frequency of atleast monitoring once in a year in Winter season to get a clear idea of WTG impacts on birds and bats in the area. • It is further advised to initiate Baseline Bird and Bat Monitoring Study from December 2022-February 2023 to envisage preliminary status of migratory birds in the area and to take appropriate mitigation measures accordingly.	Annual basis (Once in a year) for atleast 2 years	As suggested during Ecological Survey Studies
A random survey for search of bat and raptors carcass should be conducted by OKPPL a representative sample of turbines to determine the level of bat mortality.	This is especially important during the periods March to May and September to December when bats are migrating between summer and winter roosts.	If frequent mortality is observed, efforts need to be made to increase visibility of power line and/or insulate the lines.

OKPPL should monitor power lines passing near by the water bodies for bird collisions. Also, peacock collision with power lines along the peacock corridor near Hullikere village.		
Noise Monitoring during O&M Phase	Once in a year during Operation Phase for atleast 2 years in the Core Zone of the Project (near WTG locations)	
Ambient Air Quality Monitoring during O&M Phase for parameters- PM2.5, PM10, SO2, NOx and CO	Once in a year during Operation Phase for atleast 2 years in the Core Zone of the Project (near WTG locations)	

Impact Description	Significance of Impact	
	Before Mitigation	With Mitigation
Construction Phase		
Soil Erosion and Compaction	Minor	Negligible
Visual Amenities	Minor	Minor
Landuse Impact	Minor	Minor
Topography and Drainage	Minor	Minor
Waste Generation, storage and Disposal	Minor	Negligible
Water Resources and Quality	Moderate	Minor
Ecology	Minor	Minor
Traffic and Transport	Moderate	Minor
Atmospheric Emissions	Minor	Negligible
Noise and Vibrations	Minor	Minor
Health and Safety Hazards	Moderate	Minor
Socio-economic Impacts Community Health and Safety	Minor	Negligible
Economic loss due to selling of land	Minor	Negligible
Labour in-migration issues	Moderate	Minor
Impact on local employment opportunities during the project life cycle	Negligible	Negligible
Archaeological, Historic and Cultural Aspects	Minor	Negligible
Operation Phase		
Soil Quality	Minor	Negligible
Aesthetics and Visual Impact	Moderate	Minor
Noise Impact	Moderate	Minor

Waste Generation, storage and Disposal	Moderate	Negligible
Water Resources and Quality	Moderate	Minor
Impact on Ecology (Flora and Fauna)	Minor	Minor
Ecology Core zone	Minor	Minor
Occupational Health and Safety	Moderate	Minor
Blade Throw	Moderate	Minor
Socio-economic Impacts Community Health and Safety	Minor	Negligible
Impact on local employment opportunities during the project life cycle	Moderate (beneficial)	Negligible
Transmission line Impact	Moderate	Minor
Decommissioning Phase		
Decommissioning Phase Impact	Moderate	Minor

Annexures

Annexure-I: ReNew QHSE Policy

ReNew POWER

QUALITY, HEALTH, SAFETY & ENVIRONMENT POLICY

ReNew Power is committed to continually improve Quality, Health, Safety and Environment performance of its operations in view of our vision to build the best Renewable Energy Company in the world.

This shall be achieved by: -

- Committing adequate resources and priorities to design the best in class Quality, Health, Safety and Environment management systems to ensure Safe and Healthy work environment for everyone working for ReNew Power
- Collaborating with all internal and external stakeholders for attaining and continually improving Quality Health, Safety and Environmental performance for sustainable development
- Complying with the expectations and requirements of applicable statutes, regulations, customers, lenders and other stakeholders
- Ensuring due diligence of each project with respect to Quality, Health, Safety, Environment and Social aspects in view of optimizing the return for all our stakeholders
- Attaining and maintaining highest standards of Quality, Health, Safety & Environment in Selection, Designing, Procurement, Construction, Operations and Maintenance of assets across their lifecycle
- Keeping up our commitment to protect the environment by minimizing the adverse impact of our operations on environment and society at large and contribute for the sustainable development goals

Sumant Sinha
Chairman & Managing Director

Date: 20.04.2020

Annexure II:

Karnataka State Guidelines for undertaking appropriate measures to assist building workers in the face of the COVID-19 Pandemic

ಕರ್ನಾಟಕ ಸರ್ಕಾರ

ಸಂಖ್ಯೆ: ಕಾಇ 170 ಸ್ವೀಮರ 2020

ಕರ್ನಾಟಕ ಸರ್ಕಾರ ಸಚಿವಾಲಯ
ವಿಕಾಸಸೌಧ
ಬೆಂಗಳೂರು, ದಿನಾಂಕ: 23-04-2020

ಆದೇಶ

ವಿಷಯ: ಕೋವಿಡ್-19 ಸಾಂಕ್ರಾಮಿಕ ರೋಗದ ಹಿನ್ನೆಲೆಯಲ್ಲಿ ಕಟ್ಟಡ ಕಾರ್ಮಿಕರಿಗೆ ಮತ್ತು ವಲಸೆ ಕಾರ್ಮಿಕರಿಗೆ ನೆರವು ಒದಗಿಸಲು ಸೂಕ್ತ ಕ್ರಮಗಳನ್ನು ಜರುಗಿಸುವ ಬಗ್ಗೆ.

ಉಲ್ಲೇಖ: ದಿನಾಂಕ: 06-04-2020 ರಂದು ಸರ್ಕಾರದ ಕಾರ್ಯದರ್ಶಿಯವರ ಅಧ್ಯಕ್ಷತೆಯಲ್ಲಿ ನಡೆದ ಸಭಾ ನಡವಳಿಗಳು.

****

ಕ್ಯಾಪ್ಟನ್ ಮಣಿವಣ್ಣನ್ ಪಿ. ಭಾ.ಆ.ಸೇ., ಸರ್ಕಾರದ ಕಾರ್ಯದರ್ಶಿ, ಕಾರ್ಮಿಕ ಇಲಾಖೆ ಹಾಗೂ ವಾರ್ತಾ ಮತ್ತು ಸಾರ್ವಜನಿಕ ಸಂಪರ್ಕ ಇಲಾಖೆ, ಆದ ನಾನು ಸರ್ಕಾರದ ಆದೇಶ ಸಂಖ್ಯೆ: ಕಂಇ 178 ಜಿಎಸ್ಆರ್ 2020 ದಿನಾಂಕ: 30-03-2020ರಲ್ಲಿ ವಿಪತ್ತು ನಿರ್ವಹಣೆ ಕಾಯ್ದೆ 2005ರ ಸೆಕ್ಷನ್ 69ರಡಿ ಪ್ರದತ್ತವಾದ ಅಧಿಕಾರವನ್ನು ಚಲಾಯಿಸಿ ಕೋವಿಡ್-19ರ ತುರ್ತು ಪರಿಸ್ಥಿತಿ ಹಿನ್ನೆಲೆಯಲ್ಲಿ ವಾರ್ತಾ ಮತ್ತು ಸಾರ್ವಜನಿಕ ಸಂಪರ್ಕ ಇಲಾಖೆಯ ಸಹಯೋಗದೊಂದಿಗೆ ವಾರ್ತಾ ಭವನದಲ್ಲಿ ದಾಸೋಹ ಸಹಾಯವಾಣಿಯ ಮೂಲಕ ಸ್ಥಾಪಿಸಲಾದ 155214 ಸಹಾಯವಾಣಿಯ ಮೂಲಕ ಆಹಾರ ವಿತರಣೆಗೆ ಕೈಗೊಳ್ಳಬೇಕಾದ ಕ್ರಮಗಳ ಬಗ್ಗೆ ಈ ಕೆಳಕಂಡಂತೆ ಆದೇಶಿಸುತ್ತಿದ್ದೇನೆ.

