ARCADIS Design & Consultancy for natural and built assets

ESIA Report for 31.5 MW Wind Power Project at Zahirabad, Medak district, Telangana

Clean Wind Energy (Aanantapur) Pvt. Ltd.

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AC	Alternating Current
TTRANSCO	Transmission Corporation of Telangana
CGWB	Central Ground Water Board
CSR	Corporate Social Responsibility
CTE	Consent to Establish
CTO	Consent to Operate
CWET	Centre for Wind Energy Technology
DISCOM	Distribution Company (India)
DC	Direct Current
E&S	Environmental and Social Risk
EIA	Environment Impact Assessment
EPFI	Equator Principles Financial Institutions
ESIA	Environment and Social Impact Assessment
ESMP	Environmental Social Management Plan
ESSG	Environmental Social safety and Governance
FI	Financial Institutions
GRM	Grievance Redressal mechanism
ICAR	Indian Council of Agricultural Research
IFC	International Finance Corporation
IFC PS	International Finance Corporation Performance Standards
ILO	International Labour Organization
IUCN	International Union for Conservation of Nature
MNRE	Ministry of New and Renewable Energy
MOEFCC	Ministry of Environment, forest and Climate Change
NIWE	National Institute of Wind Energy
TREDCL	Telangana Renewable Energy Development Corporation Limited
PAP	Project Affected People
PCU	Power Conditioning unit
PFI	Project Finance Institutions
PS	Performance Standard
WPA	Wildlife Protection Act
WPD	Wind Power density

1 EXECUTIVE SUMMARY

1.1 Project Description

Hero is planning to construct 100 MW wind power project in in Telangana and Andhra Pradesh. The proposed wind power project is located in Zahirabad, about 110 kms from Hyderabad Capital City in the state of Telangana. The project is a self-development project where HFE is involved in land purchase, erection and operation of wind turbines. The contract for operation and maintenance of the project would be given to Suzlon after commissioning of the project. Hero is now constructing 100 MW wind power project in in Telangana and Andhra Pradesh. Arcadis has the mandate to undertake ESIA study of this renewable wind energy project. As of date location of only 15 turbines are available, each having capacity of 2.1 MW with a cumulative capacity of 31.5 MW. The WTGs comprises of Suzlon make S-97 model having a hub height of 120 m. Power will be evacuated from wind farm pooling substation to Government 220 kV substation at Zahirabad via 16 km EHV line. The proposed project is in construction phase.

1.2 Identified applicable performance standards:

PS 1: Assessment and Management of Environmental and Social Risks and Impacts

PS 2: Labour and working conditions

PS 3: Resource Efficiency and Pollution Prevention

PS 4: Community Health, Safety & Security

PS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources

Approximately 60.3 acres of land is required for the project and its ancillary infrastructure (like the transmission line, access road, pooling sub-station). The land is privately owned and is being/will be purchased from about 15 land owners on a willing-buyer, willing-seller basis at a mutually agreed/negotiated rate. The willing buyer-, willing seller method has been corroborated in the ESIA with the following evidence; a) rates of land offered are higher than the prevailing rates; b) land owner consultations did not come across any evidence of coercion/ threat or negative perception with regard to the land purchase process; c) WTG locations where land owners have expressed unwillingness to sell lands have been excluded from the project and d) the documentation of the land sale deed agreements do not show any significant differential rates for land of similar type/use. No physical displacement will result from the setting up of the project and its associated utilities. Since contiguous land is not being purchased, continued access for grazing, pasture or access to agricultural fields will be ensured. Hence, PS5 (Land Acquisition and Involuntary Resettlement) is not applicable to the project.

With regard to PS7 (Indigenous Peoples), no diversions, material degradation or adverse impact is expected on land resources on which indigenous peoples are dependent. Hence PS7 is not applicable. No cultural heritage is expected to be adversely impacted as the site does not contain any archaeological monuments/sites and paleontological, or any structure that have, historical, cultural, artistic or religious values. No unique natural features/forms, tangible or intangible are present in the project area which could be materially impacted by the project and its activities.

Some temples are located in the villages near to the project sites; however, these will not be impacted and neither will there be disturbance or access disruption resulting from the project. Hence, PS8 (Cultural heritage) is not considered to be applicable to the project.

1.3 Main Environmental and Social Risks-Impacts of the Project

PS 1: Assessment and Management of Environmental and Social Risks and Impacts

Hero has a corporate health and safety, environmental (HSE) policy, which defines the scope for HSE management at different assets and operations of the company. This policy will also apply to the project company. In accordance with the requirements of this policy, Hero is designing an Environment and Social Management System (ESMS) manual which lays down specific processes and procedures to be followed during the lifecycle (preconstruction/construction/operations and decommissioning) of the projects it undertake. The environment and social procedures to be followed during planning, construction and operation stages (like site screening / contracting / scheduling / mobilization / operation and maintenance) will be specified in the ESMS manual.

An Environment and Social Impact Assessment (ESIA), undertaken by a third party is being carried out for the project to assess potential impacts and design appropriate avoidance, mitigation and compensation measures for project related risks and impacts in a manner consistent with IFC Performance Standards. The company will develop and implement a project specific environment and social Management system (ESMS) for construction and operation phases based on a) the outcome of the ESIA/ESMP and b) aligned to the requirements of the corporate ESMS. In addition to the mitigation measures delineated and discussed in the ESIA. Suzlon (the “E&C” and “O&M” contractor) has in place an environment, health and safety management system encompassing construction and O&M activities which will be implement during the construction and O&M phases. The project contractually require the contractors to ensure that the avoidance and mitigation measures described in the ESIA are fully implemented during project construction and operation phase.

The ESIA (May 2016) has assessed impacts and designed appropriate avoidance, mitigation and compensation measures for project related risks and impacts across the project life cycle in accordance with IFC Performance Standards and good international industry practice (GIIP). These include impacts (including relevant cumulative impacts) pertaining to a) ambient noise levels including cumulative noise, b) land use pattern, c) ambient air quality, d) water and soil quality, e) wastewater; hazardous and solid waste, f) traffic including impact on local infrastructure and community health & safety, g) socio-economic, h) cultural resources, i) electro-magnetic interference and air aviation, j) shadow flicker, and k) labour engagement and influx. The ESIA will include an Environment and Social Management Plan (ESMP) that outlines a) the avoidance & mitigation measures for the identified adverse impacts, b) monitoring and reporting framework and c) management responsibilities to implement the ESMP. A summary of stakeholder consultations and community engagement (undertaken as part of the ESIA) has been provided in this report. Further, a stakeholder/community engagement plan will be developed along with stakeholder analysis and a grievance redress mechanism. The ESIA will also outlines specific management plans covering traffic and road safety, occupational health& safety, waste water management, emergency management and response, stakeholder/community engagement, community development, cultural heritage protection, wild life protection that will be implemented by the project.

An emergency response plan will be developed as a part of the ESIA that will be implemented at the site to deal with emergencies such as electrocution, fire, fall of structure, endemic diseases, medical emergency, civil disturbances, sabotage/vandalism and natural disasters. Emergency numbers would be displayed at site (viz. nearest police station, health center) at the site for use by staff.

The project will ensure adherence to IFC Performance Standards as applicable to this project and operations by implementing the mitigation, monitoring and management measures as will be outlined in the ESIA. This will be done by including the E&S provisions in the contractual agreement with contractors (E&C/O&M and others) and putting in place a robust oversight mechanism (deputing personnel, regular monitoring, internal audits and reporting).

The company will contractually require the contractors to put in place a social and environmental organization consisting of qualified E&S personnel with appropriate responsibility to implement a) the ESMP, management plans and the bird/bat monitoring programme, b) community engagement and grievance redress system/mechanism, c) labour and health & safety related requirements, d) regular training of employees and contractors and e) emergency preparedness and response procedure. The company, as a part of its own contractor oversight procedure, should undertake periodic monitoring/review and reporting of E&S performance of the project to the management and investors.

The project should ensure that all applicable clearances, permits, consents, authorization and all regulatory approvals of the relevant legislation have been obtained prior to commencement of operations.

PS 2: Labour and Working Conditions

Hero will undertake a review of its HR policies/systems and procedures and strengthen and upgrade it to meet the PS 2 requirements. This could include (but not be limited to); a) a clear policy on non-discrimination and equal opportunity; b) contract labour management; c) security; d) disciplinary procedures and code of conduct; e) training and employee welfare; f) collective bargaining; g) grievance mechanism in line with PS2 to raise workplace concerns and h) retrenchment. The company's HR Policies and procedures will be made available/accessible to all employees and communicated at the time of employee induction.

The project plans to engage an experienced team of 4-5 employees at site during construction and operations phase, supported by around 10 employees based at Hero Head Office in New Delhi. During construction stage (lasting around 3 months), 50-100 workers will be required on average though at peak construction about 100-150 workers will be deployed by Suzlon. About 20 security staff will also be locally hired during the operational phase of the project.

Construction workers from outside the area/region are being provided accommodation in nearby village or accommodated in labour camps set up by contractors in the project area. Hero should ensure that the IFC's guidelines for labour accommodation should be followed for its labour camp onsite.

The company will contractually require its contractors and labour suppliers to ensure strict adherence to the guidelines. This will include contractors engaging migrant workers, to make available living conditions with basic amenities and electricity; potable water; mess facilities for food; where workers desire self-cooking, provision of fuel and arrangement for cooking; provision of toilets and bath including separate toilets and baths for women family members of workers; appropriate sewage disposal facilities and/or septic tank and soak pit; and primary medical care for all workers engaged at site including protection against heat/cold and disease carrying animals (e.g. mosquitos)The contract labour management process developed as a part of the ESMP and the project specific ESMS will be implemented for the project.

As a part of the contractor oversight procedures, the company will review the contractors' HR policies and procedures and communicate to them specific provisions of its own HR policy and PS 2 requirement that are applicable to contractors'.

Hero will put in place detailed requirements including audit procedures to ensure that: contractors comply with applicable statutory requirements; worker accommodation is consistent with agreed guidelines; workers have access to an appropriate worker grievance mechanism; and migrant workers are engaged on substantially equivalent terms as non-migrant workers performing the same work, all in accordance with IFC Performance Standard 2 provisions. The company will provide training and capacity building support to the contractors to understand and meet the aforesaid requirements. The company will ensure that Suzlon and its sub-contractors fulfill relevant environment, health & safety and labour related obligations/requirements. The company will require its contractors to ensure use of

relevant personal protective equipment, implement work permit and tag out/lock out systems or working at height, confined space, electrical works etc, and implement an incident/accident recording/reporting system. It will periodically review OHS performance of the contractor during construction and operation phases. The company will contractually require the contractors to report on OHS, ESMP implementation and worker grievances.

PS 3: Resource Efficiency and Pollution Prevention

Ambient air quality parameters in the project area are well within national standards. Temporary impacts on ambient air quality are expected during construction linked to site preparation activities (foundation and road excavation, leveling, land clearing), vehicle movement and other activities. Mitigation measures, to minimize this adverse impact, are proposed in the ESIA document, including minimization of disturbance of vegetation, covered transportation of loose construction material/excavated earth and stockpiles, water sprinkling, and management of pollution from vehicular and equipment emissions. Baseline noise levels at one of the nearest habitations exceed the permissible limits (national ambient noise standards) both during day and night time for some locations. However, this is attributed mostly to existing commercial activity and traffic movement in the area.

Major noise sources during construction will include operation of cranes, excavation, movement of construction machinery, operation of generator sets and vehicular movement. Incremental noise level increases during construction will be temporary and limited to the vicinity of the noise generating source, except in case of movement of material through/near habitations or other sensitive receptors. The project will implement a traffic management plan and other noise mitigation measures like use of noise barriers at potentially high noise area/locations, restriction on traffic movement during night hours, regular maintenance of vehicles and minimizing ground vegetation clearance. As a part of its oversight procedures, the company will undertake six monthly monitoring of ambient noise levels at receptors for which if any complaint or grievance has been registered in order to understand the increase in noise levels due to the project operation. The noise impact assessment for the operations phase indicates that no material noise impact on sensitive receptors is expected due to the project and are largely expected to be within the prescribed IFC guideline limits.

The modelling results (including cumulative modelling) for shadow flicker based on worst case scenario suggest that the turbines are likely to result in shadow flicker impacts on nearby populated receptors. The worst case scenario considers the structure as green house, with no barrier and continuous operation. The project needs to undertake shadow flicker modelling under real case scenario once the turbines gets operational and monitor risk of shadow flicker impact on all nearby habitations during operation stage; and in consultation with the affected households (if any), implement appropriate necessary mitigation to reduce or prevent shadow flicker including required provisions of curtains/blinds/screens and establish screening vegetation. Blade glint, blade throw, visual interference and Electromagnetic Fields (EMF) related impacts are not expected on account of the project.

During construction, the project water requirement will be about 65 kL/day per WTG to build foundation of tower and 4-5 kL/day for domestic water use considering 100 workers during peak hours. In the operational phase water will be needed for the domestic use project staff at the site, which is estimated to be around 2-3 kL/day considering 35-40 technical persons present on site in shift and about 10 security personnel in shift. These will be sourced from authorized vendors in the area/region.

The project will not extract ground water or use water from water bodies located close to the site or in the nearby area. Domestic wastewater during construction and O&M phases will be disposed of through septic tanks and soak pits. There will be no discharge of waste water to any surface water body. During rainy periods, appropriate mitigation measures to minimize erosion and water pollution will be implemented.

No material impact on water resources is expected on account of the project either during construction or operations. Construction waste such as packaging and crating material of turbines, construction debris like small concrete, metal, bins, scraps and debris will be collected, stored, segregated and disposed of in an environmentally safe manner through approved local vendors. Waste from earthmoving activities and hazardous waste generated from use of heavy machinery /equipment like waste oil, gearbox oil, hydraulic oil, lubricant, cleaning fluids, paints, degreasers and other similar substances will be disposed as per the Hazardous Waste (Management, Handling &Trans boundary Movement) Rules, 2008 through authorized entities. The project will, as a part of contractor oversight, require the contractor to implement the waste management plan and ensure that the waste generated at the site is securely stored, handled/used with appropriate care and personal protective equipment; segregated; and disposed of in accordance with the waste management plan requirements.

Land disturbance from construction activities such as excavation, levelling, cut and fill, topsoil stockpiling, installation of tower foundation are expected during the construction stage of the project. These will however be short-term and temporary in nature (limited to construction phase). All the excavated material will be stockpiled at a pre-determined staging area with an intention to minimize impact on fertile agricultural top soil and to protect grass spores that may be present. These will be used for back filling and road levelling work. Proper care will be taken to minimize ground vegetation clearance and prevention of soil erosion.

PS 4: Community Health, Safety and Security

The planned project equipment, plant and infrastructure meet good industry practice specifications. The project is located in a moderate seismic hazard zone, which has been taken into account in the design of turbine foundations. The site is not located on any air traffic route and turbines are not proposed within any airport obstacle limitation area. Though the construction sites are generally away from local settlements, adverse impacts on the local community during project construction and operation may include noise, dust, traffic, safety and security. The measures to minimize community health and safety risk will be discussed in the ESIA (including traffic planning, managing influx related issues, sourcing water from authorized vendors, appropriate disposal of sanitary wastewater and hazardous waste, appropriate accommodation and facilities for migrant workers) and associated management plans (emergency, community development, stakeholder engagement). The project will ensure that the O&M operator of the wind farm implements the mitigation measures detailed in these management plans.

The company will implement an Emergency Response and Preparedness Plan to deal with emergencies such as electrocution, fire, community safety incidents and natural disasters. Emergency numbers will be displayed at site (viz. nearest police station, health center) at the site for use by staff. The project is not expected to result in community exposure to disease either due to changes in land/hydrologic other terrestrial/air quality/hydrologic regimes or through large influx of migrant labor.

The project will nevertheless require the contractor to have measures in place to identify and mitigate risk of community exposure to disease due to influx of labor and any other community health, safety and security risks. Overall, road and access infrastructure in the area is good (the site is well connected by road network) and significant pressure on infrastructure is not expected due to the project. The project will allow grazing activity in most part of the site during operations. It will ensure that all transformers are fenced and cables insulated to avoid any electrical hazards. Access to agricultural fields, villages, communities and their networks will not be disrupted/hindered. The project will not hamper the activities or access to temples/mosques in the project area.

The project will employ security personnel during project construction and operation. These personnel will be engaged through an outsourced and authorized security agency. The project will require the security agency to implement procedures to ensure that: past records of security personnel employed are screened; security personnel have clear objectives and permissible actions laid out; security

personnel are trained in avoidance of abusive behaviour; security incidents are recorded, investigated and corrective action implemented; bona fide complaints against security personnel are investigated and appropriate disciplinary actions are implemented; and there is a grievance mechanism for aggrieved members of community or employees, in the event of a violation of the code for security personnel. Contractor oversight procedures of the company will ensure compliance to the aforesaid requirements

PS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources

During the ESIA study vantage point study for bird and bat was undertaken for a period of 6 days. Mostly resident birds were observed during the study period and few migratory birds. Eight Schedule I species were observed within the study area.

One fruit bat species has been observed within study area. The nearest wildlife sanctuary is Chincholi wildlife sanctuary located 20 kms south west of project site. A dam on Manjira River is located at a distance of about 14 kms north east from the nearest WTG within the project site. There is also a bird sanctuary (Manjira Wildlife & Bird Sanctuary) is located at a distance of 30 kms from the project site in the eastern direction. Based on the analysis of the type of farming, variety & growth and ground cover it concludes that no significant loss of habitat, displacement/fragmentation and loss of foraging/feeding areas from this project is envisaged.

The project should employ staff on undertaking bird/bat strike monitoring, monitor the water bodies (in the monsoon and winter season for bird activity) and if, the proposed monitoring program indicates significant activity or/and bird/bat strikes, implement measures (within 6-8 months of commissioning) as recommended by ornithologists/wildlife specialists to address the impacts, including, if required, a targeted shutdown (curtailment) protocol and enhanced collision monitoring program.

1.4 Stakeholder Engagement

A community consultation was carried out in three villages within the project area, for collecting detailed information about prevailing socio-economic condition in the study area, demographic features and composition of the population, infrastructure amenities available in the villages and also to assess awareness, opinion and reaction of the inhabitants about the project. Consultations were also conducted with land owners, village panchayats members, village secretory, community, SHGs, Health Centre, land developer and Project proponent team.

These consultations suggest that the privately owned land purchased was being acquired on a willing-buyer, willing-seller basis and that the rates of compensation offered were more than the prevailing rates for land in the area. It also suggests that the process adopted for land purchase is transparent and participatory and that there are no major concerns relating to encroachments or illegal occupation of revenue land allotted to the project. Key concerns and expectations reported in these meetings included a) increased local employment and contractual benefits, b) infrastructure development of villages (like roads, health care and education facilities and c) better management of traffic. These concerns and expectations have been addressed in the ESIA/ESMP and the management plans and will be communicated to the stakeholders/communities.

The ESIA includes a stakeholder engagement plan, which would proposes a stakeholder/ community engagement strategy/ programme for the project. As a part of the ongoing engagement process the company will a) disclose the findings of the ESIA (and the ESMP) to the community/stakeholders and (b) seek and incorporate their additional feedback/ inputs. It will engage with the communities, panchayat and local administration on an ongoing basis to address any complaints/grievances/concerns of the stakeholder and to plan and implement community development activities. The project is implementing the grievance redress plan from start of construction activity and

constitute a grievance redress committee comprising of community/ company/ panchayat representatives to look into any community/ stakeholder concerns and grievances.