1. 155214 ದಾಸೋಹ ಉಚಿತ ಸಹಾಯವಾಣಿಯ ಮೇಲುಸ್ತುವಾರಿಗಾಗಿ ಶ್ರೀ ವಿ.ಎಂ ಗುರುಪ್ರಸಾದ, ಸಹಾಯಕ ಕಾರ್ಮಿಕ ಆಯುಕ್ತರು, ಕರ್ನಾಟಕ ರಾಜ್ಯ ಅಸಂಘಟಿತ ಕಾರ್ಮಿಕರ ಸಾಮಾಜಿಕ ಭದ್ರತಾ ಮಂಡಳಿ ಹಾಗೂ ಶ್ರೀ ಸರ್ವೇಶ್, ಸಮಾಲೋಚಕರು, ಆಶಾವೀಪಯೋಜನೆ ಇವರುಗಳನ್ನು ನೇಮಿಸಿ ಆದೇಶಿಸಿದೆ. ಸದರಿಯವರು ಕಾರ್ಯದರ್ಶಿಗಳು, ಕಾರ್ಮಿಕ ಇಲಾಖೆ ಇವರಿಗೆ ಇದಕ್ಕೆ ಸಂಬಂಧಪಟ್ಟಂತೆ ವರದಿಯನ್ನು ಪ್ರತಿನಿತ್ಯ ಸಲ್ಲಿಸುವುದು.

2. 155214 ಸಹಾಯವಾಣಿಗೆ ಕಟ್ಟಡ ಕಾರ್ಮಿಕರ ಮತ್ತು ವಲಸೆ ಕಾರ್ಮಿಕರ ಮಧ್ಯಾಹ್ನದ ಊಟ ಮತ್ತು ರಾತ್ರಿ ಊಟದ ಕರೆಗಳನ್ನು ಸ್ವೀಕರಿಸಲಾಗುತ್ತಿದೆ. ಈ ಕರೆಗಳನ್ನು ಕಟ್ಟಡ ಕಾರ್ಮಿಕರು ಅಥವಾ ಇತರೆ ಕಾರ್ಮಿಕರು ಇದರಲ್ಲಿ ಪಡಿತರ ಚೀಟಿಯನ್ನು ಹೊಂದಿರುವ ಕಟ್ಟಡ ಕಾರ್ಮಿಕರು ಹಾಗೂ ಹೊಂದಿಲ್ಲದ ಕಾರ್ಮಿಕರ ಕರೆಗಳನ್ನು ವಿಂಗಡಿಸಿ ಹಾಗೂ ಇನ್ನಿತರ ಕರೆಗಳನ್ನು ವಿಂಗಡಿಸಿ, ಕೇವಲ ಕಟ್ಟಡ ಕಾರ್ಮಿಕರಿಗೆ ದಾಸೋಹ ಮೂಲಕ ಆಹಾರವನ್ನು ಒದಗಿಸುವ ವ್ಯವಸ್ಥೆಯನ್ನು ಶೇ.100ರಷ್ಟು ಸುನಿಶ್ಚಿತಗೊಳಿಸಲು ನಿಯಮಾನುಸಾರ ಅಗತ್ಯ ಕ್ರಮ ಕೈಗೊಳ್ಳಲು ಹಾಗೂ ಸಹಾಯವಾಣಿಯಲ್ಲಿ ಐ.ವಿ.ಆರ್.ಎಸ್. ವ್ಯವಸ್ಥೆಯನ್ನು ಸ್ಥಾಪಿಸಲು ಆದೇಶಿಸಿದೆ.

3. ಸಹಾಯವಾಣಿಯ ಮೇಲುಸ್ತುವಾರಿ ಹೊಂದಿರುವ ಅಧಿಕಾರಿಗಳು, 155214ಗೆ ಸ್ವೀಕೃತವಾಗುವ ಎಲ್ಲಾ ಕರೆಗಳನ್ನು ಶೇ.100ರಷ್ಟು ಸ್ವೀಕೃತವಾಗಿರುವ ಬಗ್ಗೆ ಧೃಢೀಕರಿಸುವುದು. ಸದರಿ ಕರೆಗಳಲ್ಲಿ ಕಟ್ಟಡ ಕಾರ್ಮಿಕರ ಕರೆಗಳಲ್ಲದಿದ್ದಲ್ಲಿ, ಸಹಾಯವಾಣಿಯು ಆಹಾರವನ್ನು ಕಟ್ಟಡ ಕಾರ್ಮಿಕರಿಗೆ ಮಾತ್ರ ಒದಗಿಸಲಾಗುವುದು ಎಂದು ಕರೆ ಮಾಡಿದವರಿಗೆ ತಿಳಿಸುವುದು. ಆಹಾರ ಪೊಟ್ಟಣ ಮತ್ತು ಇತರೆ ಬೇಡಿಕೆ ಕುರಿತು ಕಟ್ಟಡ ಕಾರ್ಮಿಕರಿಂದ ಸ್ವೀಕೃತವಾಗುವ ಕರೆಗಳನ್ನು ಇಂದಿರಾ ಕ್ಯಾಂಟೀನ್‌ಗೆ ವರ್ಗಾಯಿಸಿರುವ ಬಗ್ಗೆ ಖಚಿತಪಡಿಸಿಕೊಳ್ಳುವುದು.

.....2

-2-

4. ಕರ್ನಾಟಕ ಕಟ್ಟಡ ಮತ್ತು ಇತರೆ ನಿಮಾಣ ಕಾರ್ಮಿಕರ ಕಲ್ಯಾಣ ಮಂಡಳ ಮತ್ತು ಕರ್ನಾಟಕ ರಾಜ್ಯ ಅಸಂಘಟಿತ ಕಾರ್ಮಿಕರ ಸಾಮಾಜಿಕ ಭದ್ರತಾ ಮಂಡಳಗಳು ತಮ್ಮ ದೈನಂದಿನ ವೆಚ್ಚದ ವಿವರಗಳನ್ನು ಇಲಾಖೆಯ ಅಧಿಕೃತ ವೆಬ್‌ಸೈಟಿನಲ್ಲಿ ಪ್ರತಿದಿನ ಸಂಜೆ 6.00 ಗಂಟೆಯೊಳಗೆ upload ಮಾಡುವುದು.

5. ಕಾರ್ಮಿಕ ಇಲಾಖೆಯಿಂದ ಹೊರಡಿಸಲಾಗುವ ಎಲ್ಲಾ ಆದೇಶ/ಸುತ್ತೋಲೆ/ಅಧಿಸೂಚನೆ ಇತ್ಯಾದಿಗಳನ್ನು ಶ್ರೀ ಶೈಲೇಶ್ ರವರು ಇಲಾಖೆಯ ಅಧಿಕೃತ ಜಾಲತಾಣದಲ್ಲಿ ಪ್ರಕಟಿಸುವ ಜವಬ್ದಾರಿಯನ್ನು ಹೊಂದಿರುತ್ತಾರೆ.

(ಕ್ಯಾಪ್ಟನ್ ಮಣಿವಣ್ಣನ್ ಪಿ.)
ಸರ್ಕಾರದ ಕಾರ್ಯದರ್ಶಿ
ಕಾರ್ಮಿಕ ಇಲಾಖೆ ಹಾಗೂ ವಾರ್ತಾ ಮತ್ತು
ಸಾರ್ವಜನಿಕ ಸಂಪರ್ಕ ಇಲಾಖೆ,

ಇವರಿಗೆ,

1. ಕಾರ್ಮಿಕ ಆಯುಕ್ತರು, ಕಾರ್ಮಿಕ ಭವನ, ಬನ್ನೇರುಘಟ್ಟ ರಸ್ತೆ, ಬೆಂಗಳೂರು.
2. ಶ್ರೀಮತಿ ವಿ. ಚೈತ್ರ, ಭಾ.ಆ.ಸೇ., ವಿಶೇಷ ನೋಡಲ್ ಅಧಿಕಾರಿ, (ಕೋವಿಡ್-19) ಕಾರ್ಮಿಕ ಇಲಾಖೆ, ಬೆಂಗಳೂರು.
3. ಕಾರ್ಯದರ್ಶಿ, ಕರ್ನಾಟಕ ಕಟ್ಟಡ ಮತ್ತು ಇತರೆ ನಿರ್ಮಾಣ ಕಾರ್ಮಿಕರ ಕಲ್ಯಾಣ ಮಂಡಳ, ಕಾರ್ಮಿಕ ಭವನ, ಬನ್ನೇರುಘಟ್ಟ ರಸ್ತೆ, ಬೆಂಗಳೂರು.
4. ನಿರ್ದೇಶಕರು, ಕಾರ್ಖಾನೆಗಳು, ಬಾಯ್ಲರುಗಳು, ಕೈಗಾರಿಕೆ ಸುರಕ್ಷತೆ ಮತ್ತು ಸ್ವಾಸ್ಥ್ಯ ಇಲಾಖೆ, ಕಾರ್ಮಿಕ ಭವನ, ಬೆಂಗಳೂರು.
5. ಅಪರ ಕಾರ್ಮಿಕ ಆಯುಕ್ತರು (ಆಡಳಿತ ಮತ್ತು ಲೆಕ್ಕಪತ್ರ), ಕಾರ್ಮಿಕ ಭವನ, ಬೆಂಗಳೂರು.
6. ಅಪರ ಕಾರ್ಮಿಕ ಆಯುಕ್ತರು (ಕೈಗಾರಿಕಾ ಬಾಂದವ್ಯ) ಕಾರ್ಮಿಕ ಭವನ, ಬೆಂಗಳೂರು.
7. ಜಂಟಿ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕರ್ನಾಟಕ ರಾಜ್ಯ ಅಸಂಘಟಿತ ಕಾರ್ಮಿಕರ ಸಾಮಾಜಿಕ ಭದ್ರತಾ ಮಂಡಳ, ಕಲ್ಯಾಣ ಸುರಕ್ಷಾ ಭವನ, 3ನೇ ಮಹಡಿ, ಐಟಿಐ ಆವರಣ, ಡೈರಿ ಸರ್ಕಲ್, ಬೆಂಗಳೂರು-29.
8. ಕಲ್ಯಾಣ ಆಯುಕ್ತರು, ಕರ್ನಾಟಕ ಕಾರ್ಮಿಕ ಕಲ್ಯಾಣ ಮಂಡಳ, ಕಾರ್ಮಿಕ ಕಲ್ಯಾಣ ಭವನ, ನಂ. 48, 2ನೇ ಮಹಡಿ, ಮತ್ತಿಕೆರೆ ಮುಖ್ಯ ರಸ್ತೆ, (ಆರ್.ಟಿ.ಓ. ಹತ್ತಿರ), ಯಶವಂತಪುರ, ಬೆಂಗಳೂರು.
9. ಎಲ್ಲಾ ಜಂಟಿ/ಉಪ ಕಾರ್ಮಿಕ ಆಯುಕ್ತರು/ಸಹಾಯಕ ಕಾರ್ಮಿಕ ಆಯುಕ್ತರು/ಕಾರ್ಮಿಕ ಅಧಿಕಾರಿಗಳು/ ಹಿರಿಯ ಕಾರ್ಮಿಕ ನಿರೀಕ್ಷಕರು/ಕಾರ್ಮಿಕ ನಿರೀಕ್ಷಕರು (ಕಾರ್ಮಿಕ ಆಯುಕ್ತಾಲಯದ ಮೂಲಕ)

ಪ್ರತಿಯನ್ನು ಮಾಹಿತಿಗಾಗಿ:

1. ಮಾನ್ಯ ಮುಖ್ಯ ಕಾರ್ಯದರ್ಶಿಯವರ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿ, ವಿಧಾನಸೌಧ, ಬೆಂಗಳೂರು.
2. ಮಾನ್ಯ ಇಲಾಖಾ ಸಚಿವರ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿ, ಕಾರ್ಮಿಕ ಇಲಾಖೆ, ವಿಕಾಸಸೌಧ, ಬೆಂಗಳೂರು.
3. ಸರ್ಕಾರದ ಕಾರ್ಯದರ್ಶಿ ರವರ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿ, ಕಾರ್ಮಿಕ ಇಲಾಖೆ ವಿಕಾಸ ಸೌಧ, ಬೆಂಗಳೂರು
4. ಶಾಖಾ ರಕ್ಷಾ ಕಡತ/ಹೆಚ್ಚವರಿ ಪ್ರತಿಗಳು.

Annexure III:
Power Purchase Agreement letter

STANDARD

POWER PURCHASE AGREEMENT FOR

PROCUREMENT OF 300 MW WIND POWER

ON LONG TERM BASIS

Between

M/s Ostro Kannada Power Private Limited

And

Solar Energy Corporation of India Limited

[October 2019]

BUYER-WPD PPA

INDIA NON JUDICIAL

Government of National Capital Territory of Delhi

e-Stamp

सत्यमेव जयते

Certificate No.	:	IN-DL69239129406415R
Certificate Issued Date	:	15-Oct-2019 11:38 AM
Account Reference	:	IMPACC (IV)/ dl921303/ DELHI/ DL-DLH
Unique Doc. Reference	:	SUBIN-DLDL92130346243425129239R
Purchased by	:	SOLAR ENERGY CORPORATION OF INDIA LIMITED
Description of Document	:	Article 5 General Agreement
Property Description	:	Not Applicable
Consideration Price (Rs.)	:	0 (Zero)
First Party	:	SOLAR ENERGY CORPORATION OF INDIA LIMITED
Second Party	:	Not Applicable
Stamp Duty Paid By	:	SOLAR ENERGY CORPORATION OF INDIA LIMITED
Stamp Duty Amount(Rs.)	:	100 (One Hundred only)

Please write or type below this line

This Power Purchase Agreement is made on the 30th day of October of 2019 at New Delhi