1.5 Environmental and Social Categorization and Rationale

The proposed wind power project will have minor as well as short term impact during construction phase. Minor but temporary impact due to generation of dust and fugitive emissions are expected during construction phase only. Minor impact is expected on resource utilization like land and socio economic conditions of project area villages. Minor impact is anticipated on the livelihood of the community. There is no resettlement or land acquisition involved in the proposed project. There will be no impact on cultural resources as well as indigenous people due to their absence in the study area. Overall minor impact is anticipated due to generation of noise from the operating WTGs and moderate impact anticipated due to shadow flicker generation from operating WTGs. Rest of the impacts on environment and social parameters is assessed to be minor during operation phase of the proposed project.

The project also have a positive impact in terms of employment generation and socio economic conditions for the local people during entire project lifecycle. The impacts identified both during construction and operation phase can be minimized and mitigated by adopting suitable mitigation measures as suggested in the ESIA report. Based on the conclusion drawn from the ESIA study the proposed project can be categorized as Category B (as per IFCs categorization of projects), which specifies that this project is expected to have limited adverse environment and social impacts which can be mitigated by adopting suitable mitigating measures.

2 INTRODUCTION

Hero Future Energy (HFE) is an IPP, which has a well-defined portfolio in wind projects. HFE has cumulative capacity of ~ 320 MW in wind power in 2015. The company has a robust pipeline of around 1000 MW of wind projects across different states of India. Hero is now constructing 100 MW wind power project in in Telangana and Andhra Pradesh. Arcadis has the mandate to undertake ESIA study of the same. As of date location of only 15 turbines are available, each having capacity of 2.1 MW with a cumulative capacity of 31.5 MW. This ESIA report discussed the findings from 15 turbines only with a cumulative capacity of 31.5 MW.

2.1 Background

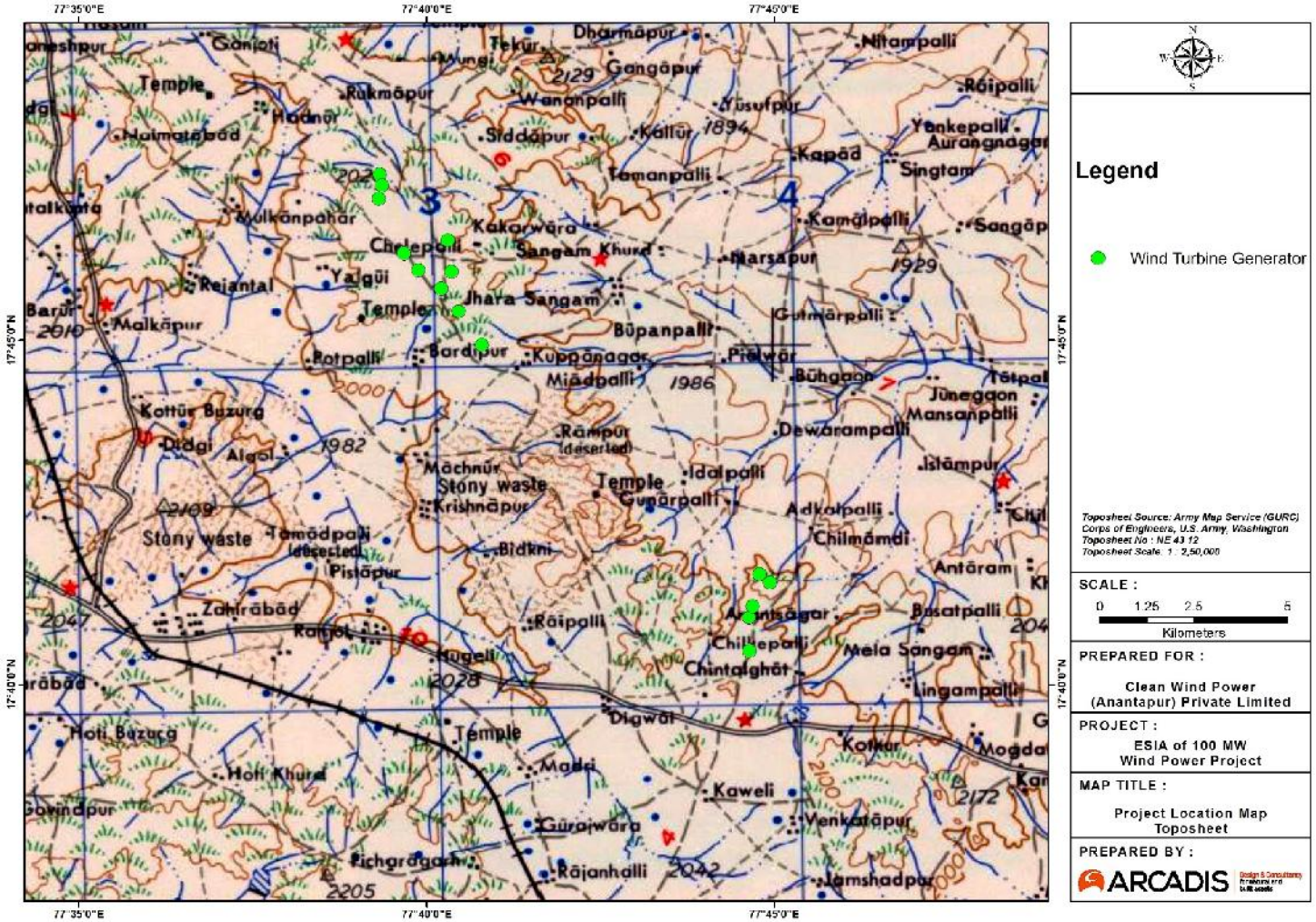
The proposed wind power project will be located in Zahirabad, about 110 kms from Hyderabad City in the state of Telangana. The project is a self-development project where HFE is involved in land purchase, erection and operation of wind turbines. The contract for operation and maintenance of the project would be given to Suzlon after commission of the project. The project comprises of 15 WTGs of Suzlon make S-97 model having a hub height of 120 m. Power will be evacuated from wind farm pooling substation to Government 220 kV substation at Zhairabad via 16 km EHV line. During ESIA study the proposed project was in construction phase for most of the WTGs.

A site visit was undertaken by Arcadis and HFE team in the first week of April 2016, to understand the site conditions and assess the environment and social impacts (if any) due to development of the project. A brief snapshot of the project is presented in **Table 2.1**

Table 2-1: The status of permits and approvals

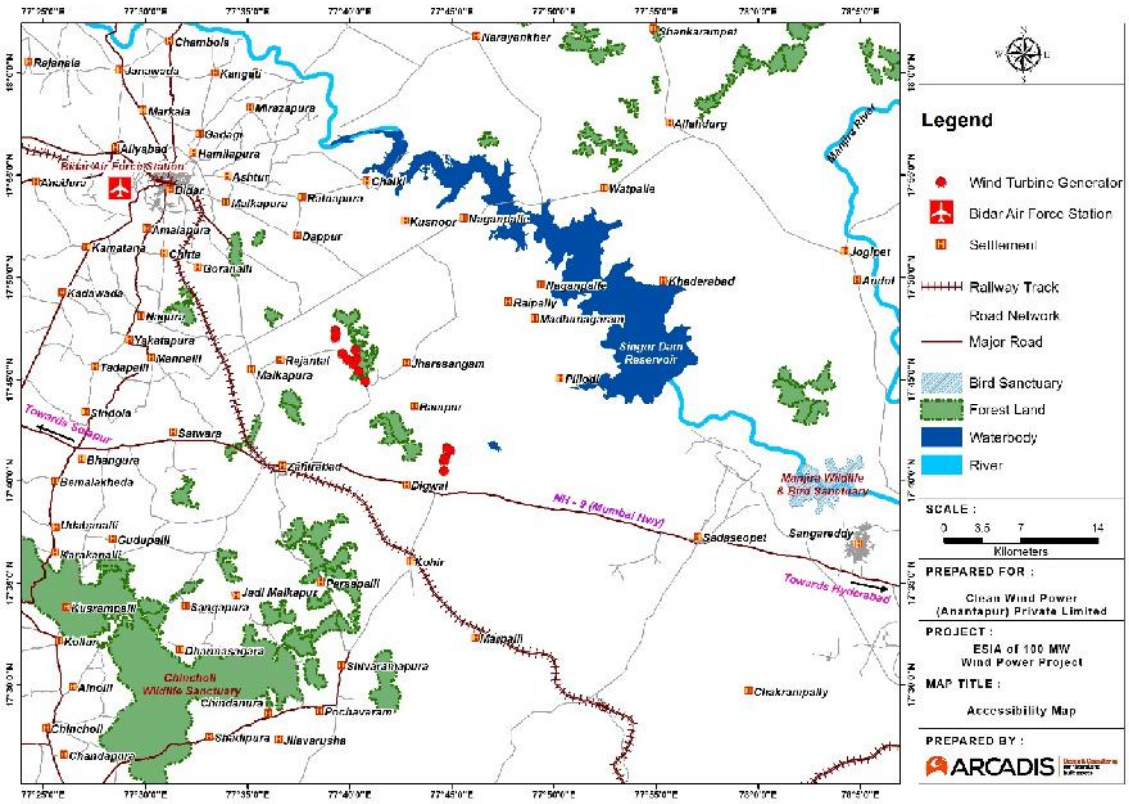
S. No	Particulars	Description
1	Project Site	At Zahirabad
2	Mandal	Jharasangam
3	District Name	Medak
4	Name of the State	Telangana
5	Site Elevation	About 680 m AMSL
6	Latitude	791175 E
7	Longitude	1957555 N
8	Road Accessibility	From Hyderabad to Zahirabad (via NH-9)
9	Nearest Airport	Hyderabad (110 kms)
10	Nearest Railway Station	Zahirabad
11	Type of Terrain	Generally flat terrain with some undulations
12	Ownership of land	Private land
13	Present land use	Mostly Agricultural (once cultivated) and barren land
14	Proposed arrangement of land	Point basis (3-4 acres per WTG)
15	Number of WTGs	15
16	Capacity of each turbine proposed	2100 KW
17	Model of wind turbine	S-97
18	Hub height of turbines	120 m
19	Rated Wind Speed	11m/s
20	Swept Area	7368m2

Figure 2-1: Project Site Location Map



2.2 Site Accessibility

The site can be approached from Hyderabad via Hyderabad Zahirabad road. The nearest airport is at Hyderabad at a distance of about 110 kms and the nearest railway station is at Zahirabad about 15 kms from proposed project site.



2.3 Project Site Setting

Regional Topography:

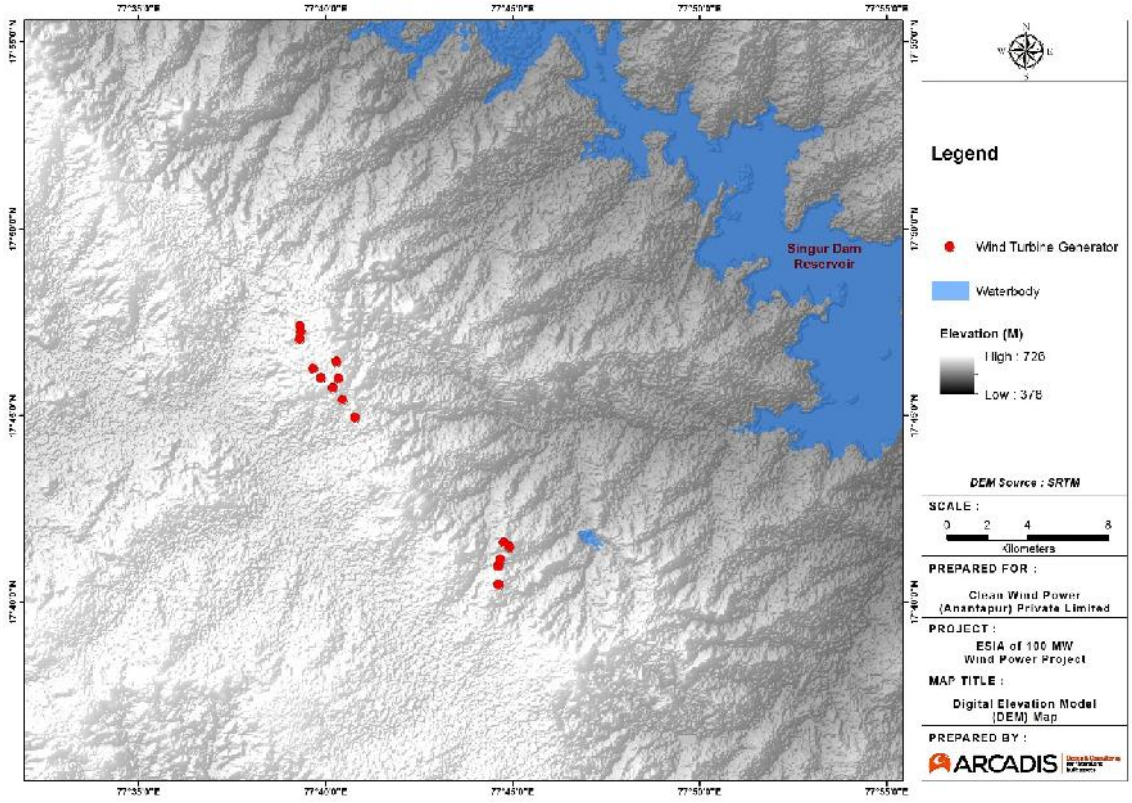
Medak district forms part of the table land of the Deccan Plateau. The ground is mostly plains, gentle slopes and undulating hills, isolated peaks and rocky clusters lie all over the district. The elevation of the ground ranges from 500m-600m with occasional hills up to 638m above sea level. The district is not watered by any big river. The Manjra River, a tributary of Godavari rises in Bidar district of Karnataka and enters Medak district from south east. It flows through Zahirabad.

Site Topography:

The proposed project site is a mix of agriculture land, scrub land and barren land. There are few scattered settlements and few villages within 5 kms radius of the proposed project site. The soil is mostly black soil mix of sand and loam. The proposed project site is fairly flat for most of the turbine locations but slightly undulating in nature for two of the turbine locations. The highest elevation is 650 m above sea level and the lowest being 630 m above sea level.

Photo-Topography

Figure 2-2: Topography Map of the proposed project site.



2.4 Power Evacuation

The proposed project will generate 31.5 MW of power and power evacuation is proposed via 220 KV line near Zahirabad connected to discom at Hyderabad.

2.5 Resource Requirement

2.5.1 Land

The proposed wind power project is under construction when the site visit was undertaken. Private land has been purchased for 15 WTG locations including land required for access roads. Total land requirement for 13 WTGs is 50.97 acres while land requirement for two more WTGs (L05 & L12) is not known. Land required for construction of substation is 6.52 acres. The village wise land distribution and project component wise land breakup as shared by HERO is provided in following **Table 2-2 and 2-3.** The procured land was dependent on rainfed agricultural mixed with non-cultivated, barren and undulating land. The compensation for the purchased land is reportedly above the existing government circle and market rate. Land aggregator was involved during the purchase process. Reportedly, 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;

- Sample copy of sale deed (3 copy)
- Absence of corrosive methods verified through primary consultation with landowners (Consulted with three landowners),

- Consultation with land developer (Enerfra),
- Analysis of market value of land that the land sold by landowners are at a higher price than the circle rate.

Table 2-2: Village wise land distribution

Sl. No.	Village	Land in acre	Land type (Pvt./ Govt.)	WTG No./PSS
1	Chilkepalle	16.8	Private	5
2	Chilepalle	8.45	Private	2
3	Bardipur	8.125	Private	3
4	Yelgoi	7.6	Private	2
5	Kuppanagar	10	Private	1
6	Machnoor	6.525	Private	PSS
	Total	**57.5**		**13 WTG**

Table 2-3: Project component wise land breakup

Sr, No	Project Components	Required Land (Acres)	Remarks
1	WTGs	50.97	13 WTGs
2	Pooling Substation	6.525	33KVA
3	Transmission Lines	1.04	Around 66 transmission line tower falls under 16 Km length of T. line. Land requirement for one tower is 8 m X 8 m.
4	Access Roads	1.77	900 m length and 8 m width considered for access road creation.
	Total	**60.30**	

Land for access road: The private land procured for the access road. The required land for access road has purchased approximately 900 m length with 8-10 m in width. As per the information provided by HERO project land team. Approximately 1.77 acres of land is acquired. An exclusive access to the construction site is usually required prior to the mobilization of manpower and machinery. The construction of access road is linked with village main road and district major road.

Land for transmission line & PSS: As per the information provided by HERO, approximately 6.525 acres of land has been procured for PSS in Machnoor village. Transmission line will cross 4-5 villages for a length of about 16 km. M/s Bharat Bijli construction is entrusted with the responsibility of identification of land required for construction of transmission line connecting WTGs to PSS and to GSS. A relatively small area of 8mx8m will be used for erecting towers by paying a one-time compensation based on negotiation with land owners (which includes the compensation for crops in the Right of Way of transmission towers & transmission line).

Private land purchase process

During site visit and dialogue with representative of land developer (Enerfra India Pvt. Ltd) over on telephonic discussion, it was informed that only the private land has been purchased for 15 WTG

locations. Private land has purchased through the private negotiation willing seller and willing buyer bases. As per discussion with representative of land developer, the land purchase procedure was followed for land uptake is below.

Typical Procedure of land purchase

- Land has to be identified by project team based on micro siting
- The title of the property needs to be checked in sub-register office and verify the title of the seller.
- A search of the records at the sub-registrar's office may be carried out for documents that may affect the property and may have been registered.
- If land records are okay than developer or land team can go ahead for the private negotiation with owners
- If mutual negotiation is agreed by both side, then land registration at sub- register office, Mandal level can be imitated
- Land registrations in the name of company
- Mutation to be done in favour of Companies name in revenue records
- Computerization of land records in the name of company.