Between

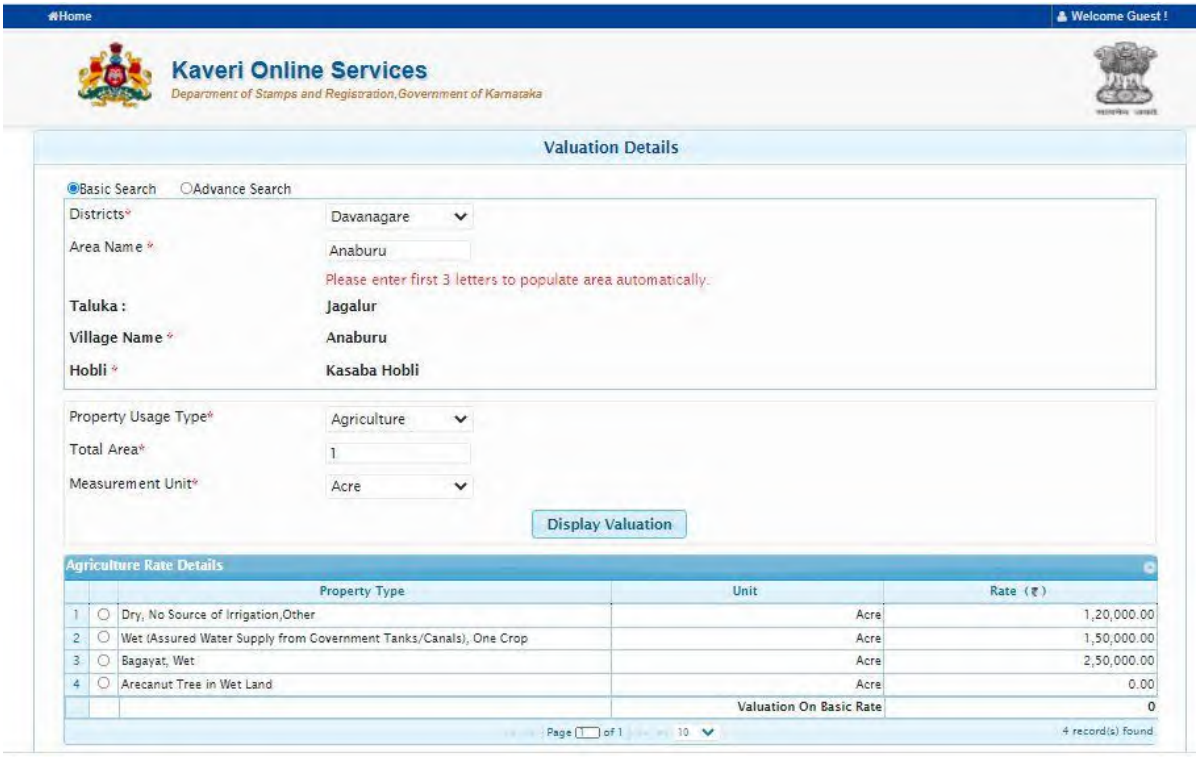
M/s Ostro Kannada Power Private Limited, a Company incorporated under the Companies Act 1956 or Companies Act 2013, bearing CIN: U40300DL2016PTC291394, having its registered office at 138, Ansal Chambers- II, Bhikaji Cama Place, New Delhi -110066, India (hereinafter referred to as "**Wind Power**

Page 2 of 66

Statutory Alert:
1. The authenticity of this Stamp Certificate should be verified at "www.shcilestamp.com". Any discrepancy in the details on this Certificate and as available on the website renders it invalid.
2. The onus of checking the legitimacy is on the users of the certificate.
3. In case of any discrepancy please inform the Competent Authority.

[WPD-ISTS-T6-OKPPL-300TN]

Annexure-IV:
Revenue rates (Jagalur Taluka)



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Kaveri Online Services
Department of Stamps and Registration, Government of Karnataka

Valuation Details

◉ Basic Search ○ Advance Search

Districts*	Davanagare
Area Name *	Anaburu
	Please enter first 3 letters to populate area automatically.
Taluka :	**Jagalur**
Village Name *	**Anaburu**
Hobli *	**Kasaba Hobli**
Property Usage Type*	Agriculture
Total Area*	1
Measurement Unit*	Acre