Table 2-4: WTG Profiling of the proposed project

WTG Identification No.	***Latitude***	***Longitude***	Location	Land Required	Land Type		Project Status	Topography	Site Surroundings	Remarks/Observations	Site photograph
WTG-60	17°41'37.04"N	77°44'46.95"E		14.00	Private	Barren	Registration Completed	Undulating	Water body : Not within 1km radius Approach road: yet to be planned Forest Area: No forest land within 5km	Shadow flicker impact is anticipated on the nearest receptor	
WTG-59	17°41'29.99"N	77°44'55.93"E	Anantha sagar		Private	Barren	Registration Completed	Undulating	Water body : Not within 1km radius Forest Area: No forest land within 5km	Shadow flicker impact is anticipated on the nearest receptor	
WTG-52	17°40'59.23"N	77°44'38.17"E	Chillkepalle village		Private	Non cultivated	Under construction	Flat terrain	Water body : Not within 1km radius Approach road: yet to be planned Forest Area: No forest land within 5km	Shadow flicker impact is anticipated on the nearest receptor	
WTG-53	17°41'9.23"N	77°44'41.34"E	Chillkepalle village	-	Private	Non cultivated	Under construction	Flat terrain	Water body : Not within 1km radius Approach road: yet to be planned Forest Area: No forest land within 5km	Shadow flicker impact is anticipated on the nearest receptor	

WTG Identification No.	***Latitude***	***Longitude***	Location	Land Required	Land Type		Project Status	Topography	Site Surroundings	Remarks/Observations	Site photograph
WTG-50	17°40'29.44"N	77°44'38.56"E	Chillkepalle village	-	Private	Non-cultivated	Under construction	Flat terrain	Water body : Not within 1km radius Approach road: yet to be planned Forest Area: No forest land within 5km	Shadow flicker impact is anticipated on the nearest receptor	
WTG- L12	17°47'15.64"N	77°39'21.49"E	Rukmapur village	-	Private	Agriculture	Registration completed	Flat terrain	Water body : Not within 1km radius Approach road: yet to be planned Forest Area: No forest land within 5km	Shadow flicker impact is anticipated on the nearest receptor	
WTG-L-05	17°47'25.16"N	77°39'19.59"E	Yelgoi village	-	Private	Barren	Registration completed	Flat terrain	Water body : Not within 1km radius Approach road: yet to be planned Forest Area: No forest land within 5km	Shadow flicker impact is anticipated on the nearest receptor	
WTG- L-04	17°47'3.94"N	77°39'18.91"E	Yelgoi village	-	Private	Non-cultivated	Under constriction	Flat terrain	Water body : Not within 1km radius Approach road: yet to be planned Forest Area: No forest land within 5km	Shadow flicker impact is anticipated on the nearest receptor	

WTG Identification No.	***Latitude***	***Longitude***	Location	Land Required	Land Type		Project Status	Topography	Site Surroundings	Remarks/Observations	Site photograph
WTG-57	17°46'2.03"N	77°39'52.94"E	Yelgoi		Private	Non-cultivated	Land Registration Completed, under constriction	Flat terrain	Water body : Not within 1km radius Approach road: yet to be planned Forest Area: No forest land within 5km	Shadow flicker impact is anticipated on the nearest receptor	
WTG-56	17°46'16.66"N	77°39'40.60"E	Malkanpahad		Private	Non-cultivated	Registration Completed. Under construction	Flat	Water body : Not within 1km radius Approach road: yet to be planned Forest Area: No forest land within 5km	Shadow flicker impact is anticipated on the nearest receptor	
WTG-8	17°46'28.04"N	77°40'18.51"E	Bardipur		Private	Non-cultivated	Registration Completed, under construction	Flat	Water body : Not within 1km radius Approach road: yet to be planned Forest Area: No forest land within 5km	Shadow flicker impact is anticipated on the nearest receptor	
WTG-10	17°46'0.53"N	77°40'21.56"E	Chillepalle		Private	Barren	Registration Completed, under erection	Flat	Water body : Not within 1km radius Approach road: yet to be planned Forest Area: No forest land within 5km	Shadow flicker impact is anticipated on the nearest receptor	

WTG Identification No.	***Latitude***	***Longitude***	Location	Land Required	Land Type		Project Status	Topography	Site Surroundings	Remarks/Observations	Site photograph
WTG-11	17°45'45.99"N	77°40'12.66"E	Bardipur		Private	Stony Scrub	Registration Completed, under construction	Barren	Water body : Not within 1km radius Approach road: yet to be planned Forest Area: No forest land within 5km	Shadow flicker impact is anticipated on the nearest receptor	
WTG-13	17°45'25.89"N	77°40'27.66"E	Bardipur		Private	Barren	Registration Completed, under construction	Flat	Water body : Not within 1km radius Approach road: yet to be planned Forest Area: No forest land within 5km	Shadow flicker impact is anticipated on the nearest receptor	
WTG-15	17°44'56.33"N	77°40'47.47"E	Kuppanagar		Private	Barren	Registration Completed	Undulating	Water body : Not within 1km radius Approach road: yet to be planned Forest Area: No forest land within 5km	Shadow flicker impact is anticipated on the nearest receptor	

2.5.2 Workforce

Approximate 100 nos. of workers to be deployed by the contractor during peak hours on temporary basis including 30 security personnel (mostly local) during construction phase. About 60 workers are currently in the labour camp for the proposed project. The contractor workforce is comprised of both skilled and unskilled labours, which will be sourced from the nearby village settlements depending on their skills and capabilities. However during the operations phase approx. 10 nos. of personnel will be deployed on site that includes technical personnel and security guards

During ESIA study and dialogue with site in charge, Mr. Yogender Reddy of M/s Lotus civil construction, it was informed that, M/s Lotus is responsible for the only civil work for the wind project. Labour licence has expired, which needs to be renewed from Telangana government. Labour camp found to be in a good condition. Labour camp has constructed at Kuppanagar village with basic amenities which are described in following section-

2.5.2.1 Living condition

Majority of labours are migrated from different state of India (Jharkhand, Karnataka, Bihar, Assam and A.P.). For the migrant labours, small to medium sized 35 thatched sheds has been erected to house a maximum of 100 labours working onsite. However, during visit around 60 workers found to be onsite. On an average each thatched shed accommodates 4-6 labours. About 4-5 women workers have been hired specifically for cooking purpose, but in the labour camp a separate sleeping space has been provided to the cook family workers. Around five child up to 3 to 4 years old found to be in camp. The labour camps were found to be equipped with cots of standard size, beddings, fans and power supply. The thatched sheds were quite ventilated and had sufficient space for natural light. Besides, a separate kitchen has been constructed in the camp itself, where the cooks (4-5 members) prepare food for all labours and site officials. LPG gas cylinders are used as cooking fuel. 3 DG sets (45 kv, 125 kv and 5 kv) have been provided for power supply for some fixed duration.

2.5.2.2 Health and sanitation facility

Mobilize water tanker and portable is provided to the labours for drinking and domestic purpose. Seven toilets have also been provided to the labours which are connected to a well-constructed septic tank. Cleanness of toilets were in good condition. The kitchen waste generated is composted in a pit near the labour camp, however, compost pit were not maintained.

First aid kit was present in the camp. No records of health check-up was found with the civil contractor. A tie up with the local Govt. hospital located at Zahirabad a distance of 10-15km distance from the labour camp.

2.5.2.3 Safety System

The workers have been provided Proper Personal Protective Equipment's (PPE's) like, helmets, goggles, gloves and safety shoes etc. It was recommended that all workers wear their (PPEs) as per their nature of work during construction related activities to ensure health and safety at workplace. First Aid kits are available in the camp to manage injuries occurring during project activity. Care has also been taken to place fire extinguishers at separate places along with their manual in the site office. The labours are given a hands on training related to foundation work. Induction training and mock drill is provided to workers before starting to the work, however, record was not found during the visit.

A separate storage yard has been constructed within the project site area where the equipment parts are stored. Local emergency contact numbers has not displayed.

2.5.2.4 Workers and labour commutation

The project activity requires both unskilled and skilled workers as per the nature of work. Unskilled labours include both local and migrant labours. The unskilled migrant labour as well as local labours are carried through small vehicles like Sumo, Bolero etc. to the project site. The Company provides a separate vehicle for workers for daily and weekly commutation. No recreation facility were observed for the workers in the camp.

2.5.3 Water Requirement

Water is required for plant civil works, was sourced from local water suppliers and supplied to the site via water tankers by contractors. During construction period, water requirement would be about 65 KLD per WTG to build foundation of tower and 3-5 KLD for domestic water use considering 100 workers during peak hours. Labour camp is already established on site and about 60 labourers are accommodated in the camp. Considering this, the water requirement for 60 labourers would be 8 KLD per day.

In operational phase water is being used for the domestic use of project staff at the site, which is estimated to be around 2-3 KLD considering 10 technical persons present on site in shift and about 4 security personnel. Water to be supplied through tankers by local water suppliers during construction phase of the proposed project to meet domestic and construction water requirements. Drinking water requirements of personnel in operational phase will be met by packaged drinking water.

Table 2-5: Project Snapshot

S.No.	Area		Approximate Quantity	Source
1	During Construction	Various WTG foundation and construction activities	65 KLD per WTG	Local bore wells supplied by tankers
2		Domestic water requirement	8-12 KLD (considering regular and peak labour requirement)	Local bore wells supplied by tankers
3	During operation	Domestic water requirement	2-3 KLD	Local bore wells supplied by tankers

2.6 Tentative Project Schedule

Sr. No.	Phase of the Project	Schedule
1	Construction Phase	Completion by June 2016
2	Commissioning of Project	July 2016

2.7 Benefits of the project

This wind power project offers the following advantages:

- The technology of electricity generation from wind has been developed fully for smooth and trouble-free operation as well as for its economic viability.
- It is renewable, pollution free and eco-friendly;
- Low gestation period – less than six months from concept to commissioning, enabling fast bridging of power gap even in remote areas.
- With no fuel consumption, power generation becomes almost free after recovery of capital cost. Operation & Maintenance (O & M), cost is nominal.
- It can be developed in modular form with facilities for extension at a later date.

- No adverse social impact, such as resettlement and rehabilitation;
- Wind power plant provides energy security by minimizing the dependency on fossil fuels for power generation;
- Availability of government incentives to renewable projects in India.

2.8 Approach and Methodology

2.8.1 Approach

The project related activities are understood through desktop review of documents like permits/clearances (if any), maps, etc. and reconnaissance survey to the project location and surrounding area was conducted for familiarization with the project location. This was followed by identifying environmental and social risks associated with the project with respect to applicable national regulations and IFC performance standards. The review and findings will be assessed to identify gaps in addressing environmental or social risks and additional risks (if any) due to planned project activities. The identified gaps will thereby lead to derive an environmental and social management and action plan (with timelines & responsibilities) to address these gaps. ARCADIS has followed following steps to achieve the above mentioned approach:

a) Preliminary Discussion with project Proponent: At this stage size and location of the project, scheduled date of site visits, scope of work, timelines for report submissions, concerned point of contacts are understood from the project proponent through an official meeting or a conference call whatever is convenient. List of further information required such as status of applications made, clearances obtained, project schedule, proposed plant layout, topo sheets, WTG specifications, noise curves etc is formally requested from project proponent.

b) Desktop Review of the project Area: After confirming the project area and site location, review of the site area is made using readily available sources such as google earth, google maps, GIS, land use maps of the area. With the help of desktop review, assessment is made on how the site/project and its components such as proposed WTG locations, pooling substation, transmission line etc are located with reference to the nearby villages, forest areas, bird sanctuaries, or any other protected areas (if any), major water bodies, rivers, national and state highways, commercial and defence airports (if any).

c) Review of relevant Secondary information: Secondary information on geology, hydrology, prevailing natural hazards like floods, earthquakes etc. have been collected from literature reviews and authenticated information made available by government departments. Primary surveys were carried out to understand and record the biological environment prevailing in the area and the same was verified by the forest officials and against published information and literature. The socioeconomic environment has been studied through consultations with various stakeholders within the site. Additionally, socioeconomic data have been obtained from the Census 2011 of India reports.

d) Site Investigation through site visit: After gaining a fair idea from the desktop review of the project area, a team of experienced professionals which typically includes an environmental expert, a social expert, a biodiversity expert and a language translator (if required) visits the project area for site reconnaissance and consultations with relevant stakeholders such as project area related community, project developers, relevant government offices such as local forest department office, Revenue department office etc.

e) To understand and assess the environmental and social risks associated with the project the study area was divided into core area (500 m around each of the WTG location) and buffer area (5 km around each of the WTG location).

i. Investigation of Project Components: After getting the exact locations of different project components such as proposed WTG components, PSS, GSS, proposed transmission line, proposed land for batching plant and labour camps, the environmental and biodiversity expert visits all the project component locations along with the site representative from developers. To verify the locations, professionals use GPS to track exact locations of project component. While visit to every location, careful visual observation is made in the surrounding to notice if there are any sensitive receptors like residential houses, villages, major water bodies, or other structures like high tension line, main roads located within nearby surroundings of a project component. Further, observations are also made pertaining to what is the land use of the area i.e agricultural or barren, private or government, whether assigned by local/ state government to some vulnerable communities, whether a reserved forest land etc. All the aforementioned observations are noted in a standard format for reference which is used during report preparation. WTG locations located close to any sensitive receptors are selected for noise and shadow flicker modelling to further ascertain whether concerned WTG locations will have noise and shadow flicker impact on nearby receptors identified during site visit.

ii. Sampling for Environmental Baselining: While selecting locations for primary monitoring of air, noise, water, soil and meteorology emphasis is given to collect the representative baseline data. Monitoring stations for air and noise were selected in proximity to the WTG locations as well as approach roads and settlements. Closeness to the sensitive receptors were considered for selecting noise and air monitoring locations. Monitoring locations for surface water quality was selected based on the macro and micro watershed and drainage pattern of the area. Soil sample collection locations were selected based on the land use & land cover of the study area.

iii. Biodiversity Assessment: While travelling across different project area the biodiversity expert observes and notes the nature of habitat, local flora & fauna, mammal &reptile species and avifaunal species present in the project area. Major water bodies present within the project study area are visited during sunrise and sunset hours to observe the diversity of avifaunal species present in the project area. In general, area within 5 km radius of the project site is considered for biodiversity assessment. If there are any forest areas, bird sanctuaries or wetlands located within the project area or the project located within the buffer zone of any protected area then the biodiversity expert makes visit to such ecologically important areas to have further observations. Further, to gain more information about mammal and avifaunal species of the project area, visit is made to local forest department and interviews are conducted with the concerned officials.

iv. Selection of Vantage points: The selection of the vantage points for assessing the bird and bat presence within the project site and surroundings is made keeping in mind that the entire study area is properly represented and all type of habitats present within the study area is covered during the study. A total of eight vantage points were selected for the study and three type of habitats viz forest area, scrub land and water body was covered during the assessment.

v. Community Consultations: The social expert identifies the project related villages and conducts village community consultations in presence of site representatives. During community consultations, baseline information of villages pertaining to population, different

castes, presence of any vulnerable communities, availability of water and electricity, schools and primary health clinics, general occupation of local people, other income sources etc is gathered. During consultation, the social experts tries to understand the probable perspective of village communities towards a proposed project. Depending on the status of the land procurement and approval of project developer, the social expert also conducts consultation with existing land owners, whose land has been identified for project components. While consultation with land owners, attempt is made to assess whether negotiations with land sellers were made in good faith and on what basis land is being purchased for the proposed project. Further, it is assessed whether any land seller is getting land less, whether any land owned by a person from any vulnerable communities involved in the project.

vi. Consultation with concerned Government offices: Visit to respective government departments viz revenue department, health department, panchayat office, B.D.O office etc is undertaken to collect information for the proposed project site and the stakeholders involved with the project.

vii. Consultation with project developer: Concerned persons from developers land team and construction team are interviewed to understand the land procurement process, project construction schedule, estimated workers required during construction and operations, plans for arrangement of water required during construction and operation, procedures to address occupational health and safety, waste management plan, emergency response plan etc.

viii. Identification of Potential Environmental and Social Impacts: The assessment process has taken into consideration the impacts due to project sitting, land preparation, and construction and operation of the project. The risks and impacts of the proposed wind power project has been assessed on the social and physical environment. To study the environmental and social impact, study area was divided into core area and buffer area based on the extent of influence of project activities. Primary impacts are assessed for a radius of 500m around the project site and secondary impacts are assessed beyond this radius for the proposed project. Also, 100 m RoW along the transmission line route is also considered for impact assessment. The Environmental & Social Impact Assessment (ESIA) has been taken into consideration for the following:

- Applicable National Regulations;
- IFC's Performance Standards;
- Outcomes of the community consultation
- Baseline environmental monitoring;
- IFC General EHS Guidelines.

ix. Development of Project Specific Environmental and Social Management Plan: The review and findings of the study were assessed to identify gaps in addressing identified environmental or social risks and identifying additional risks (if any) due to planned project activities. The identified gaps will thereby lead to derive an environmental and social management action plan (with timelines & responsibilities) to address these gaps. ARCADIS has followed following steps to achieve the above mentioned approach:

2.8.2 Methodology

ARCADIS has adopted following methodology to prepare the ESIA report:

- Formulation of a team of environmental, ecologists and social experts,
- Carrying out kick-off meetings with Hero to arrive at a common understanding and consensus on all important project aspects, for efficient and effective delivery of the assignment's needs and objectives,
- Desktop review of basic project details and site conditions and collection of relevant secondary information,
- Carrying out reconnaissance survey of project site,
- Assessment of the project compliance with respect to IFC's performance standards,
- Conducting detailed site visits, meetings, monitoring and consultations with project management & stakeholders, review and gather relevant documents and records,
- Analysis of all the information gathered during the site visits, consultations and meetings,
- Carrying out detailed ecological assessments and avifauna monitoring for a period of two weeks through vantage point study,
- Carrying out noise and shadow flicker modelling and assessment for the proposed WTGs,
- Carrying out detailed impact assessment for the proposed project,
- Discussion on identified tasks in Environment & Social Management Plan & resources needed for the same,
- Internal review of the ESIA report followed by incorporation of the suggestions,
- Submission of the ESIA report to Hero.

2.9 Limitation of ESIA Study

The ESIA study has been carried out on the basis of project planning information and documents provided by the project proponent, stakeholder consultation and observations during site survey. Any major changes in the proposed activities may result in significant deviations of outcomes or impacts. Major limitations for the ESIA study includes:

- Limited consultation with landowner have been conducted since land procurement was not complete at the time of site visit
- Out of the proposed 100 MW project details of 31.5 MW were available. A majority of remaining turbines are expected to be located in forest area.
- Land details regarding two WTGs L-05 and L-12 are awaited from Hero.

3 APPLICABLE REGULATORY FRAMEWORK

3.1 National Regulation

The following regulations are applicable for the proposed wind power project:

- Environment (Protection) Amendment Rules 2002 vide GSR 371(E), dated 17th May 2002
- Hazardous Waste (Management, Handling & Transboundary Movement) Rules 2008 as amended
- Contract Labour (Regulation & Abolition) Act 1970 and Rules
- The Building and Other Construction Workers' (Regulation of Employment and Conditions of Service) Act 1996
- The Factories Act 1948 and Rules
- The Minimum Wages Act 1948
- The Payment of Wages Act 1948
- Workmen Compensation Act 1923 and Rules
- Administration of Scheduled areas and Tribal areas as per Article 244 in the constitution of India 1949.
- Panchayat (Extension to Scheduled Areas) Act, 1996 (PSEA)

Other relevant policies and guidelines applicable for the proposed wind power projects are:

- IFC Performance Standards on Environmental and Social Sustainability 2012.
- IFC/World Bank EHS Guidelines for Wind Energy Project;
- IFC/World Bank EHS Guidelines for Power Transmission and Distribution.
- Relevant ILO conventions covering core labor standards and basic terms and conditions of employment.

3.2 Permitting & Key Compliance Issues

Permit	Authority	Remarks
Environmental Clearance	Ministry of Environment, Forest & Climate Change (MoEFCC)	Wind power projects are exempted from obtaining an environmental clearance (EC) from Ministry of Environment, Forest and Climate Change (MoEFCC), as per the EIA notification, 2006 and its subsequent amendments
Forest Clearance from MoEFCC/ State Government	Forest Department	No forest land involved for 31.5 MW of project
Power evacuation approval	Telengana State Transmission Corporation Limited (TSTRANSCO)	Required for the project.
Consent to Establish (CTE)	Telangana State Pollution Control Board (TSPCB)	As per Draft Telengana Wind Power Policy 2016, WPPs being a part of green energy will be exempted from obtaining any NOC/Consent for establishment under pollution control laws from Telangana Pollution Control board.
Consent to Operate (CTO)	TSPCB	Same as above
NOC state nodal agency	Industry Commissioner/R.O.	Required for the project. Change in land use from agriculture to industry.

Permit	Authority	Remarks
NOC State Electricity Board	State Electricity Commission	Required for the project prior to grid connection.
Contractor permits	Project Developer	The contractor will need to abide by the following laws and M/s Suzlon will have to ensure that it is being done. Also, HERO needs to abide as Principal Employer for the proposed project. • The Workmen's Compensation Act, 1923; • The Maternity Benefit Act, 1961; • The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996; • The Contract Labour Act, 1970; • The Child Labour (Prohibition and Regulation) Act, 1986; • The Bonded Labour System (Abolition) Act 1976; • The Minimum Wages Act, 1948; and • The Equal Remuneration Act 1976.
Land procurement	Project Developer	Completed
No Objection Certificate from the Gram Panchayat	Gram Panchayats	Obtained from six villages viz Bardipur, Chilkepalle, Chilepalle, Koppanagar, Machnoor and Yalgoi.

3.3 International Finance Corporation

IFC, a member of the World Bank Group, is the largest global development institution focused exclusively on the private sector in developing countries. The International Finance Corporation (IFC) Environmental & Social Performance Standards ("IFC Standards") have become the global benchmark for corporate social responsibility (CSR) and sustainability in project financing. While the IFC Standards originated in relation to projects financed by the World Bank, they are now used by all financial institutions around the globe that have signed up to the "Equator Principles", accounting for a substantial proportion of global project finance.

The IFC Standards (Performance Standards and Equator Principles) updated 2012 edition of IFC's Sustainability Framework applies to all investment and advisory clients whose projects go through IFC's initial credit review process **after January 1, 2012.** It establish a private regulatory framework in respect of labour and working conditions; environmental practices; workplace health & safety; community health, safety and security; land acquisition and involuntary resettlement; relations with indigenous communities, and preservation of cultural heritage. In addition to the express guidelines of the IFC Standards themselves, adherents must meet the requirements of local and international laws in these areas, regardless of whether such laws are regularly or consistently enforced by local governmental institutions. Hence the standard has been chosen to evaluate the project activity. The International Finance Corporation has laid down a set of eight Performance Standards that the project developers need to comply with while establishing the project. The provisions of the Performance Standards relevant to the wind power project are summarized below.

Table 3-1: IFC Performance Standards & Applicability To The Project

Title of Performance Standard	Objective	Applicability
PS 1: Social and Environmental Assessment and Management Systems	PS 1 establishes the importance of: Integrated assessment to identify the E & S impacts, risks and opportunities of projects. Effective community engagement through disclosure of project related information & consultation with local communities Management of E & S performance throughout the life of the project by the project developer.	The PS 1 is applicable for the proposed project with environment and/or social risks and/or impacts. The proposed project will have environmental and social impacts such as generation of noise and generation of small quantities of hazardous wastes (operation of DG sets etc.). PS 1 is therefore applicable for the project which requires an Environmental and Social Impact Assessment (ESIA) study to be conducted before commencement of the project. Hero has their own Environment & Social Management Plan. Hero also needs to implement the actions as provided in their Environmental and Social Management System to manage the risks associated with its operations.
PS 2: Labour and Working Conditions	To promote the fair treatment, non-discrimination, and equal opportunity of workers, To establish, maintain, and improve the worker management relationships To promote compliance with national employment and labor laws To protect workers, including vulnerable categories of workers such as child workers, migrant workers, workers engaged by client or third party, To promote safe and healthy working conditions and the health of workers and To avoid use of forced labor	The PS is applicable for the project as the project developer is going to employ labors for both the phases-construction as well as operation. The labors would be temporarily employed by contractors of Suzlon. Labor camp has been setup for the proposed project. Hero and its contractors should follow the requirements of IFC guidelines and ILO guidelines for worker accommodation. The ILO worker accommodation requirements are attached as Annexure I of this report. Hero should supervise the labour accommodation conditions on site during the construction phase of the project.
PS 3: Resource Efficiency and Pollution Prevention	To avoid or minimize adverse impacts on human health and environment by avoiding or minimizing pollution from project activities, To promote sustainable use of resources, including energy and water, To reduce project related GHG emissions.	The PS is applicable as the project will utilize resources like water and power. Water will be sourced locally via tankers from village bore wells. Access road will be constructed for the movement of the vehicles like trailer trucks, equipment loaded trucks, tractors and other small vehicles for loading, unloading and inspecting the erection of the WTGs during construction phase. This will generate some dust emission as the area is arid in nature which can be mitigated by adopting suitable mitigation measures as recommended in ESMP of this report.
PS 4: Community Health, Safety and Security	To anticipate and avoid adverse impacts on the health and safety of the Affected Community during the project life from both routine and non-routine circumstances; and	The PS is applicable as the project will involve movement of vehicles on the approach road passing through villages. Precautionary measures need to be taken to avoid accidents/incidents. The project

Title of Performance Standard	Objective	Applicability
	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.	also envisages influx of labors from different nearby villages and migrant labors during construction phase. Conflict among labors and breakout out of any diseases due to mixing with local community can possess a risk for the proposed project and thereof community health and safety need to be taken care by the project developer, ensuring safety measures to be put in place both during construction and operation phase of the project.
PS 5: Land Acquisition and Involuntary Resettlement	To avoid, and when avoidance is not possible, minimize displacement by exploring alternative project designs; To avoid forced eviction; To anticipate and avoid, or where avoidance is not possible, minimize adverse social and economic impacts from land acquisition or restrictions on land use by (i) providing compensation for loss of assets at replacement cost4 and (ii) ensuring that resettlement activities are implemented with appropriate disclosure of information, consultation, and the informed participation of those affected, To improve or restore the livelihoods and standards of living of the displaced persons To improve living conditions among physically displaced persons through provisioning of adequate housing with security of tenure at resettlement sites.	This PS is not applicable as land purchased for the project as there is no land acquisition involved for the project.
PS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	To protect and conserve biodiversity To maintain the benefits from the ecosystem service, To promote the sustainable management of living resources through the adoption of practices that integrates conservation needs and development activities.	The proposed project site is dry and arid in nature comprising of dry, thorny scrub land mixed with pockets of private agriculture land. During the ESIA study 14 vantage point study for bird and bat was undertaken for a period of 6 days. The list of bird species observed within the study area is presented below in Table 4.1. Mostly resident birds were observed during the study period and few migratory birds. Eight Schedule I species were observed within the study area. Detailed observations for each VP point would be provided in detail in ESIA Report. One fruit bat species has been observed within study area. The nearest wildlife sanctuary is Chincholi wildlife sanctuary located 20 kms south west of project site. A dam on Manjira River is located at a distance of about 14 kms north east from the nearest WTG within the

Title of Performance Standard	Objective	Applicability
		project site. There is also a bird sanctuary (Manjira Wildlife & Bird Sanctuary) is located at a distance of 30 kms from the project site in the eastern direction.
PS 7: Indigenous Peoples	To ensure that the development process fosters full respect for the human rights, dignity, aspirations, culture, and natural resource-based livelihoods of Indigenous Peoples; To anticipate and avoid adverse impacts of projects on communities of Indigenous Peoples, or when avoidance is not possible, to minimize and/or compensate for such impacts; To promote sustainable development benefits and opportunities for Indigenous Peoples in culturally appropriate manner; To establish and maintain an ongoing relationship based on Informed Consultation and Participation(ICP) with the Indigenous Peoples affected by a project throughout the project's life- cycle; To ensure the Free, Prior, and Informed Consent (FPIC) of the Affected Communities of Indigenous Peoples when the circumstances described in this Performance Standard are present; and To respect and preserve the culture, knowledge, and practices of Indigenous Peoples.	PS is not applicable as there are no indigenous people present within the study area.
PS 8: Cultural Heritage	To protect cultural heritage from the adverse impacts of project activities and support its preservation; and To promote the equitable sharing of benefits from the use of cultural heritage.	The PS is not applicable as there is no impact anticipated on the cultural heritage of the proposed project site due to the project activities. No monument or structure of religious importance were observed within 500m from the nearest WTG. Chance finding procedure should be applied during construction phase for the proposed project. World Bank Chance Find Procedure has been annexed as **Annexure II**

4 DESCRIPTION OF ENVIRONMENT

This chapter describes the existing environmental settings of the project site and its immediate surroundings. This includes physical environment comprising air, water and land components, biological environment and socio-economic environment. Attributes of the physical environment like air, water, soil and noise quality in all blocks and surrounding area were assessed primarily through monitoring and analysis of samples collected from the area. Primary monitoring was conducted by Avon Food Laboratory (a NABL certified laboratory). Primary monitoring was conducted in May, 2016 for ambient air, ambient noise, surface water, ground water and soil quality.

Secondary information on geology, hydrology, prevailing natural hazards like floods, earthquakes etc. have been collected from literature reviews and authenticated information made available by government departments. Primary surveys were carried out to understand and record the biological environment prevailing in the area and the same was verified by the forest officials and against published information and literature. The socioeconomic environment has been studied through consultations with various stakeholders within the site. Additionally, socioeconomic data have been obtained from the Census 2011 of India reports.

4.1 Study area

Primary monitoring was carried out for the proposed project. While selecting locations for primary monitoring of air, noise, water, soil and meteorology emphasis is given to collect the representative baseline data. Monitoring stations for air and noise were selected in proximity to the WTG locations as well as approach roads and settlements. Monitoring locations for surface water quality was selected based on the macro and micro watershed and drainage pattern of the area. Soil sample collection locations were selected based on the land use & land cover of the study area.

To understand and assess the environmental and social risks associated with the project the study area was divided into core area (500 m around the WTG location) and buffer area (5 km around the WTG location).

4.2 Physical Environment

4.2.1 Climate & Meteorology

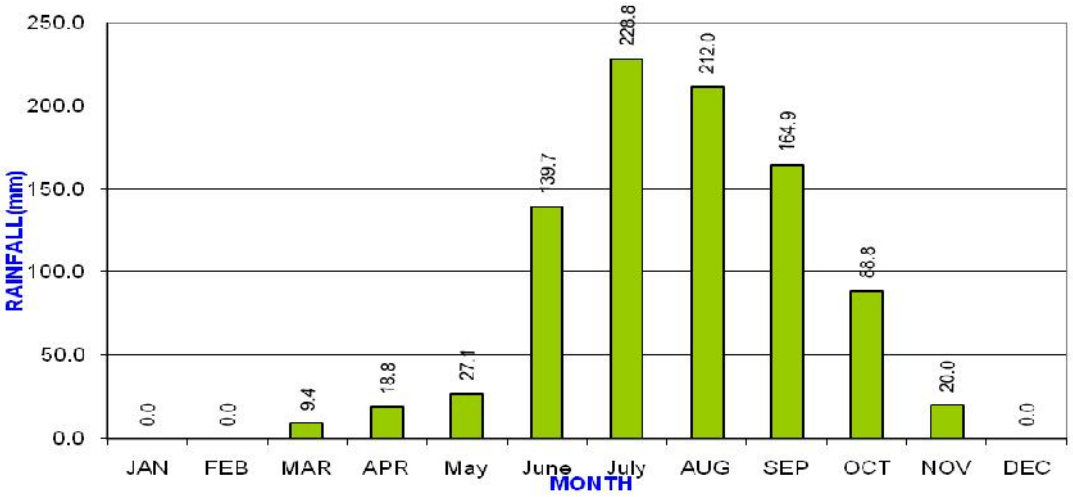
The climate of Medak district is semi-arid climate, with hot and dry conditions for most of the year. A dry and mild winter starts in late November and lasts until early February with little humidity. The nearest IMD[1] monitoring station is Medak. The average annual rainfall of the district is 910 mm, which ranges from nil rainfall in December, January and February to 229 mm in July. July is the wettest months of the year. The mean seasonal rainfall distribution is 745 mm in southwest monsoon (June- September), 109 mm in northeast monsoon (Oct-Dec), 0.0 mm rainfall in winter (Jan-Feb) and 55 mm in summer (March – May).

Sl No	YEAR	ANNUAL	SWM	NEM	WINTER	SUMMER	SWM (%)	NEM (%)	WINTER (%)	SUMMER (%)	DEP FROM LPA (%)
1	1999	657.0	574.0	20.0	0.0	63.0	87.37%	3.04%	0.00%	9.59%	-28%
2	2000	868.0	763.0	17.0	15.0	73.0	87.90%	1.96%	1.73%	8.41%	-5%
3	2001	691.5	496.0	154.5	7.0	34.0	71.73%	22.34%	1.01%	4.92%	-24%

[1] *Indian Metrological Department*

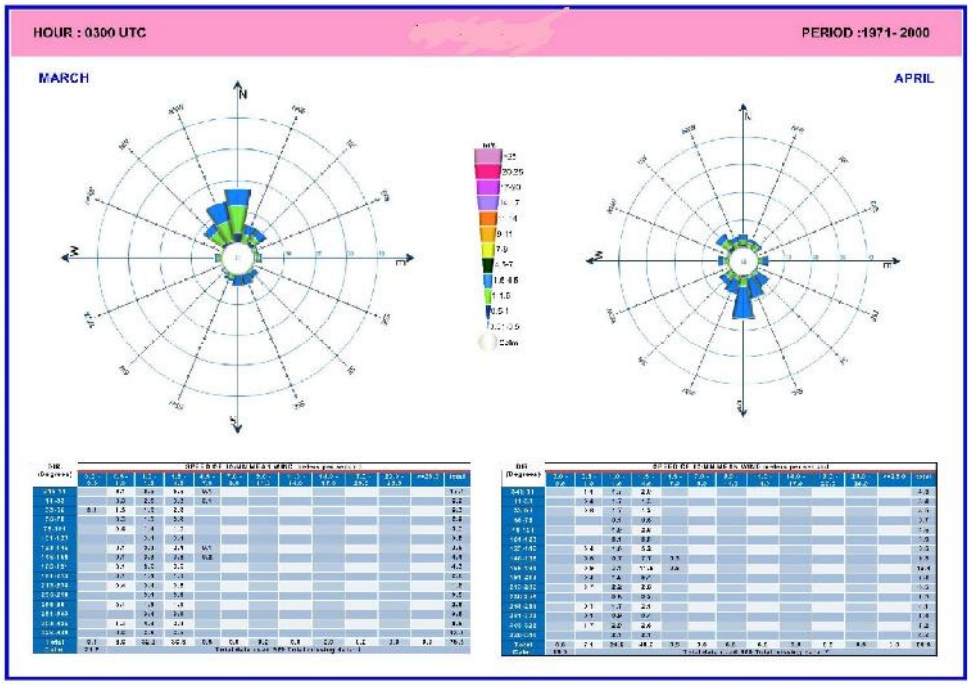
Sl No	YEAR	ANNUAL	SWM	NEM	WINTER	SUMMER	SWM (%)	NEM (%)	WINTER (%)	SUMMER (%)	DEP FROM LPA (%)
4	2002	559.1	431.1	88.0	16.0	24.0	77.10%	15.74%	2.86%	4.29%	-39%
5	2003	759.0	664.6	73.0	2.0	19.4	87.56%	9.62%	0.26%	2.56%	-17%
6	2004	654.8	533.1	51.7	2.2	67.8	81.41%	7.90%	0.34%	10.35%	-28%
7	2005	1188.7	880.6	172.3	87.5	48.3	74.08%	14.49%	7.36%	4.06%	31%
8	2006	961.2	721.6	41.5	0.0	198.1	75.07%	4.32%	0.00%	20.61%	6%
9	2007	745.8	692.5	27.6	0.0	25.7	92.85%	3.70%	0.00%	3.45%	-18%
10	2008	969.3	695.0	25.3	58.7	190.3	71.70%	2.61%	6.06%	19.63%	7%
11	2009	504.1	416.9	59.6	0.0	27.6	82.70%	11.82%	0.00%	5.48%	-45%
12	2010	1038.4	890.3	114.1	23.2	10.8	85.74%	10.99%	2.23%	1.04%	14%
13	2011	694.8	642.8	16.6	0.0	35.4	92.52%	2.39%	0.00%	5.09%	-24%
Long Period Average		909.5	745.4	108.8	0.0	55.3	81.96%	11.96%	0.00%	6.09%	

Figure 4-1: Mean Monthly Distribution of Rainfall in Medak District



Source: India Meteorological Department and Directorate Of Economics And Statistics

Figure 4-2: Windrose Showing Predominant Wind Direction



4.3 Ambient Air Quality

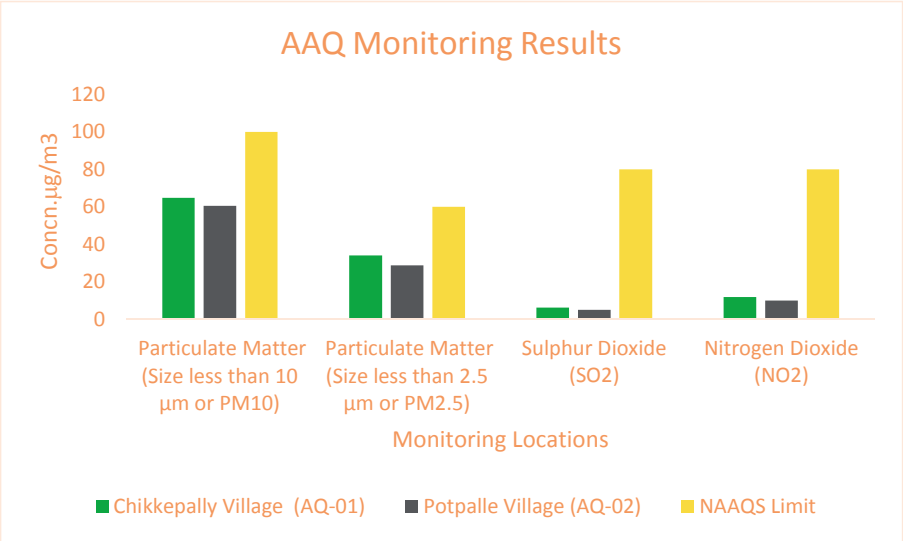
The existing quality of the ambient air environment serves as an index for assessing the pollution load and the assimilative capacity of any region and forms an important tool for planning project activities in the area. A detailed assessment of the existing air environment was undertaken for the purpose mentioned above. The ambient air quality monitoring was conducted at 2 representative locations during the period of May 2016. The baseline air quality status of the study area was primarily assessed by monitoring for particulates and gaseous pollutants at these stations (**Refer Figure 5.3**). The monitoring network was established based on the following key criteria.

Regional Meteorology

- Important receptor locations (e.g. prominent villages, ecological sensitive areas etc.);
- Site reconnaissance survey and professional judgment

The ambient air quality monitoring was carried out in accordance with guidelines of Central Pollution Control Board (CPCB) June 1998 and National Ambient Air Quality Standards (NAAQS), November 2009. Air quality monitoring was carried out for 24 hours a day twice a week for Particulate Matter (PM_{10} and $PM_{2.5}$), Sulphur Dioxide (SO_2) and Oxides of Nitrogen (NOx), 8 hours a day twice a week for Carbon Monoxide (CO). Four monitoring locations has been chosen within the study area for monitoring of ambient air quality as presented in figure below.

Figure 4-3: Ambient Air Quality Monitoring Results



Interpretation of Air Quality Results

On comparison of obtained Ambient Air Quality Values with NAAQ Standards, the obtained values are well within the prescribed standards for all parameters viz PM10, PM 2.5,NOX, SO2 and CO..

4.4 Ambient Noise Quality

The ambient noise monitoring was conducted during the month of June at 3 locations within the study area. The noise monitoring network was established based on the understanding of the proposed project activities and professional judgment.

Sound pressure level (SPL) measurements in dB(A) were recorded for every hour continuously for 24 hours for the aforesaid monitoring stations and equivalent noise levels in the form of Leq day and Leq night. The results so obtained were compared with the standard specified in Noise Pollution (Regulation and Control) Rules, 2000. The summary of noise quality results are presented in Table 5.1 below.