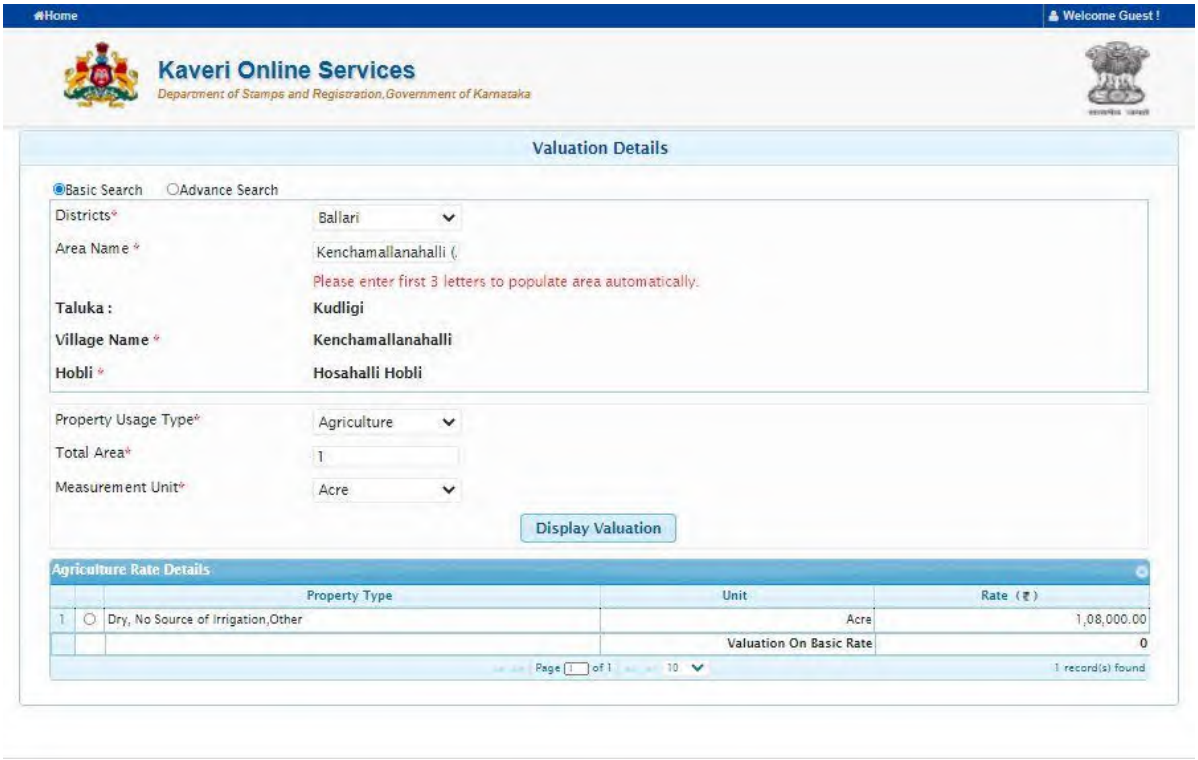
Display Valuation

Agriculture Rate Details

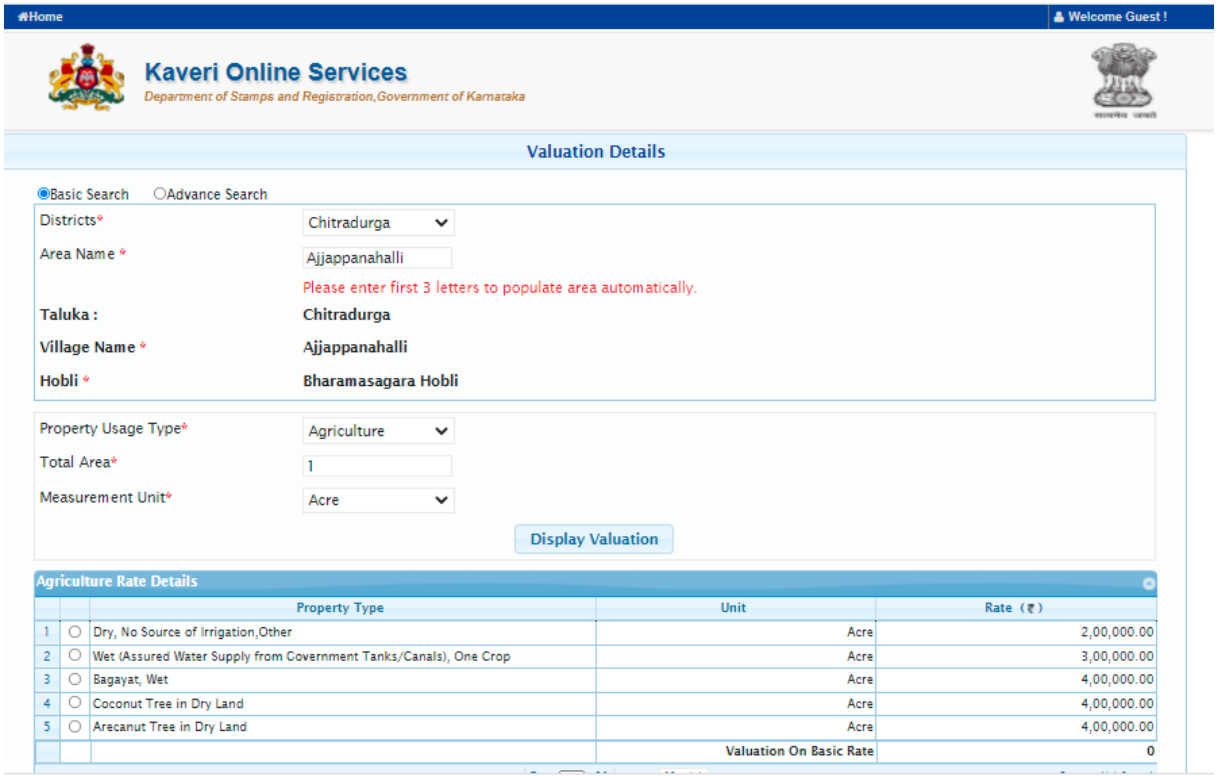
		Property Type	Unit	Rate (₹)
1	○	Dry, No Source of Irrigation,Other	Acre	1,20,000.00
2	○	Wet (Assured Water Supply from Government Tanks/Canals), One Crop	Acre	1,50,000.00
3	○	Bagayat, Wet	Acre	2,50,000.00
4	○	Arecanut Tree in Wet Land	Acre	0.00
			Valuation On Basic Rate	**0**

Page 1 of 1 | 10 | 4 record(s) found

Revenue Rate (Kudligi Taluka)



Revenue Rate (Chitradurga Taluka)



#Home | Welcome Guest !

Kaveri Online Services
Department of Stamps and Registration,Government of Karnataka

Valuation Details

◉Basic Search ○Advance Search

Districts* Chitradurga

Area Name * Ajjappanahalli

Please enter first 3 letters to populate area automatically.

Taluka : Chitradurga

Village Name * Ajjappanahalli

Hobli * Bharamasagara Hobli

Property Usage Type* Agriculture

Total Area* 1

Measurement Unit* Acre

Display Valuation

Agriculture Rate Details

		Property Type	Unit	Rate (₹)
1	○	Dry, No Source of Irrigation,Other	Acre	2,00,000.00
2	○	Wet (Assured Water Supply from Covernment Tanks/Canals), One Crop	Acre	3,00,000.00
3	○	Bagayat, Wet	Acre	4,00,000.00
4	○	Coconut Tree in Dry Land	Acre	4,00,000.00
5	○	Arecanut Tree in Dry Land	Acre	4,00,000.00
			Valuation On Basic Rate	0

Annexure-V:
NOC from Gram Panchayat

ಕಾಡು ಬೆಳೆಸಿ, ನಾಡು ಉಳಿಸಿ !
ನೀರು ಅಮೂಲ್ಯವಾದ ಮಣ್ಣು ಮಿತವಾಗಿ ಬಳಸಿ !

ಸ್ವಚ್ಛತೆಯೇ ಆರೋಗ್ಯ, ಮಾಲಿನ್ಯತೆಯೇ ಆನಾರೋಗ್ಯ !!
ಪರಿಸರ ರಕ್ಷಣೆ ನಮ್ಮೆಲ್ಲರ ಹೊಣೆ !!

ಜಿಲ್ಲಾ ಪಂಚಾಯಿತಿ, ದಾವಣಗೆರೆ

ಗ್ರಾಮ ಪಂಚಾಯಿತಿ ಕಾರ್ಯಾಲಯ

ಹಿರೇಮಲ್ಲನಹೊಳೆ, ಜಗಳೂರು ತಾಲ್ಲೂಕು, ದಾವಣಗೆರೆ ಜಿಲ್ಲೆ.

ಹಿ.ಗ್ರಾ.ಪಂ. ಸಂ.
Ref No. 8/3 /2020-21

ದಿನಾಂಕ : .....
Date : 16-02-2021

To,
Ostro Kannada Power Privite Limited
138, Ansal Chambers -II, Bhikaji Chama Place,
New Delhi-110066

Sub : NOC for OSTRO Kannada Power Privite Limited by our Panchayath

1. **Construction, Implementation and Operation of their Wind Project and their components.**
2. **Laying, winding and extension of village panchyath roads to transport Wind turbine equipment/Components, like tower, blade hub, Nacelle and Cranes to their Wind Turbine locations.**
3. **Laying of electricle transmission lines from their Wind Turbine location to the electrical substaion, near Anaburu Grama Panchayath of Jagalur Taluk, Davanagere Dist, Karanataka.**

In this regard as per the Panchayat resolution No. 8/3 passed in the panchayat meeting held on 15-02-2021 it was unanimously decided that there is No Objection with the following conditions. The said No Objection Certificate is issued.

Conditions:
1. The construction work should be done in the place shown as per your records.
2. Proper mutually agreed compensation should be given for landowners for this Wind project location.
3. Company should respond suitably for the development activities of panchayat.

Yours Truly

Panchayath Development Officer
Hirenallamallanahole Grama Panchayath
Jagalur Taluk, Davanagere Dist. Karnataka

Enclosed:
1. Panchayat meeting resolution copy.

Annexure VI: Eco Sensitive Zone Notification

4. List of activities prohibited or to be regulated within the Eco-sensitive Zone.- All activities in the Eco sensitive Zone shall be governed by the provisions of the Environment (Protection) Act, 1986 (29 of 1986) and the rules made there under including the Coastal Regulation Zone (CRZ), 2011 and the Environmental Impact Assessment (EIA) Notification, 2006 and other applicable laws including the Forest (Conservation) Act, 1980 (69 of 1980), the Indian Forest Act, 1927 (16 of 1927), the Wildlife (Protection) Act 1972 (53 of 1972), and amendments made thereto and be regulated in the manner specified in the Table below, namely:-

TABLE

S No	Activity	Description
(1)	(2)	(3)
	A. Prohibited Activities	
1.	Commercial Mining, stone quarrying and crushing units.	(a) All new and existing (minor and major minerals), stone quarrying and crushing units shall be prohibited except for meeting the domestic needs of bona fide local residents including digging of earth for construction or repair of houses and for manufacture of country tiles or bricks for housing and for personal consumption. (b) The mining operations shall be carried out in accordance with the order of the Hon'ble Supreme Court dated the 4th August, 2006 in the matter of T.N. Godavarman Thirumulpad Vs. UOI in W.P.(C) No.202 of 1995 and dated the 21st April, 2014 in the matter of Goa Foundation Vs. UOI in W.P.(C) No.435 of 2012.
2.	Setting of industries causing pollution (water, air, soil, noise, etc.).	(a) no new industries or expansion of existing polluting industries in the Eco-sensitive zone shall be permitted. (b) only non-polluting industries may be permitted within Eco-sensitive Zone as per classification of Industries in the guidelines issued by the Central Pollution Control Board in February 2016, unless otherwise specified in this notification.
3.	Establishment of major hydroelectric project.	Prohibited (except as otherwise provided) as per applicable laws.

4.	Use or production or processing of any hazardous substances.	Prohibited (except as otherwise provided) as per applicable laws.
5.	Discharge of untreated effluents in natural water bodies or land area.	Prohibited (except as otherwise provided) as per applicable laws.
6.	Establishment of solid waste disposal site and common incineration facility for solid and bio medical waste.	No new solid waste disposal site and waste treatment/processing facility of solid waste shall be permitted within Eco-sensitive Zone, and installation of common or individual incineration facility for treatment of any form of solid waste generated from industrial process and health establishment, hospitals, etc. shall be prohibited.
7.	Establishment of large-scale commercial livestock and poultry farms by firms, companies, etc.	Prohibited (except as otherwise provided) as per applicable laws except for meeting local needs.
8.	Setting of saw mills.	No new or expansion of existing saw mills shall be permitted within the Eco-sensitive Zone.
9.	Setting up of brick kilns.	Prohibited (except as otherwise provided) as per applicable laws.
10.	Commercial use of fire wood.	Prohibited (except as otherwise provided) as per applicable laws.

	B. Regulated Activities	
11.	Commercial establishment of hotels and resorts.	No new commercial hotels and resorts shall be permitted within one kilometre of the boundary of the Protected Area or upto the extent of Eco-sensitive Zone, whichever is nearer, except for small temporary structures for Eco-tourism activities: Provided that, beyond one kilometre from the boundary of the protected Area or upto the extent of the Eco-sensitive Zone whichever is nearer, all new tourist activities or expansion of existing activities shall be in conformity with the Tourism Master Plan and guidelines as applicable.
12.	Construction activities.	(a) No new commercial construction of any kind shall be permitted within one kilometre from the boundary of the Protected Area or upto extent of the Eco-sensitive Zone whichever is nearer: Provided that, local people shall be permitted to undertake construction in their land for their residential use including the activities listed in sub- paragraph (1) of paragraph 3 as per building byelaws to meet the residential needs of the local residents such as:- (i) Widening and strengthening of existing roads and construction of new roads; (ii) Construction and renovation of infrastructure and civic amenities; (iii) Small scale industries not causing pollution termed as per classification done by the Central Pollution Control Board in the year 2016; (iv) Cottage industries including village industries; convenience stores and local amenities supporting eco-tourism including home stays; and (v) Promoted activities listed in this Notification: Provided that the construction activity related to small scale industries not causing pollution shall be regulated and kept at the minimum, with the prior permission from the competent authority as per applicable rules and regulations, if any.

[भाग II—खण्ड 3(ii)] भारत का राजपत्र : असाधारण 27

		(b) Beyond one kilometre it shall be regulated as per the Zonal Master Plan.
13.	Small scale non polluting industries.	Non polluting industries as per classification of industries issued by the Central Pollution Control Board in the year 2016 and non-hazardous, small-scale and service industry, agriculture, floriculture, horticulture or agro-based industry producing products from indigenous materials from the Eco-sensitive Zone shall be permitted by the competent Authority.
14.	Felling of trees.	(a) There shall be no felling of trees on the forest or Government or revenue or private lands without prior permission of the competent authority in the State Government. (b) The felling of trees shall be regulated in accordance with the provisions of the relevant Central or State Acts and the rules made thereunder.
15.	Collection of Forest Produce or Non-Timber Forest Produce (NTFP).	Regulated under applicable laws.
16.	Erection of electrical and communication towers and laying of cables and other infrastructures.	Regulated under applicable laws (underground cabling may be promoted).
17.	Infrastructure including civic amenities.	Shall be done with mitigation measures, as per applicable laws, rules and regulation and available guidelines.
18.	Widening and strengthening of existing roads and construction of new roads.	Shall be done with mitigation measures, as per applicable laws, rules and regulation and available guidelines.
19.	Under taking other activities related to tourism like over flying the Eco-sensitive Zone area by hot air balloon, helicopter, drones, Microlites, etc.	Regulated under applicable laws.

20.	Protection of hill slopes and river banks.	Regulated under applicable laws.
21.	Movement of vehicular traffic at night.	Regulated for commercial purpose under applicable laws.
22.	Ongoing agriculture and horticulture practices by local communities along with dairies, dairy farming, aquaculture and fisheries.	Permitted under applicable laws for use of locals.
23.	Discharge of treated waste water or effluents in natural water bodies or land area.	The discharge of treated waste water or effluents shall be avoided to enter into the water bodies and efforts shall be made for recycle and reuse of treated waste water, and the discharge of treated waste water or effluents shall be regulated as per applicable laws.
24.	Commercial extraction of surface and ground water.	Regulated under applicable laws.
25.	Open well, bore well, etc. for agriculture or other usage.	Regulated and the activity shall be monitored by the concerned authority.
26.	Solid waste management.	Regulated under applicable laws.
27.	Introduction of Exotic species.	Regulated under applicable laws.
28.	Eco-tourism.	Regulated under applicable laws.
29.	Use of polythene bags.	Regulated under applicable laws

28 THE GAZETTE OF INDIA : EXTRAORDINARY [PART II—SEC. 3(ii)]

30.	Commercial sign boards and hoardings.	Regulated under applicable laws.
	C. Promoted Activities	
31.	Rain water harvesting.	Shall be actively promoted.
32.	Organic farming.	Shall be actively promoted.
33.	Adoption of green technology for all activities.	Shall be actively promoted.
34.	Cottage industries including village artisans, etc.	Shall be actively promoted.
35.	Use of renewable energy and fuels.	Bio gas, solar light, etc. to be actively promoted.
36.	Agro-forestry.	Shall be actively promoted.
37.	Use of eco-friendly transport.	Shall be actively promoted.
38.	Skill development.	Shall be actively promoted.
39.	Restoration of degraded land/ forests/ habitat.	Shall be actively promoted.
40.	Environmental Awareness.	Shall be actively promoted.