Table 4-1: Ambient Noise Monitoring Results (in decibels)

Location	Leq Day	Leq Night
Chikepally	51.8	40.2
Yelgoi	42.5	34.2
Potpalle	52.8	41.1

The project area being a residential area the limits for day time noise level is 55 decibels and at night the prescribed limit is 45 decibles. The noise monitoring results suggest that for all four locations noise levels are within prescribed limit for day time and night time.

Table 4-2: Ambient Air Quality Standards in respect of Noise as per MoEFCC

Area Code	Category of Area	Limit 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 Area	50	40
Note	Day time is reckoned in between 6 am and 9 pm		
	Night time is reckoned in between 9 pm and 6 am		
	Silence zone is defined as areas upto 100 m around such premises as hospitals, educational institutions and courts. The silence zones are to be declared by the Competent Authority		
	Mixed categories of areas should be declared as "one of the four above mentioned categories by the Competent Authority and the corresponding standard shall apply		

4.5 Soil Quality

The soils of Belgaum district can broadly be classified into red soils and black soils. These soils vary in depth and texture, depending on the parent rock type, physiographic settings and climatic conditions. By and large, black soils predominates the Deccan Trap terrain and the red soils are found in the southwestern and south eastern part of the district in gneissic terrain. The proposed project site is a mix of red and black soil. These soils occur in the northern parts of the district. They are dark reddish-brown to dark greyish-brown in colour with silty-clay to clayey-loam textures. These soils are derived from gneisses, schists and sedimentary rocks. Red soils having high infiltration characteristics are confined to uplands, whereas, black soils of poor to medium infiltration characteristics occur in valleys and low lands.

4.6 Surface Water Quality

One surface water sampling was carried out near the project site. Water sampling and analysis was done following CPCB standard guidelines for physical, chemical and bacteriological parameters. The proposed project area is very dry devoid of any flowing water body. Water sample was collected from a pond near village Rampur.

Table 4-3: Surface Water Quality Monitoring Results

Sl. No	Tests	Unit	Results Rampur Village Pond
1.	pH	-	7.84
2.	Odour	-	Agreeable
3.	Colour	Hazen	< 1
4.	Temperature	°C	22.6
5.	Turbidity	NTU	< 1
6.	Dissolved Oxygen (DO) (Min)	mg/L	2.4
7.	BOD (3day, at 27oC)	Mg/L	9
8.	Chemical Oxygen Demand (COD)	mg/L	72

Sl. No	Tests	Unit	Results Rampur Village Pond
9.	Ammonical Nitrogen	mg/L	0.7
10.	Fluoride (as F)	mg/L	0.85
11.	Conductivity	µS/Cm	2411
12.	Chloride	mg/L	234.9
13.	Sulfates (as SO4)	mg/L	412
14.	Total Phosphorus	mg/L	0.26
15.	Nitrate (as NO3)	mg/L	6.3
16.	Nitrite (as NO2)	mg/L	2.8
	Sodium (Na)	mg/L	452
	Calcium (Ca)	mg/L	194
	Magnesium (Mg)	mg/L	24.6
	Carbonate	mg/L	290
	Boron (B)	mg/L	BDL
	Total Coliform	MPN/ 100 mL	350
	Faecal Coliform	MPN/ 100 mL	50

Note:

BDL= Below Detection Limit,

Detection Limits

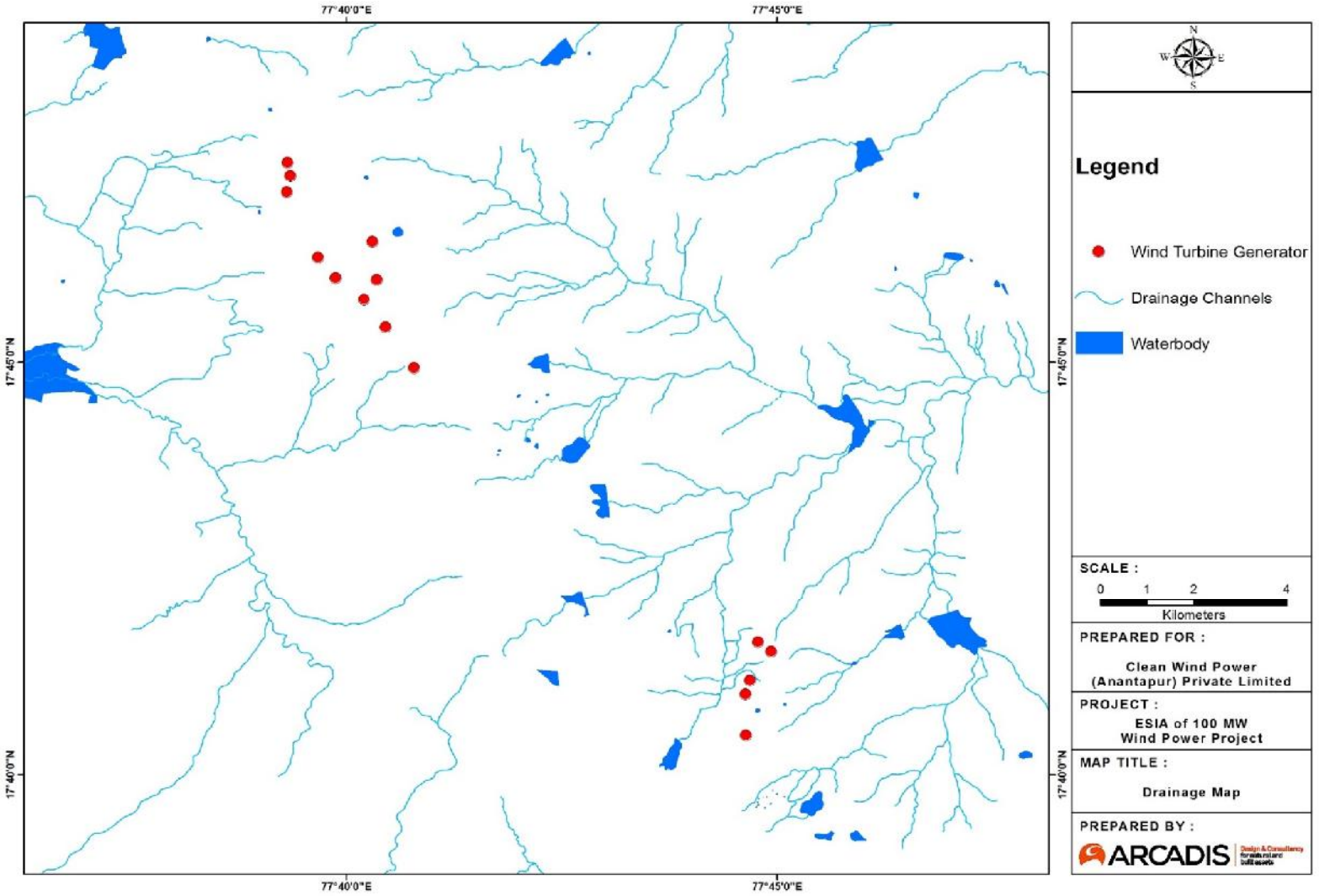
Turbidity =1 NTU, Colour =1 Hzn, Fluoride= 0.1 mg/L , Nitrate = 0.2 mg/L, BOD =1.0 mg/L, COD= 4.0 mg/L, Mg = 1.0 mg/L, K= 0.1 mg/L Fe =0.3 mg/L, Total Coliform = 2 MPN/100mL, Faecal Coliform =2 MPN/100 mL, P= 0.003 mg/L, B=0.01 mg/L

Interpretation of Surface Water Quality Results

Surface water characteristics were assessed against water quality criteria as per CPCB guidelines for water resources. The surface water samples collected from one source (Water sample collected from Sattegiri Village Pond). The dissolved oxygen (DO) levels value observed as 2.4 mg/l indicating non favourable conditions for the growth and reproduction of normal population of fish and other aquatic organisms in the water bodies. BOD levels of the water body is 9 mg/l and Total coliforms detected as 350 MPN/100 ml. The surface water sample is analysed to be alkaline in nature having pH value of 7.84. Hence, the best use class of the surface water bodies according to the CPCB Water Use Classification conforms to Class D inland surface water quality.

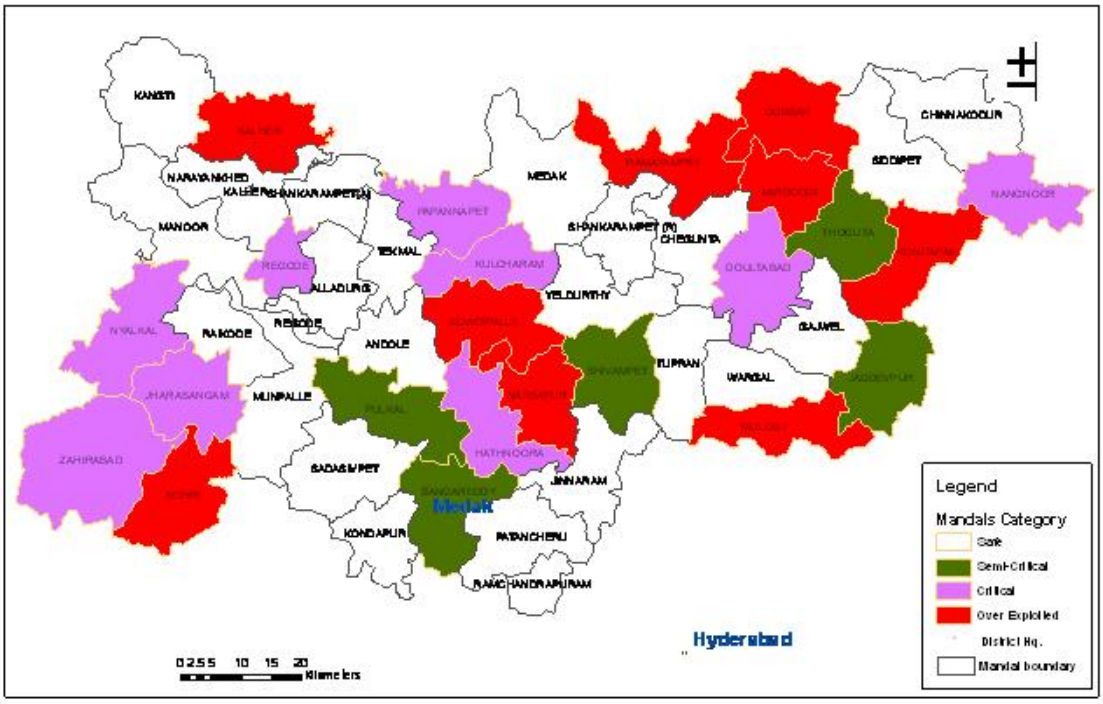
The figure below provides the drainage map of the district. It is observed that the proposed project site has many dry water channels for drainage in the area but they are mostly dry in nature.

Figure 4-4: Drainage Map of Project Site Area



4.7 Ground Water Quality

As per Central Ground Water Board Report, August 2007, the entire district is covered by hard rock except for 0.2% of the alluvium area. Ground water occurs under unconfined to confined conditions in hard rock (Archaean and Deccan traps ages) and recent alluvial formations. The common ground water abstraction structures are dug wells, dug-cum-bore wells and bore wells and their yields mainly depending on the recharge conditions in the area. Yield potential of the aquifers in the consolidated rocks varies widely from 3 to 7 lps (Fig.4). Due to indiscriminate drilling of bore wells, the yields have fallen drastically, lack of recharge to fracture confined aquifer and existing borewells becoming to defunct and even leading to failure.



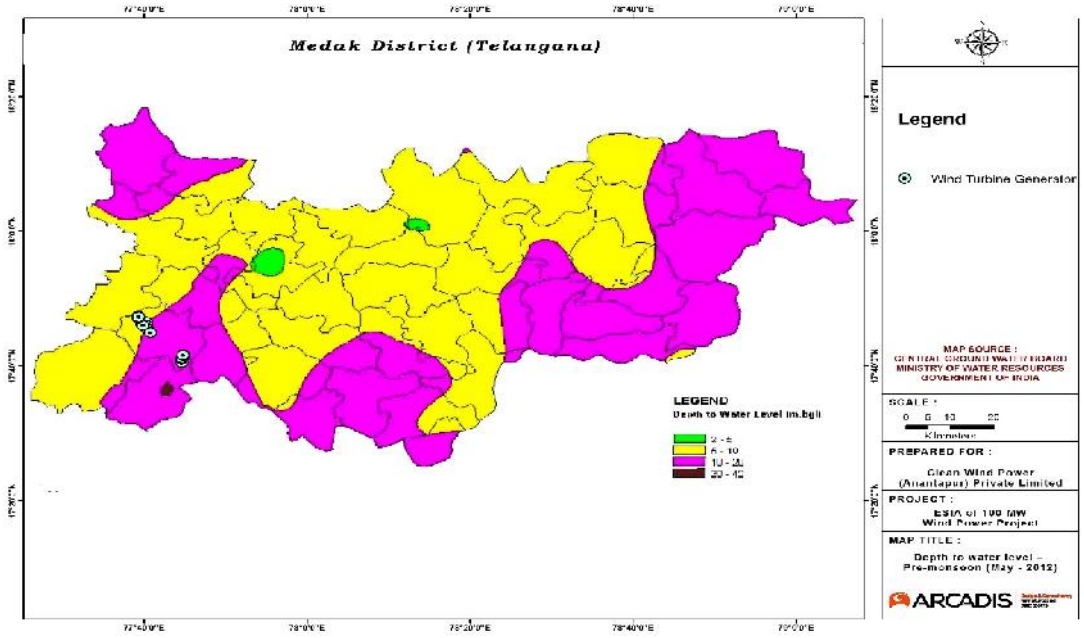
4.7.1 Depth to Water Level

In order to monitor the changes in ground water scenario Central Ground Water board established a network of observations wells and collects water level data 4 times a year.

4.7.2 Pre-monsoon

The depth to water level varies from a minimum of 3.85 m.bgl (Medikonda) to a maximum of 21.00m.bgl (Kohir). Most of the area is having water levels below 5 mbgl. Water levels ranges from 5-10m and above 10m water levels in Zahirabad, Kohir, Sangareddy and Kondapuram.

Figure 4-5: Premonsoon Depth to Water Level



4.7.3 Post Monsoon Depth to water table

The depth to water level during post-monsoon ranges from a minimum of 0.98 m.bgl (Peroor) to maximum of 22.65 m bgl (Melchelma). Water levels of less than 2m were recorded at North-western parts of the district. The water levels of less than 10 m bgl cover the maximum area of the district

Figure 4-6: Post monsoon depth to water level

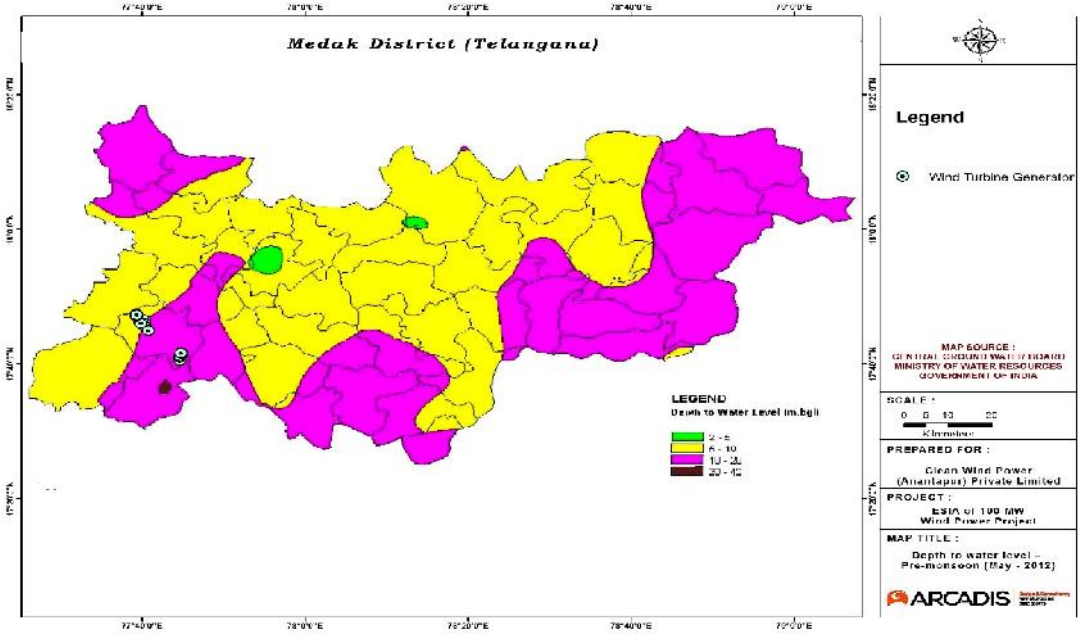


Table 4-4: Ground Water Quality Monitoring Results

Sl. No	Parameters	Unit	Results		Specification/ IS:10500-2012 Acceptable Limit
			Itnal Village	Chikkoppa Village	
1.	pH Value	-	7.42	7.12	6.5-8.5
2.	Temp.	0C	25.2	23.9	Agreeable
3.	Turbidity	NTU	< 1	< 1	1
4.	Total Hardness (as CaCO3)	mg/L	190	180	200 Max.
5.	Iron (as Fe)	mg/L	BDL	BDL	0.3 Max.
6.	Chlorides (as Cl)	mg/L	110	120	250 Max.
7.	Fluorides (F)	mg/L	0.1	0.28	1 Max.
8.	Total Dissolved solids	mg/L	419	523	500 Max.
9.	Calcium (Ca)	mg/L	12.74	9.36	75 Max.
10.	Magnesium (as Mg)	mg/L	23.38	31.86	30 Max.
11.	Copper (as Cu)	mg/L	BDL	BDL	0.05 Max.
12.	Nitrate as NO3, mg/l	mg/L	0.93	1.8	45 Max.
13.	Mercury (as Hg)	mg/L	BDL	BDL	0.001 Max.
14.	Arsenic (as As)	mg/L	BDL	BDL	0.01 Max.
15.	Zinc (as Zn)	mg/L	BDL	BDL	5 Max.
16.	Alkalinity	mg/L	100	140	200 Max.
17.	Total Coliform	MPN/100 ml	110	Absent	Shall not be detectable in any 100 mL sample
18.	Faecal Coliform	MPN /100 ml	Absent	Absent	Shall not be detectable in any 100 mL sample

Note:

BDL= Below Detection Limit,

Detection Limits

Turbidity =1 NTU, Fluoride= 0.1 mg/L , Nitrate = 0.2 mg/L, Mg = 1.0 mg/L, Fe =0.3 mg/L, As = 0.01 mg/L, Hg = 0.001 mg/L , Cu = 0.01 mg/L, Zn =0.2 mg/L, Total Coliform = 2 MPN/100mL, Faecal Coliform =2 MPN/100 mL,