Annexure-VII:
Consultation Attendance

Social Perception Survey – Questionnaire - ESIA for MW Wind Power Project

List of Participants

Name of the village: Rastemachikeri Date: 10/10/21

Panchayat: Tehsil/Taluka:

District:

S.No.	Name	Village	Occupation	Signature
1	Shamukppa		Panchayat member	

Social Perception Survey – Questionnaire - ESIA for MW Wind Power Plant

List of Participants

Name of the village: Channapura Gollarahatti **Date:** 10/10/21

Panchayat: **Tehsil/Taluka:**

District:

S.No.	Name	Village	Occupation	Signature
①	Shashi Kumar Naik		Agriculture	B Shashikumar Naik
②	Mantesh Naik		Agriculture	ಮಂಜೇಶ್ ನಾಯ್ಕ್

Social Perception Survey – Questionnaire - ESIA for MW Wind Power Plant

List of Participants

Name of the village: Gbdankatti **Date:** 10/10/21

Panchayat: **Tehsil/Taluka:**

District:

S.No.	Name	Village	Occupation	Signature
1	Hanumakka		Homemaker	
2				

Social Perception Survey – Questionnaire - ESIA for MW Wind Power Project

List of Participants

Name of the village: Kalagiri Date: 9/10/21

Panchayat: Tehsil/Taluka:

District:

S.No.	Name	Village	Occupation	Signature
1	Rangappa	Kalagiri	farmer	

2

Social Perception Survey – Questionnaire - ESIA for 300 MW Wind Power Project

List of Participants

Name of the village: Nallikatte **Date:** 9/10/21

Panchayat: **Tehsil/Taluka:**

District:

S.No.	Name	Village	Occupation	Signature
1	Jeevan	Nallikatti	Graduation.	
2	Manjunath	"	"	

2

Social Perception Survey – Questionnaire - ESIA for 300 MW Wind Power Project

List of Participants

Name of the village: Anubur **Date:** 10 | 10 | 21

Panchayat: **Tehsil/Taluka:**

District:

S.No.	Name	Village	Occupation	Signature
1	K.S. Prakash	Anubur	Private Agent	
2	K. Shivana	"	Agriculture	

2

Social Perception Survey – Questionnaire - ESIA for 300 MW Wind Power Project

TÜV SÜD South Asia

List of Participants

Name of the village: Huchavanahalli

Date: 10/10/21

Panchayat:

Tehsil/Taluka:

District:

S.No.	Name	Village	Occupation	Signature
1.	Vaibhav	Huchavalli	Studied (Lab technical) (Training)	Vaibhava. G.S[illegible]

Social Perception Survey – Questionnaire - ESIA for 300 MW Wind Power Project

List of Participants

Name of the village: ~~K H Halli~~ Hucharanahalli Date: 10/10/21

Panchayat: Tehsil/Taluka:

District:

S.No.	Name	Village	Occupation	Signature
1.	Uma Devi	~~K H Halli~~ Hucharanahalli	Housewife	

2

Perception Survey – Questionnaire - ESIA for 300 MW Wind Power Plant

South Asia

List of Participants

Name of the village: OKPPL **Date:** 7/10/21

Panchayat: **Tehsil/Taluka:**

District:

S.No.	Name	Village	Occupation	Signature
1.	Mr. Bharat	Land Team		
2.	Mr. Durga Rao	Surveyor		
3.	Mr. Nagendra	PSS Incharge		
4.	Mr. Nidhi Rajan	Civil Expat		

1

Social Perception Survey – Questionnaire - ESIA for 300 MW Wind Power Plant

List of Participants

Name of the village: ~~Alur~~ PAP Date: 08/10/2021

Panchayat: Tehsil/Taluka:

District:

S.No.	Name	Village	Occupation	Signature
1.	K.G. Sandeep Kumar	Alur	Farming	
2.	Boranna (ST) - PAP	Konamadu	Deputy Sarpanch	
3.	Nagaraja	Hulikere	Farming	
4.	Mallikarjun	Mallur	Deputy Sarpanch	
5.	Venkatesh	Kenchamalanhalli	Farming	
6.	Manjunath	Kenchamalanhalli	"	
7.	K.G. Kubera Gowda	Alur	"	
8.	Basavarajan	Kere Halli	"	
9.	Somashekhara Gowda	Lakikere	Farmer Deputy Sarpanch	
10.	Bharat Gowda (Late)	Lakikere	Farmer	
11.	Renukappa (W/o of PAF Nagappa)	Lakikere	Farmer	

Social Perception Survey – Questionnaire - ESIA for 300 MW Wind Power Plant

List of Participants

Name of the village: PAP Date: 9/10/21

Panchayat: Tehsil/Taluka:

District:

S.No.	Name	Village	Occupation	Signature
1.	(Rajanava) Revana (Kiran)	Davangere	Land Aggregator	
2.	Rajesh (Virtuz)	Da Bangalore	Land Aggregator	
3.	Srinivas DC Aqua Reality Solutions.	Bangalore	"	
4.	(Rajendra) (RPR)	Tamil Nadu	"	T. Rajendra
5.	(") Lawrence Defelkar	Hubli	"	
6.	Venkatesh ; Kulkarni (")	Gadag	"	

1

Social Perception Survey – Questionnaire - ESIA for 300MW Wind Power Plant

List of Participants

Name of the village: PAP Date: 09/10/2021

Panchayat: Tehsil/Taluka:

District:

S.No.	Name	Village	Occupation	Signature
1	B. Kumar Swamy	Lokikere	Farmer	
2	Anjaniappa	K M Halli	Farmer (GP Member)	
3	Rangaswamy	Anabur	Farmer)	
4	Kattappa	Anabur	Farmer	
5	Rangana Pha. Reddy	Huchavarayahalli	Farmer	
6	Satyanarayan Reddy	"	"	
7	Honnamma Reddy	"	"	
8	Mahesh (Jayamma)	Chikkamalavalli	Housewife	
9	Mahadev Reddy	Yerrakalli	Farmer	

Social Perception Survey – Questionnaire - ESIA for 300 MW Wind Power Plant

List of Participants

Name of the village: Anubhur Date: 10/10/21

Panchayat: Tehsil/Taluka:

District:

S.No.	Name	Village	Occupation	Signature
1	Rajappa		Farmer	Rajappa.m

Social Perception Survey – Questionnaire - ESIA for 300 MW Wind Power Plant

List of Participants

Name of the village: Huchavanahalli Date: 10/10/21

Panchayat: Tehsil/Taluka:

District:

S.No.	Name	Village	Occupation	Signature
1)	Thippeswamy	Huchavanahalli	Farmer	H.T. Thippeswamy
2)	Mallikarjuna	"	"	ಮಲ್ಲಿಕಾರ್ಜುನ
3)	Yellappa	"	"	H. Yellappa.
4)	Parsuram	"	"	ಪರಶುರಾಮ
5)	Manoj	"	"	Manoj

Social Perception Survey – Questionnaire - ESIA for 300 MW Wind Power Project

List of Participants

Name of the village: Hucharavanahalli **Date:** 10/10/21

Panchayat: **Tehsil/Taluka:**

District:

S.No.	Name	Village	Occupation	Signature
(1)	G V V Lakshmma	Hucharavanahalli	Farmer	G.V.V

Social Perception Survey – Questionnaire - ESIA for 300 MW Wind Power Project

List of Participants

Name of the village: Lokikere **Date:** 09/10/21

Panchayat: **Tehsil/Taluka:**

District:

S.No.	Name	Village	Occupation	Signature
1.	G. Chandrama	Lokikere	Housewife	
2.	Bhagyamma	"	"	
3.	Hemavathi	"	"	

2

Social Perception Survey – Questionnaire - ESIA for 300 MW Wind Power Project

List of Participants

Name of the village: Rastemachekere Date: 10/10/21

Panchayat: Tehsil/Taluka:

District:

S.No.	Name	Village	Occupation	Signature
1	Chandan MS	-	Graduation	Chandana. M.S.

2

Social Perception Survey – Questionnaire - ESIA for 300MW Wind Power Plant

List of Participants

Name of the village: Rastanaeheken **Date:** 10/10/21

Panchayat: **Tehsil/Taluka:**

District:

S.No.	Name	Village	Occupation	Signature
1	Siddhalingappa		Agriculture	
2	Khasibasab		Agriculture	
3	Shivaraj		Sarpanch Mem	

Social Perception Survey – Questionnaire - ESIA for 300 MW Wind Power Plant

List of Participants

Name of the village: Sagalkatti **Date:** 09/10/21

Panchayat: **Tehsil/Taluka:**

District:

S.No.	Name	Village	Occupation	Signature
1	Tej Murti		Agriculture	
2	Shivanappa		Agriculture	

Social Perception Survey – Questionnaire - ESIA for 300 MW Wind Power Plant

List of Participants

Name of the village: Kakbala **Date:** 10/10/21

Panchayat: **Tehsil/Taluka:**

District:

S.No.	Name	Village	Occupation	Signature
1	Mohan	Kakbala	Agriculture	Mohana L
2	Narsimappa	"	"	ನರಸಿಂಹಪ್ಪ
3	Nagendrappa	"	"	Nagendrappa

Social Perception Survey – Questionnaire - ESIA for 300 MW Wind Power Plant

List of Participants

Name of the village: Land Aggregator Date: 9/6/21

Panchayat: Tehsil/Taluka:

District:

S.No.	Name	Village	Occupation	Signature
1	Lawrence Telkar		Land Aggregator	

Social Perception Survey – Questionnaire - ESIA for 300 MW Wind Power Project

List of Participants

Name of the village: Kakbala (Anganwadi) **Date:** 10/10/21

Panchayat: **Tehsil/Taluka:**

District:

S.No.	Name	Village	Occupation	Signature
1	Durgamma		Helper	
2	Manjama.		Helper	

Social Perception Survey – Questionnaire - ESIA for 300 MW Wind Power Plant

List of Participants

Name of the village: Chennapura **Date:** 10/10/21

Panchayat: Devikere **Tehsil/Taluka:**

District:

S.No.	Name	Village	Occupation	Signature
(SC/ST) 1	Shivanna		Agriculture	
2	Rudresh		Agriculture	
3	Viresh		Agriculture	
4	Erappa		Agriculture	

Social Perception Survey – Questionnaire - ESIA for 300 MW Wind Power Plant

List of Participants

Name of the village: Giddankatti **Date:** 09/10/21

Panchayat: Kechanahalli **Tehsil/Taluka:**

District:

S.No.	Name	Village	Occupation	Signature
(1)	Guruswami		Shop (Busines)	
(2)				

Social Perception Survey – Questionnaire - ESIA for 300 MW Wind Power Project

List of Participants

Name of the village: Rastemacheker Date: 10/10/21

Panchayat: Tehsil/Taluka:

District:

S.No.	Name	Village	Occupation	Signature
1	Savita		Homemaker	Savitha

2

Social Perception Survey – Questionnaire - ESIA for 300 MW Wind Power Plant

List of Participants

Name of the village: Chennapura **Date:** 10/10/21

Panchayat: **Tehsil/Taluka:**

District:

S.No.	Name	Village	Occupation	Signature
1	Lavanya Bai		Homemaker	
2	Jaya Bai		11	
3	Bansamma		Agriculture	

1

Social Perception Survey – Questionnaire - ESIA for 300 MW Wind Power Project

South Asia

List of Participants

Name of the village: Kalagiri **Date:** 09/10/21

Panchayat: **Tehsil/Taluka:**

District:

S.No.	Name	Village	Occupation	Signature
1	Manjakshama C	Kalagiri	Library	G. [illegible]

2

Social Perception Survey – Questionnaire - ESIA for 300 MW Wind Power Plant

List of Participants

Name of the village: Nilakatti **Date:** 04/10/21

Panchayat: **Tehsil/Taluka:**

District:

S.No.	Name	Village	Occupation	Signature
1	Chandappa		Agriculture	
2	Niranjan Murti		Panchayat member	
3	Hanumantanna		Panchayat member	
4	Shivaraj		Banking work	
5	Hanumanth			

Social Perception Survey – Questionnaire - ESIA for 300MW Wind Power Project

List of Participants

Name of the village: Nillikatti
Panchayat: Kalligiri
District:

Date: 09/10/21
Tehsil/Taluka:

S.No.	Name	Village	Occupation	Signature
1	Rashmi		Research Scientist	
2	Gurusiddamma		Homemaker	
3	Rashmi.S.		"	
4	Vrundama		"	
5	Suvarnamma		"	
6	Sallitha			Sallitha
7				

Social Perception Survey – Questionnaire - ESIA for 300MW Wind Power Plant

List of Participants

Name of the village: Kalagini **Date:** 04/10/21

Panchayat: **Tehsil/Taluka:**

District:

S.No.	Name	Village	Occupation	Signature
1	Chandappa	Kalagini		
2	Hanumanthappa	"	Agriculture	
3	Lokanna	"	Agriculture	
4	Venkateshwarapajar	"	Agriculture	
5	Nagakhushan	"	Welding	
6	Ranjat Jr	"	Agriculture	
7	Harishanthappa	"	Agriculture	
8	Suresh	"	Agriculture	
9	Chanbasappa	"	Agriculture	

Social Perception Survey – Questionnaire - ESIA for 300 MW Wind Power Project

List of Participants

Name of the village: Kakbala **Date:** 9th Oct

Panchayat: **Tehsil/Taluka:**

District:

S.No.	Name	Village	Occupation	Signature
1	Lata		Housewife	Latha
2	Manjuma		Helper Aanganwadi	
3	Nimala		Agriculture	
4	Sushilamaa		"	
5	Kavita		"	
6	Durgamaa (SC)		Helper Aanganwadi	
7	Devi Rama.		Agriculture	

Social Perception Survey – Questionnaire - ESIA for 300 MW Wind Power Project

List of Participants

Name of the village: Guttidurga **Date:** 09/10/21

Panchayat: **Tehsil/Taluka:**

District:

S.No.	Name	Village	Occupation	Signature
1	Shivamma HS	Guttidurga	Headmistress	
2	Kotresha.D	"	Sen. asst. teacher	

Social Perception Survey – Questionnaire - ESIA for 300 MW Wind Power Project

List of Participants

Name of the village: Konamadu **Date:** 08/10/21

Panchayat: **Tehsil/Taluka:**

District:

S.No.	Name	Village	Occupation	Signature
1	Shrijakala	Konamadu	Tailoring	
2	Vijayakala	"	Homemaker	
3	Sunda Manjunath	"	Agriculture	
4	Shantala	"	Homemaker	
5	Meenakshi	"	Agriculture	
6	Kalikama	"	Agriculture	
7	Shivnagamma	"	Agriculture	
8	Shruti	"	Homemaker	
9	Ratnamma	"	Provision store	

2

Social Perception Survey – Questionnaire - ESIA for 3a MW Wind Power Project

List of Participants

Name of the village: Anubur **Date:** 10/10/21

Panchayat: **Tehsil/Taluka:**

District:

S.No.	Name	Village	Occupation	Signature
1	Gowrama	Anubur	Housewife	Gowrama
2	Kathama	"	Housewife	Kathamma
3	Geeta	"	Housewife	Geeta
4	Shivagangam	"	"	H.K. Shivagangamma