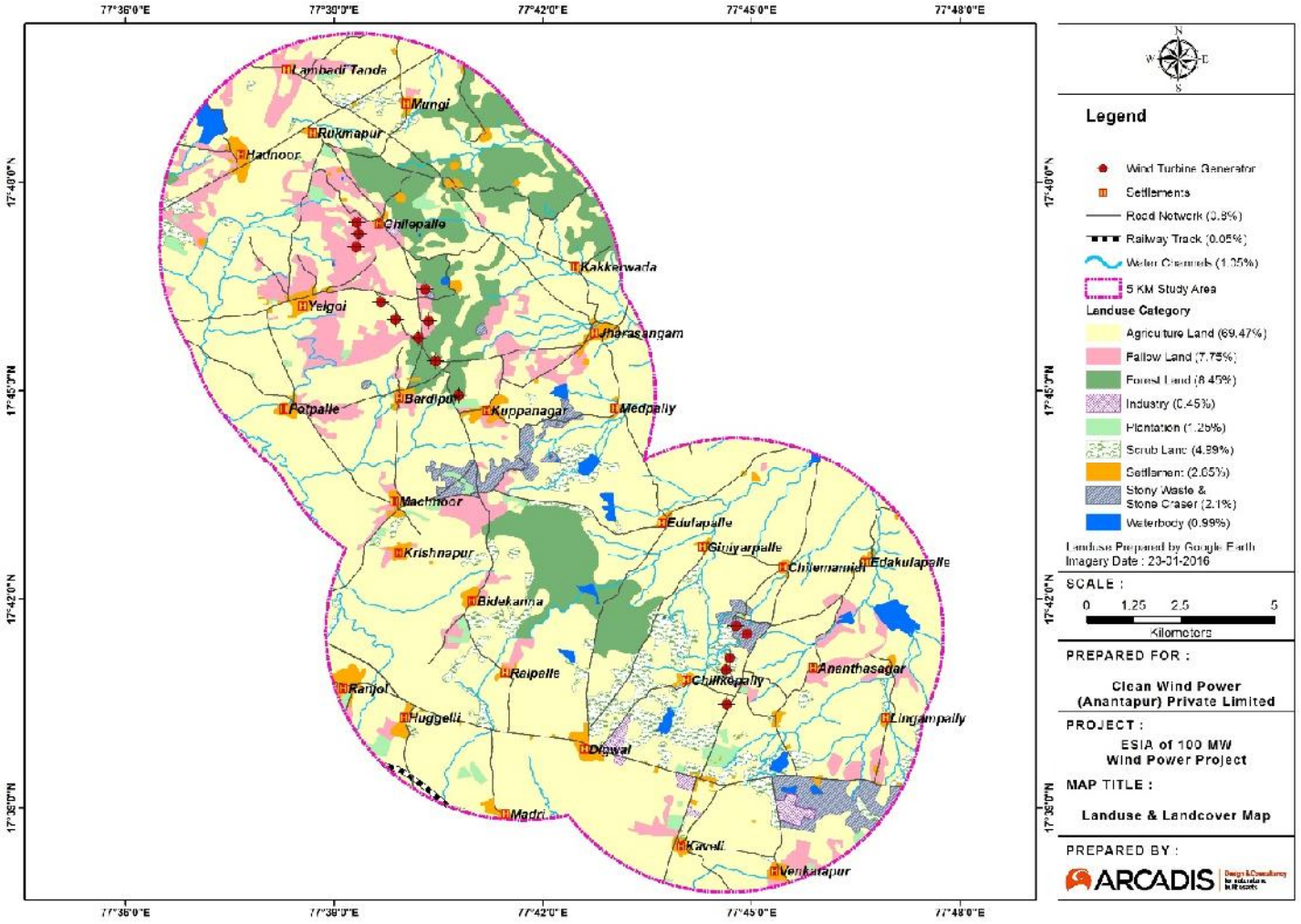
Interpretation of Ground Water Quality Results

A total of 2 no. ground water samples were collected from Itnal and Chikoppa villages respectively within the project site. The samples were analyzed for physicochemical and bacteriological parameters and results compared with IS: 10500 (2012) drinking water standards to identify and interpret any deviation in the statutory limits set for parameters under this standard. Overall, ground water in Chikoppa village is suitable for drinking than the ground water in Itnal village as the total coliform is 110 MPN/100 ml in Itnal ground water which is not within acceptable limit as per drinking water standard. Rest of the parameters are within the permissible limit as per drinking water standards in both villages

4.8 Land Use

Land use of the proposed project site is mainly a mix of scrub forest land and agricultural land. A 10 km land use map surrounding all WTGs is provided in Fig 5.9 showing the land use pattern of the proposed project site. The land use at the project site comprises mostly of agricultural land (79.02%). Other land use in the project study area is characterized by i) Scrub land (8.08%) ii) Hillocks (2.55 %) iii) Stony waste (6.88 %) i v) Water body (0.20%) v) Settlement (1.75%) vi) Dry River (0.18%). Most of the land that would be taken up for the proposed project would be a mix of seasonal agriculture land and scrub land.

Figure 4-7: Landuse Map of the Project Area



4.9 Biological Environment

The proposed project site is dry and arid in nature comprising of dry, thorny scrub land mixed with pockets of private agriculture land. During the ESIA study 14 vantage point study for bird and bat was undertaken for a period of 6 days. The list of bird species observed within the study area is presented below in Table 4.5. Mostly resident birds were observed during the study period and few migratory birds. Eight Schedule I species were observed within the study area. 14 vantage point study were for 6 days for 20 mins at each vantage point per day.

Flying fox bat species has been observed within study area at two locations as in Fig 4-10. The nearest wildlife sanctuary is Chincholi wildlife sanctuary located 20 kms south west of project site. A dam on Manjira River is located at a distance of about 14 kms north east from the nearest WTG within the project site. There is also a bird sanctuary (Manjira Wildlife & Bird Sanctuary) is located at a distance of 30 kms from the project site in the eastern direction.

Chincholi Wildlife Sanctuary: This is Chincholi in Gulbarga district and it was only last year that 134.88 sq km area of Chincholi forest on the Karnataka side was declared as South India's first dry land wildlife sanctuary. The area was formally notified as a forest on November 28, 2012 to protect the prime wolf and hyena habitat here which is spread over the two districts of Gulbarga and Yadgir. Named as the Chincholi wildlife sanctuary, the Forest Department considers the areas to be ecologically sensitive. Though it has a canopy cover of just about 0.40 per cent, it is the only area in the entire Hyderabad-Karnataka region comprising Gulbarga, Yadgir, Bidar and Bellary to share certain similar features with the forests of the Western Ghats.

The forests cover 13,488.31 hectare area (ha) or (134.88 sq km area) over five blocks, the Chincholi forest block comprising of 11,985.62 ha, Sangapura forest block comprising of 688.39 ha, Bhonsapur forest block comprising of 317.59 ha, Magdumpur forest block comprising of 327.67 ha and Shadipur forest block comprising of 169.04 ha.There are 30 Lambani Thandas in the region and they mainly depend on forest produce for their livelihood. Medicinal herbs and sandalwood trees, red sanders and floral species like Anogessus Latifolia, Chloroxylon, Bosweellia Serrat and Madhuca Indica are widely scattered. Apart from the wolf and the hyena, the forest is known to house wildlife like panther, boar, antelope, black buck, common fox, fruit bat, snakes and mongoose. Orinthologists have recorded over 35 species of birds, including Rollers, Wagtails, Bee eaters, Jacanas kite, oriole, black drongo, blossom-headed parakeet, pigeon and grey patridge. The wildlife sanctuary covers the forest areas of 28 villages of Chincholi taluk.

Manjira Bird Sanctuary: The Manjira Bird Sanctuary, 50-km from Hyderabad near Sangareddy in Medak District, Andhra Pradesh is home to a variety of migratory as well as domestic feathered species. The sanctuary is just 20 Sq.km in area. Painted Storks, Herons, Coots, Teals, Cormorants, Pochards, Black and White Ibises, Spoon Bills, Open Billed Storks are the prime attractions here. The sanctuary is just 20 Sq.km in area. Painted Storks, Herons, Coots, Teals, Cormorants, Pochards, Black and White Ibises, Spoon Bills, Open Billed Storks are the prime attractions here. There are also a number of reptiles that is present at the Manjira Wildlife & Bird sanctuary. These reptiles include Monitor Lizards, Fresh water Turtles, Cobra and marsh Crocodiles.

Figure 4-8: Ecological Sensistive Map of the proposed project site.

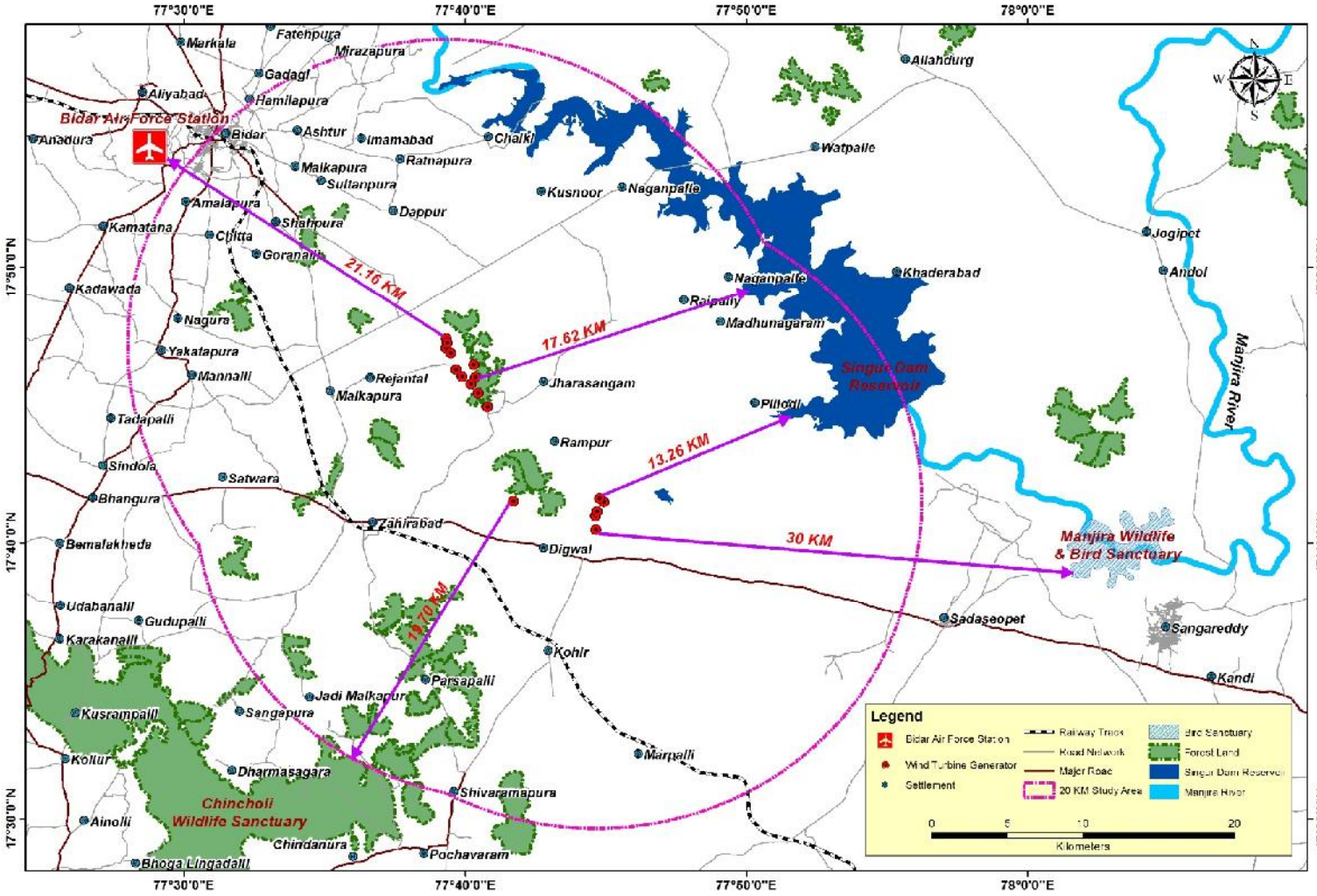


Figure 4-9: Vantage Point Location Map

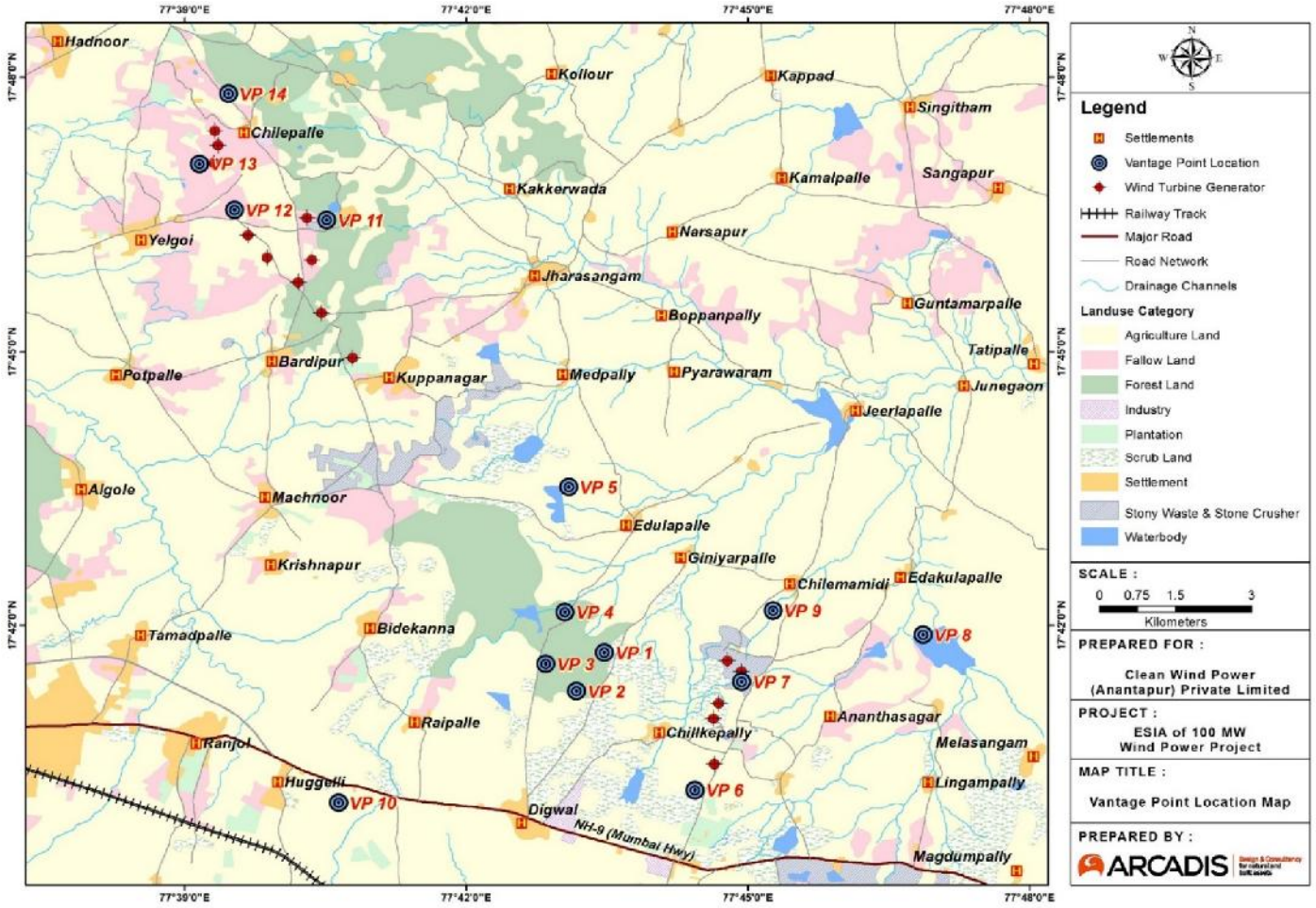


Figure 4-10: Bat Observation Location Map

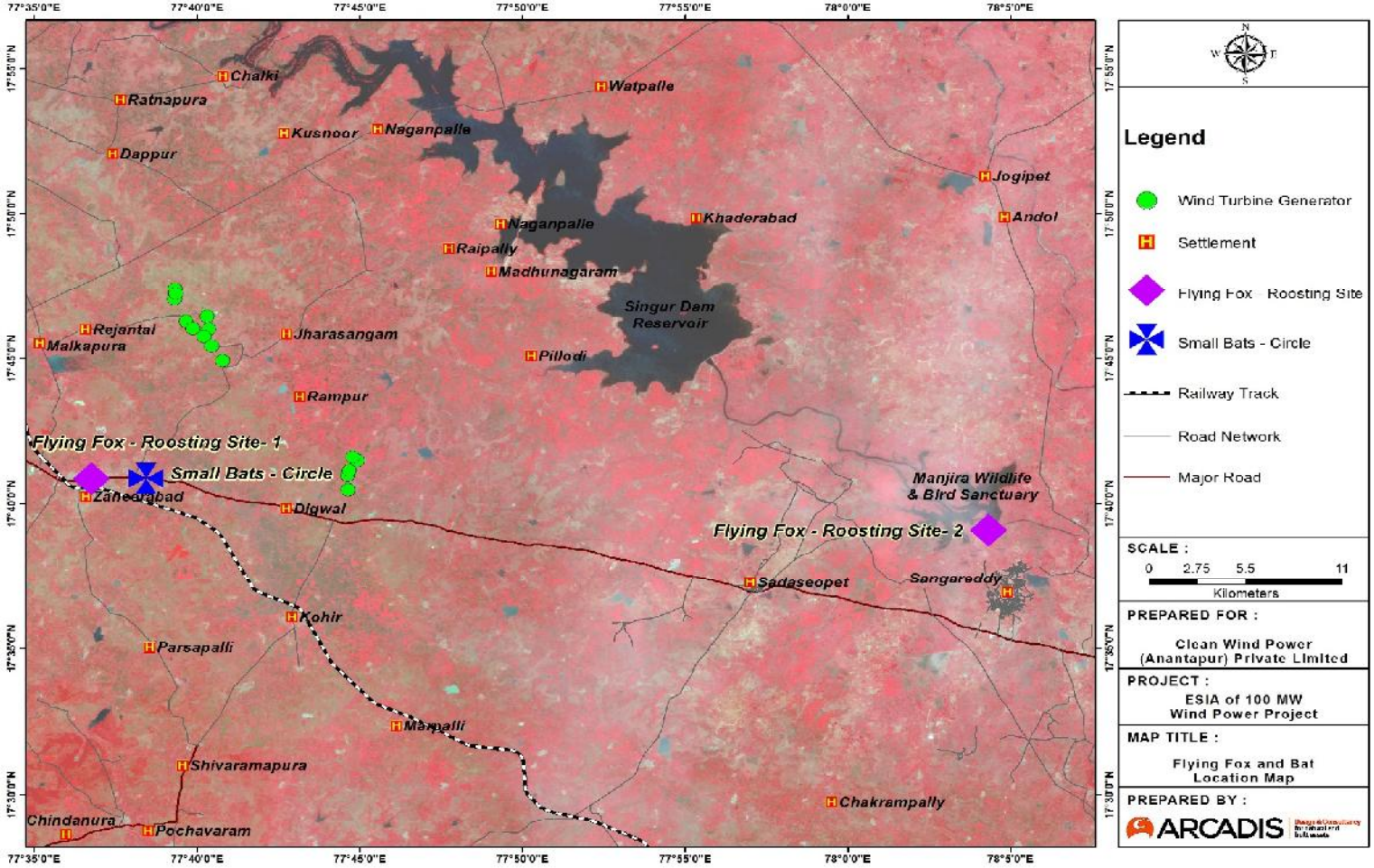


Table 4-5: List of bird species observed in the study area

Sr. No.	Species	Scientific Name	IUCN Category	WPA Schedule	Ecological Status
1	Rock Pigeon	Columba livia	LC	Schedule IV	Resident
2	Purple Sunbird	Nectarinia asiatica	LC	Schedule IV	Resident
3	House Crow	Corvus splendens	LC	Schedule IV	Resident
4	Indian Robin	Saxicoloides fulicatus	LC	Schedule IV	Resident
5	Laughing Dove	Spilopelia senegalensis	LC	Schedule IV	Resident
6	Black Kite	Milvus migrans	LC	Schedule I	Resident
7	Red Wattled Lapwing	Vanellus indicus	LC	Schedule IV	Resident
8	Jungle Babbler	Turdoides striata	LC	Schedule IV	Resident
9	Black Drongo	Dicrurus macrocercus	LC	Schedule IV	Resident
10	Cattle Egret	Bubulcus ibis	LC	Schedule IV	Resident
11	Rufous Tailed Lark	Ammomanes phoenicura	LC	Schedule IV	Resident
12	Red Vented Bulbul	Pycnonotus cafer	LC	Schedule IV	Resident
13	Paddy Field Pipit	Anthus rufulus	LC	Schedule IV	Resident
14	Black Winged Kite	Elanus caeruleus	LC	Schedule I	Resident
15	Common Quail	Coturnix coturnix	LC	Schedule IV	Resident
16	Yellow Wattled Lapwing	Vanellus malabaricus	LC	Schedule I	Resident
17	Red Rumped Swallow	Hirundo daurica	LC	Schedule IV	Resident
18	Indian Peafowl	Pavo cristatus	LC	Schedule I	Resident
19	Indian Spot Billed Duck	Anas poecilorhyncha	LC	Schedule IV	Resident
20	Black Winged Stilt	Himantopus himantopus	LC	Schedule IV	Resident
21	Grey Heron	Ardea cinerea	LC	Schedule IV	Resident
22	Little Cormorant	Microcarbo niger	LC	Schedule IV	Resident
23	Indian Cormorant	Phalacrocorax fuscicollis	LC	Schedule IV	Resident
24	River Tern	Sterna aurantia	NT	Schedule IV	Resident
25	Pond Heron	Ardeola grayii	LC	Schedule IV	Resident
26	Common Coot	Fulica atra	LC	Schedule IV	Resident
27	Asian Openbill	Anastomus oscitans	LC	Schedule IV	Resident
28	Rose-ringed Parakeet	Psittacula krameri	LC	Schedule IV	Resident
29	Intermediate Egret	Ardea intermedia	LC	Schedule IV	Resident
30	Common Myna	Acridotheres tristis	LC	Schedule IV	Resident
31	Pied Bushchat	Saxicola caprata	LC	Schedule IV	Resident

Sr. No.	Species	Scientific Name	IUCN Category	WPA Schedule	Ecological Status
32	Southern Coucal		LC	Schedule IV	Resident
33	Pheasant Tailed Jacana	Hydrophasianus chirurgus	LC	Schedule IV	Resident
34	Black Crowned Night Heron	Nycticorax nycticorax	LC	Schedule IV	Resident
35	Purple Heron	Ardea purpurea	LC	Schedule IV	Resident
36	Brahminy Kite	Haliastur indus	LC	Schedule I	Resident
37	Osprey	Pandion haliaetus	LC	Schedule I	Resident
38	Little Ringed Plover	Charadrius dubius	LC	Schedule IV	Resident
39	Common Sandpiper	Actitis hypoleucos	LC	Schedule IV	Resident
40	Grey Francolin	Francolinus pondicerianus	LC	Schedule IV	Resident
41	Black Headed Ibis	Threskiornis melanocephalus	NT	Schedule IV	Resident
42	White Throated Kingfisher	Halcyon smyrnensis	LC	Schedule IV	Resident
43	Streak ThroatedSwallow	Petrochelidon fluvicola	NA	Schedule IV	Resident
44	Wire Tailed Swallow	Hirundo smithii	LC	Schedule IV	Resident
45	Shikra	Accipiter badius	LC	Schedule I	Resident
46	Scarlet Minivet	Pericrocotus flammeus	LC	Schedule IV	Migratory
47	Plain Prinia	Prinia inornata	LC	Schedule IV	Resident
48	Ashy Prinia	Prinia socialis	LC	Schedule IV	Resident
49	Woolly Necked Stork	Ciconia episcopus	V	Schedule IV	Migratory
50	Ashy Crowned Sparrow Lark	Eremopterix griseus	LC	Schedule IV	Resident
51	House Sparrow	Passer domesticus	LC	Schedule IV	Resident
52	Jungle Crow	Corvus levaillantii	LC	Schedule IV	Resident
53	Eurasian Spoon Bill	Platalea leucorodia	LC	Schedule IV	Resident
54	Indian Rufous Tree Pie	Dendrocitta vagabunda	LC	Schedule I	Resident
55	Brahminy Starling	Sturnus pagodarum	LC	Schedule IV	Resident
56	Long tailed Shrike	Lanius schach	LC	Schedule IV	Resident
57	Indian Roller	Coracias benghalensis	LC	Schedule IV	Resident
58	Common Hawk-Cuckoo	Hierococcyx varius	LC	Schedule I	Resident
59	Oriental Magpie Robin	Copsychus saularis	LC	Schedule IV	Resident
60	Great Tit	Parus major	LC	Schedule IV	Migratory

Sr. No.	Species	Scientific Name	IUCN Category	WPA Schedule	Ecological Status
61	Asian Palm Swift	Cypsiurus balasiensis	LC	Schedule IV	Resident
62	Asian Koel	Eudynamys scolopaceus	LC	Schedule IV	Resident

- *LC: Least Concern*
- *V: Vulnerable*
- *NT: Near Threatened*

Ashy Prinia

Asian Koel

Weaver Bird

Black Crowned Night Heron

Drongo

Black headed ibis

Black Winged Kite

Black winged stilt

Brahminy Kite

Bronze Winged Jacana

Common Hawk Cuckoo

Common Iora

Common Quail

Indian Cormorant

Indian Cursor

Indian Golden Oriole

Indian Peafowl

Jungle Pirnia

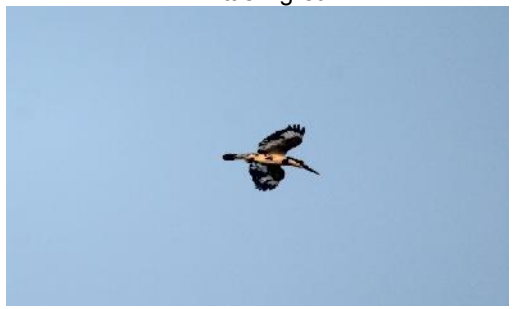
Laughing Dove

Little Cormorant

Little Egret

Paddy Field Pipit

Painted Stork



Pied Kingfisher

Red Rumped Swallow

River Tern

Red ring parakeet

Little Egret

Osprey

Short toed snake eagle

Rofous tailed lark

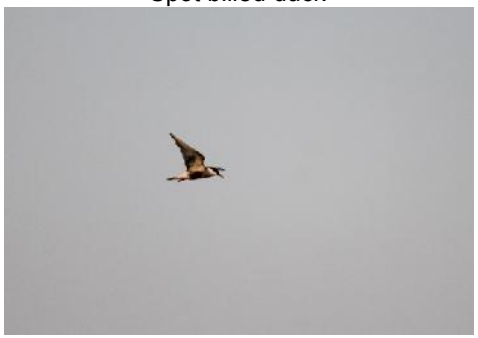
Sirkheer Malkhoa

Small Minivet

Spot billed duck

Tailor bird

Twany Bellied Babbler



Whiskered Tern

White breasted Kingfisher

Wire Tailed Swallow

Yellow billed babbler

Yellow Eyed Babbler

Roosting Sites of Flying Fox

4.10 Socio Economic Environment

This section describes the socioeconomic condition in the study area and relates the village level socioeconomic conditions with tehsil and district level. The objective of analysis of information at village, tehsil and district level is to identify the existing facilities and gaps at village level which can be considered as need of the study area. The following section discusses the methodology used for the socio-economic assessment.

4.10.1 Methodology

The social assessment was primarily based on the analysis of the secondary data obtained from the census survey (2011 and District statistical handbook), district portal website, community consultations and primary survey with the help of framed sample questionnaire for village profiling as referred in **Annexure III.** It was designed to capture occupational patterns, societal set up, access to basic amenities and socio - economic profiling of villages and communities. Considering the nature of the project operations and understanding of the demographic characteristics of the area from the secondary data.

4.10.1.1 Study Area

The proposed project is spread over on seven villages (including WTGs, Access roads, PSS and T. L.) which are comes under Jharasangam Mandal of Medak district in the state of Telangana. Total seven villages have been considered in the study area for socio economic profiling which are located within 5 km of the project site. The list of villages for which socio economic profiling has been carried out with their demographic profile is provided in below the **Table 4.6.**

Table 4-6: List of villages for Socio-economic profiling

Sl. No	State and District	Mandal/Tehsil	Village & Panchayat
1	Telangana and Medak	Jharasangam	Chilepalle
2			Chilkepalle
3			Yelgoi
4			Potpalle
5			Bardipur
6			Kuppanagar
7			Machnoor

4.10.2 Demographic profile

The demographic profile in terms of total population, number of households, household size and sex-ratio of the selected villages surveyed in study area has been discussed in section below and details are presented in **Annexure IV.**

4.10.2.1 Population and sex ratio

State: As per census 2011and Statistical Year Book 2015, the total population of Telangana is 351.94 Lakhs of which male and female are 177.04 Lakhs and 174.90 Lakhs respectively. Sex ratio in

Telangana is 988 i.e. for each 1000 male there is 988 females, which is more than national average of 940 as per census 2011.

Medak district: As per census 2011, respect to the district level, Medak has a population of 3,033,288 of which male and female are 1,523,030 and 1,510,258 respectively. With regards to sex ratio in Medak, it stood at 992 per 1000 male which is higher than average of state sex ratio 988. As presented in as details referred in **Annexure IV.**

Mandal: As per census, respect to the Mandal level, Jharasangam has a population of 44,583 of which male and female are 22,731 and 21,852 respectively. With regards to sex ratio in Jharasangam, it stood at 961 per 1000 male which is lowest to the average of district 992.

Study Areas Villages: As per census 2011, with respect to the study area villages, the total population of the area is 15,398 out of which 7825 are male and 7573 are females. Yelgoi village has a highest population of 3233 and Chilkepalle has a lowest population of 1123.

The average sex ratio in the study area villages is 973 which is lower as compared to average sex ratio of district Medak (992) and highest to the Mandal (961) . The lowest sex ratio has been recorded in Potpalle (937) and highest sex ratio has been recorded for Chilkepalle village (1038) followed by Machnoor (1006). Details as provided in **Annexure IV.**

4.10.2.2 Household size

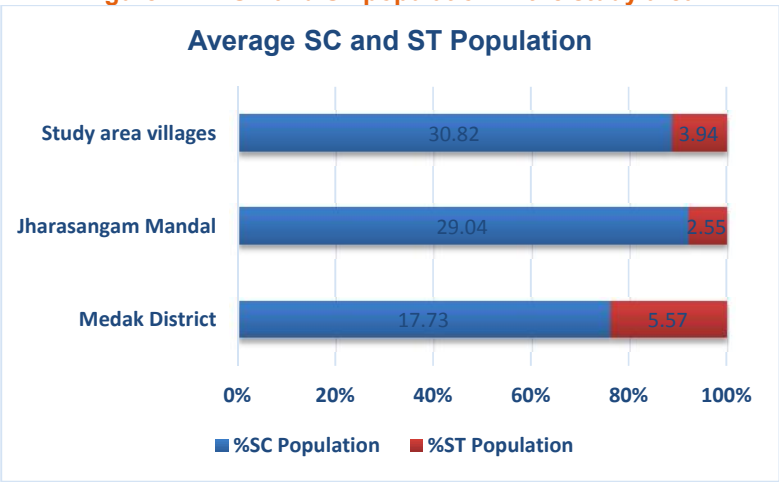
As per census 2011, an average house hold size of district Medak is 4.5 and in respect to Mandal Jharasangam (4.9). In respect to study area villages an average house hold size is 5.1 which is highest to the average of district (4.5). Details as provided in **Annexure IV.**

4.10.3 Schedule Caste and Schedule Tribes (SC/ST)

Mandal and District: As per census 2011, in respect to Medak district, the average SC and ST population constitute 17.73% and 5.57%. In respect to the Mandal Jharasangam SC and ST population constitute 29.04% and 2.55%, ST population is found to be lower than that of average of district (5.57%). as shown in **Figure 4.11**.

Study Areas Villages: As per census 2011, with respect to the study area villages, the average SC and ST population is 30.82% and 3.94% respectively as shown in **Fig 5-15**. Proportion of ST population is lower than the average proportion in District. ST population has not observed in Potpalle and Machnoor villages. The highest ST population recorded in Chillepalle village. Details of SC and ST population in the study area is given in **Annexure V.**

Figure 4-11: SC and ST population in the study area



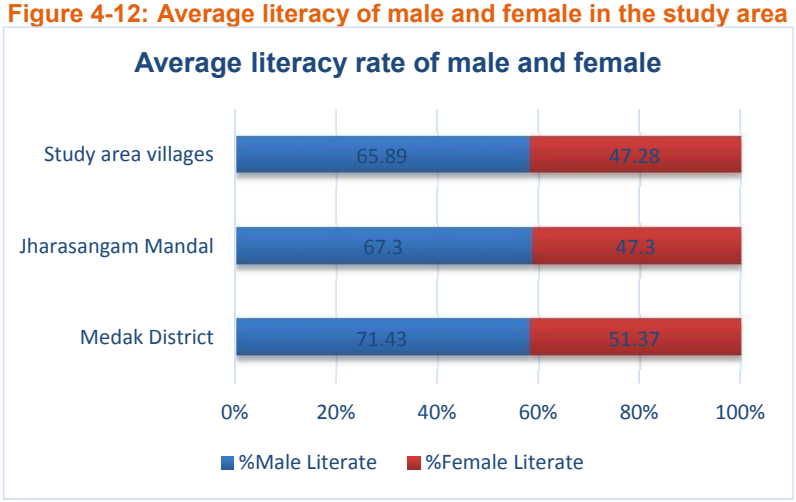
Source: census of India 2011

4.10.4 Literacy in the study area

District and Mandal: As per census 2011, average literacy rate of Medak district is 61.42 %. Of that, gender wise, male and female literacy is 71.43 and 51.37, respectively. With respect to Mandal level, an average literacy rate of Mandal Jharasangam is 57.49%, of that, gender wise male and female literacy is 67.30 and 47.34 respectively. As shown in **Fig 4.12.** Details as presented in **Annexure VI.**

Study Areas Villages: As per census 2011, with respect to study area villages, the average literacy rate of the villages is 56.63%. Gender wise male and female literacy is 65.89% and 47.28. The average literacy rate of study area is found to be below the average of district Medak (61.42%) and Mandal (57.49%), as shown in **Fig 4.12.** The maximum literacy rate is in Bardipur village (63.62%) and lowest literacy rate is observed in Machnoor village (52.88%).The lowest female literacy rate recorded for Chilkepalle village (42.75%).

Figure 4-12: Average literacy of male and female in the study area



Source: census of India 2011

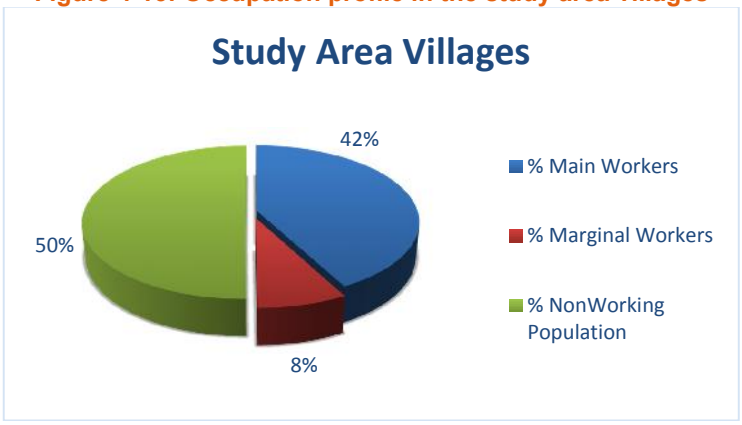
4.10.5 Workforce participation and occupation

Medak district: As per census 2011, the work participation rate in the district is 58.10 % and 41.90 %, respectively, for males and females. The district primarily depends on agriculture; with 52.6% of the workforce working as agricultural labourers and cultivators. In all, 29.17% and 23.43% of the total population constitutes agricultural labour and cultivators. However, an average 26.58 % of other workers in the district indicates that it is also the main source of livelihood. Household workers in the district are 3.71 % which is below the average of agriculture and cultivators.

Jharasangam Mandal: As per census 2011, with respect to the Mandal level, Agriculture labour (47.80%) and Cultivators (18.06 %) its reveal that major source of livelihood in Jharasangam Mandal. Other work force participation rates of Mandal is 15.41% it's also reveal that another main source of livelihood. Household workers in the mandal is 0.83%.

Study area villages: As per Census 2011, with respect to the study area villages, the average percentage of agriculture labours, cultivator and other workforce participation are 52.43%, 13.82% and 16.63 % respectively. House hold workers in the study villages is 0.97%. Comparative analysis of workforce participation data with the district and Mandal data shows that major livelihood in the study area is related to agriculture. Majority of the population in the study area villages depends on agricultural activities and work as agricultural labourers. Among the working population in the study area villages, about 83.85% has been designated as Main workers while the remaining 16.15% are designated as Marginal workers. The distribution of main and marginal worker is depicted in **Figure-4.13.**Details of work force participation of district, mandal and village level has provided in **Annexure VII.**

Figure 4-13: Occupation profile in the study area villages



Source: census of India 2011

4.10.5.1 Female workforce participation

The female work participation in Andhra Pradesh is lower than that of male but is the highest amongst all the states in India. However, the women workers in the state are not placed better economically since the workforce is concentrated in activities which are unorganized, informal, seasonal, insecure, menial and poorly paid. There is also significant wage disparity between the males and the females.

In respect to Medak district, around 42% female workforce participation in the district. On the other hand, female labours are engaged in hulking, thinning, sowing, weeding, plant protection, grading, kitchen gardening, cleaning of grains, harvesting, feeding the cattle, irrigating fields, taking care of livestock, collection of flowers, growing vegetables and partially engaged with SHGs etc.

4.10.5.2 SHGs Concept

"According to the National Bank for Agriculture and Rural Development (NABARD), a self-help group is a small economically homogeneous and affinity group of rural poor voluntarily coming together: to save small amounts regularly; to mutually agree to contribute to a common fund; to meet their emergency needs; to have collective decision making; to solve conflicts through collective leadership and mutual discussion"

As per DRDA-IKP Medak district portal site, as on 2013-14 total SHGs no. 40,266 with 4,59,342 has been formed and linked with different bank branches of district. SHGs were trained on SHG concept & management, meeting process, conflict resolution and fund management. Indira Kranti Patham (IKP) is a statewide poverty reduction project to enable the rural poor to improve their livelihoods and quality of life through their own organizations. It aims to cover all the rural poor households in the state with a special focus on the 30 lakhs poorest of the poor households. Many schemes are being implemented in the district for the women empowerment as shown in **Table 4.7 .**

Table 4-7: Some Important Schemes for SHGs in Medak district

Sl. No.	Name of the Schemes (IKP)	Benefits
1	Institution Building (**I.B.**)	Formation of Self Help Groups,imparting trainings to the members and strengthening the SHGs.
2	SHG Bank Linkage (**B.L.**)	Providing loans to the SHGsfrom Banks, ensuring repayments,PavalaVaddi and interest free loans to the eligible SHGs.
3	Sthreenidhi	Providing loans to the New SHGs from SthreenidhiBank.
4	Insurance	Coverage of Insurance to all eligible members of the SHGs and settlement of claims. Providing Scholarships to the children who are studying **IX** to **Intermediate**.
5	Dairy	Formation of DJLG, providing subsidy to the DJLGs @ Rs.1.25 lakhs for SC/ST Groups and @ Rs.1.00 lakh to the others for establishment of Pala Pragathi Kendralu so as to strengthen the groups economically.

Source; DRDA-IKP Medak district portal site, 2013-14

Consultation with SHGs members

Significance number of Self Help Groups (SHGs)/ Mahila Mandal formed in every consulted villages. During consultation with SHGs members of three groups (Vankatswar, Bhawani and Chamamti group) at Chilkepalle village it was observed that, total 25 SHGs has been formed at village level and maximum SHGs were linked with banks and taken loans for farming, livestock, dairy, poultry farm, inter group finance on petty interest, and small business purpose. The average 10 members in each group. The consulted groups were taken bank loan up to 1 lakh to 4 lakh under Sthree Nidhi scheme. SHGs were invested bank loan for running poultry farm and sheeping & goatery purpose. They also engaged in NRGES scheme in the area. Drinking water availability is main concern in the village as reported by female participants.

4.10.6 Livelihood source

As per Socio-Economic survey of A.P. 2013-2014, Agriculture plays a crucial role in the economy of Andhra Pradesh. Large segment of the population is dependent on the agriculture sector for employment and income. Agriculture which is mostly rainfed has been the main livelihood occupation of the farmers in the State. In respect to the Medak district, agriculture sector plays an important role in the economy of the district. About 80% of the district population depends on agriculture for their livelihood. As per 2011 census, 76.00 % population of Medak districts lives in rural areas of villages. There is fruit production on large scale in the district like Mango, Papain for industrial use. The district has a good poultry population and significant egg production. Stone quarry and sand are found to be common in the district.

During consultation it was confirmed that, cropping pattern is fully dependent on rain from June-September. Mainly single cropping pattern in the area is practiced. Farmers are engaged during this period after that they work under NRGES and Govt. programs which are running in the area. It was also reported that many people from the study area villages goes to nearby Piramal Health Centre, stone cursing unit and sugar mill in the district and some of migrated to other city like Hyderbabad, Bangalore and other state for other jobs.

a. ***Agriculture and cropping pattern****:* as per district contingency plan, major crops grown in the district are rice, sugarcane, ground nut and cotton under irrigated conditions while ground nut, maize, jowar, sun flower, red gram, bengal gram, and cotton crops under rainfed conditions. Maize, jowar and cotton are the major rain fed crop in the district. Productivity, production and yield price of major crops in the Medak district and study area villages for both season (Kharif and Rabi) (average of last 5 years 04, 05, 06, 07 and 08) is presented in below **Table: 4.8.**

Table 4-8: Production and productivity of major crops and price

Sl. No.	Crops	Medak District		Consulted Villages	
		Production ('000t)	Productivity (Kg/ha)	Productivity (Kg/Acre)	Yield/Price/ Quintal
1	Rice	281.49	3033	400-500	1200
2	Maiize	428.9	4222		
3	Sugarcane	4173.5	80107		
4	Jowar	54.9	1228		
5	Groundnut	55.3	995	1500	1500-1700
6	Sunflower	-	-	-	-
7	Bengal gram	37.4	993	-	-
8	Onion	72.873	17000	600	800
9	Red gram	12.0	504	-	-
10	Cotton	-	-	1000	3000
11	Pulse	-	-	1500	12000

Source*: Comprehensive District Agricultural Plan, Medak district and community consultation*

Photo 4-1: Sugarcane cropping in study area

Photo 4-2: Mango orchard in nearby project area

b. ***Livestock:*** About 29 lakh families in Telangana State are engaged in livestock sector for their livelihood. Medak is one of the most important districts for supply of milk, meat and egg production to the state capital, as it is situated quite near to the state capital. Total livestock population in the district is 23.43 lakhs and total poultry population is 86.38 lakhs.

During community consultation, it was observed that, the consulted villages has large populations of livestock and small ruminants. Buffaloes, cow, sheep's, goats and bull are the primary livestock. Sheep and goat rearing is the one of the main occupation of the shepherd community in the study area villages. Significance number of poultry farms has presence in study area villages. Shepherd community are used open shrub, government land, forest area and non-cultivated land for grazing purpose of livestock.

Livestock presence in study area villages

4.10.6.1 Land holding

As per CDAP Medak, the small, semi and marginal farmers dominate the number of holdings in the district. They together have a share of 93% in the total holdings in the district. A statement showing the category wise number of farm holdings and area of operational holdings of district and mandal is furnished in **Table 4-9.** The average size of land holding is .93 ha in the district. During consultation with community it was observed that, the average about 2-3 acre land holding size in study area villages. The detailed information of land utilization in project influenced villages is shown in **Table 4-9.**

Table 4-9: Estimated land holding in Jharasangam mandal and Medak district

Sl. No	Size group(ha)	Medak district		Jharasangam Mandal	
		Total holdings		Total holdings	
		Number	Area(ha)	Number	Area (ha)
1	Marginal Farmers (Below 1 Ha)	465100	198484	7308	3889
2	Small Farmers (1-2 Ha)	148880	207685	3831	5501
3	Semi-Medium (2.0 - 3.99)	53339	140625	1655	4369
4	Medium Farmers (2-10 Ha)	15415	87110	504	2879
5	Large Farmers (>10 Ha)	1809	29028	53	770
	ALL GROUPS	**684543**	**662932**	**13351**	**17408**

Source: http://agcensus.nic.in/2010-11

Table 4-10: Estimated land holding size in study area villages

Village	Total Geographical Area (Ha)	Net Area Sown (Ha)	Forest Area (in Ha)	Barren & Un-cultivable Land Area (Ha)	Permanent Pastures and Other Grazing Land Area (Ha)	Culturable Waste Land Area (Ha)	Fallows Land other than Current Fallows Area (Ha)	Current Fallows Area (Ha)	Total Unirrigated Land Area (Ha)	Area Irrigated by Source (Ha)
Chilepalle	755	568.4	97.9	0	0	48.6	0	0	544.12	24.28
Chilkepalle	681	501	0	0	0	40	0	0	454.5	46.5
Yelgoi	1435	1181.1	0	0	0	120	0	0	994.95	186.15
Potpalle	838	0	0	0	0	140	0	638	455.9	182.1
Bardipur	411	219.7	93.6	0	0	60	0	0	86.96	132.74
Kuppanagar	1064	0	74.8	162.1	0	40	675.6	0	563.9	111.7
Machnoor	1227	1013.9	0	0	0	111.9	0	0	826.5	187.4

Source: District Census Hand Books-villages 2011

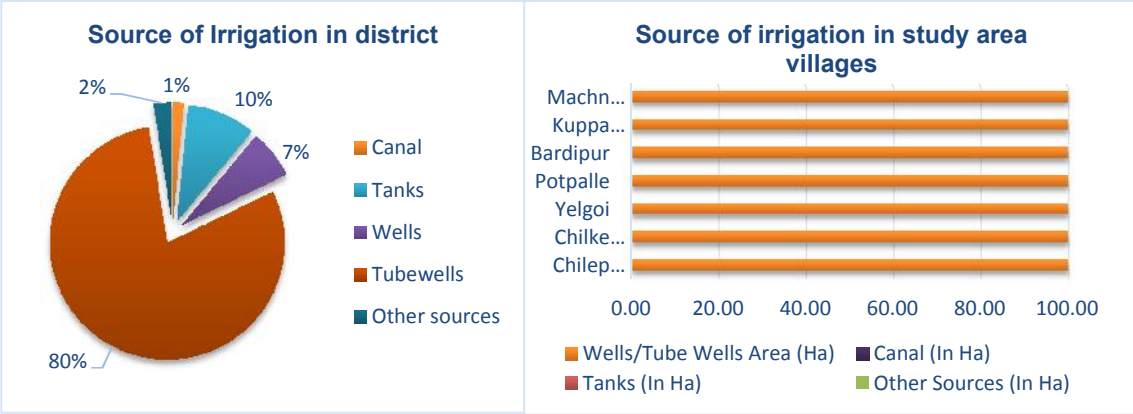
4.10.6.2 Irrigation

As per CDAP Medak and Agriculture census 2010-11, there are no major irrigation projects in the district. 1.72 lakh ha is irrigated by different sources. Medak district is one of the drought prone districts of Rayalaseema region. The details of area irrigated by different sources are given in **Figure 4-14.** Nearly 80% of the area is irrigated by tube wells only. The next important source of irrigation is tanks 10%. Canals have only got a share of 1%. Wells account for 7% in the total irrigated area. Other source have a small share of 2%.

During consultation and DCHB 2011, it was observed that, agriculture is dependent on rain and tube wells are the main source of irrigation in the project area villages. In the consulted villages adequate

irrigation facilities were not available. However, significance number of farmers have their own tube wells and rest are only dependent on rainfall for cropping.

Figure 4-14: Source of irrigation in the district and study area villages



Source: Agriculture census 2010-11 and DCHB-2011

- ***Minor irrigation schemes in Medak district:*** As per Comprehensive District Agricultural Plan, Medak, there are 582 M.I tanks irrigating more than 100 ha each with a total settled ayacut of 54452 ha. Besides these, 6207 M.I. tanks with settled ayacut of less than 100 ha each are also functional. For the three years period, 2004-05 to 2006-07.

  During site visit it was observed that, Govt. has provision to provide bore wells, drip irrigation system and sprinkler on subsidize rate 50-90% to the SC & ST and BC (backward caste) farmers.

4.10.6.3 Vulnerability

"Groups that experience a higher risk of poverty and social exclusion than the general population. Ethnic minorities, migrants, disabled people, the homeless, those struggling with substance abuse, isolated elderly people and children all often face difficulties that can lead to further social exclusion, such as low levels of education and unemployment or under employment."

During dialogue with community members of Chilepalle, Chilkepalle and Machnoor village it was observed that, some vulnerable group like landless family, physically handicapped and widows are available in three consulted villages as shown in following **Table 4.11.** Government provides pension to those who comes in vulnerable group especially for widow and physically handicapped persons.

Table 4-11: Village wise vulnerable group

Sl. No.	Village Name	Vulnerable group (lump sum)		
		Widows	Physically handicapped	Landless HH/ homeless HH
1	Chilepalle	40	13	10
2	Chilkepalle	56	21	-
3	Machnoor	156	20	15

Source: primary consultation

The project proponent may be required to focus on providing employment opportunity to the vulnerable community members and also the implementation of programme under CSR activity for them. During

dialogue with Hero Future project land team, it was confirmed that, land has not taken from the vulnerable HHs family.

4.10.7 Social Infrastructure

Village and district level integrated education, health and basic amenities data available as per census 2011 (District Census Hand Book), it is described in following the below section. Village wise details amenities as per census 2011 provided in **Annexure VIII.**

4.10.7.1 Education

As per district census hand book 2011, Medak district having there are 13 Engineering Colleges; six management institute; 16 Vocational training school /ITI, two Polytechnic, one medical college, 7 degree college; 13 senior secondary schools; 418 secondary schools; 778 middle schools; and 1187 primary schools.

In the study area villages it was observed that, all villages are equipped with primary school. Five villages having middle schools except Chilkepalle and Machnoor villages. Govt. secondary schools are presence in only three villages (Yelgoi, Bardipur and Kupanagar). Other Graduate colleges and vocational training and ITI collages are available at Jharasangam and Zahirabad which is more than 10 km distance from the project area villages. Consultation with school staff was not possible due to summer vacation.

Primary school at Chilkepalle village

4.10.7.2 Health

As per district census hand book 2011, Medak district having two Community Health Centre (CHC), 75 primary health centre (PHC) and 402 primary health sub centre. About 42 mobile health clinic and one family welfare centre is also presence in the district.

As per district census hand book 2011, Yelgoi village have only the PHC is available. Primary health sub centre is available in only two villages Yelgoi and Kuppanagar. However, health care facilities were not adequate at village level as reported by community. People have to travel primary health centre at Jharasangam and Zaheerabad for treatment in case of emergency situation, which is located at more than 10-20 km distance from the project area villages. The closest Community Health Centre and private clinic available at Zahirabad which is located at more than 10 km distance from the project area villages. Joint pain is main concern in the study area villages. The details are presented in **Annexure VIII.**

4.10.7.3 Drinking water and sanitation

Ground water in the form of bore wells, tap and hand pumps the main source for drinking water in the district. As per Central Ground Water Board report 2013, the available of ground water has fluoride content. During consultation it was observed that, tap water, hand pumps and bore wells are main source for drinking in the study area villages. Ground water depth is more than 400 ft in the consulted villages. Chilkepalle village have only one bore wells for drinking and domestic purpose, which is not sufficient for all households. Ground water has contaminated with fluoride due to chemical discharge by Piramal health centre as reported by community members. The details are presented in **Annexure *VIII.***

Drinking water source at village level

During consultation it was observed that, about 20-40 % households' access to sanitation facility among the consulted villages and rest of 60% house hold use open defecation. However, Sanitation scheme under Swach Bharat mission is being implemented in the area.

4.10.7.4 Transport and Communication

District Headquarter Medak is well connected by road, Zahirabad, Siddipet, Sangareddy are the cities in this district having road connectivity to major towns and remote villages. Some of the rail way stations in district are Chandanagar, Manoharabad, Mirzapali, Akanapet, Nagalapalle, Zahirabad which connects most of the towns and villages in the District. APSRTC runs busses from major cities to towns and villages in this district. Regarding communication, post offices are not available in seven study area villages. However, availability of sub post offices is only in 4 out of the 7 study area villages.

Transportation facility in study area

During site visit & consultation it was observed that, all villages are connected with major district road (MDR). However, village inter access roads are not adequate (mixed and unpaved road mostly). Local bus service is sole mode of transportation for the people of the study area villages. The details are presented in ***Annexure VIII.***

4.10.7.5 Power supply

As per annual report 2013- 2014 published by Power & Energy Division (Planning Commission Government of India), Andhra Pradesh state has been declared as completely electrified (including Tenagana state) i.e. 100 percent villages are electrified. As per DCHB 2011, in the all study area villages electricity facility available for domestic and agriculture purpose both. The details are presented in **Annexure *VIII.***

During consultation with community it was observed that, about 9 hours of power supply for agriculture purpose and more than 20 hours of power supply available in the study area villages.

4.10.7.6 Common Property Resource (CPR)

During site visit it was observed that, significance number of CPR like cremation ground, pond religious and worship place presence in every consulted villages. Community ponds and cremation ground available among the villages. WTG location no. 15 nearby a tomb which is around 300 mtr from away. However, access road of graveyard was separate. It was also confirmed that, due to WTG erections CPR will not be affected.

4.10.7.7 Cultural and historical heritage in the district

As per archaeology survey of India and department of archaeology & museum, Telangana, total 31 protected monuments sites identified in the district. Details as provided in **Annexure *IX.*** Three protected monuments site out of 31, these are located in Jharasangam and Zahirabad mandal which are more than 5 km away from project influenced villages. As given in **Table 4.12.** During site visit it was confirmed that, it will not be impacted due to proposed wind project.

Table 4-12: Protected Monuments in district

Sl. No.	Name of the Monument	Location	Distance from the Project site (Approx. Km)
1	Sri Venkateswara Rukmini Panduranga Temple	GadiMohalla, Zaheerabad, Medak	10
2	Sri Sangameshwar Temple	Mogudampally (Up_p_arpally tanda), Zaheerabad, Medak	10
3	Sri Basaweshwara Swamy Temple	Jharasangam	5

Source; archaeology survey of India and department of archaeology & museum, Telangana

4.10.8 Some important and employment generation schemes in district

- MAHATMA GANDHI NATIONAL RURAL EMPLOYMENT GUARANTEE SCHEME (MNREGS)

  Under this scheme, enhancement of livelihood security of the households in rural areas of the country by providing at least one hundred days of guaranteed wage employment in every financial year to every household whose adult members volunteer to do unskilled manual work.
- PRIME MINISTER'S EMPLOYMENT GENERATION PROGRAMME (PMEGP)

  PMEGP has been announced on 15th August, 2008 and launched in place of REGP Scheme. PMEGP is a credit-linked subsidy programme launched by Ministry of MSME in 2008-09 for creation of employment in both rural and urban area of the country.
- INTEGRATED WATERSHED MANAGEMENT PROGRAMME (IWMP)

  Improvement of Rural livelihoods through participatory Watershed Development with focus on integrated farming system for enhancing income, productivity and livelihood security in sustainable manner along with soil and water conservation is aim of Watershed Development.
- SWARNA JAYANTHI GRAM SSWAROZGAR YOJANA (S.G.S.Y.)

  Subsidy @ Rs.10000/- provided to the SCs/STs swarozgaries and @ Rs.7500/- provided to the BCs and others
- SOCIAL SECURITY PENSIONS (S.S.P)

  Under this scheme, pension amount from Rs.200/- to Rs.1000/- per month to Old Age, Widow, Weavers, is being provided. Rs.1500/- to the Disabled persons and eligible members under Abhayahastham scheme.

- NATIONAL FAMILY BENEFIT SCHEME (N.F.B.S.)

  Under this scheme financial Assistance @Rs.5, 000/- provided to the BPL family of deceased person.
- RAJIV YUVAKIRANALU

  Rajiv Yuva Kiranalu is conceived by the Govt. of Andhra Pradesh (further continued by Telangana Govt. after partition from A.P.) to build job specific skills among the unemployed and place them in appropriate private jobs.
-

4.10.9 STAKEHOLDER CONSULTATION

A community consultation was carried out in three villages out of the seven identified study area within a project area, for collecting detailed information about prevailing socio-economic condition in the study area, demographic features and composition of the population, infrastructure amenities available in the villages and also to assess awareness, opinion and reaction of the inhabitants about the project. Consultations were also conducted with land owners, village panchayats members, village secretory, community, SHGs, Health Centre, land developer and Project proponent team. The list of stakeholder consulted for the proposed project is provided in **Table 4-13.** The details stakeholder's participant's list is provided as an **Annex-VII.**

Table 4-13: Consultation with different stakeholders

Sl. No.	Stakeholder type	Designation	Consultation type	Village/Department/Address
1	Community	Land sellers	One to one	Chillkepalle
2				Chillepalle
3				Machnoor
4		Village president, other community members	One to one and group discussion	Chillepalle
5				Chillkepalle
6		SHGs members	Group discussion	Chillkepalle
7	Local Govt. institution	Village secretory	One to one	Chillkepalle
8				Chillepalle
9				Machnoor
10	Forest Department			Zahirabad
11	Land developer	Site in charge	Telephonic conversation	Enerfra India Pvt. Ltd., Hyderabad

Source; primary consultation

4.10.9.1 Consultation with land developer

During dialogue with Mr.KR Sriniwas who is representative land developer (Enerfra India Pvt. Ltd) of over on telephone conversation due to unviability on site it was informed that, private land has purchased for 15 WTG location including access road on willing buyer and willing seller basis. The compensation for the purchased land is reportedly above the existing government circle and market rate. Land aggregator has involved during the purchase. Majority of purchased land was non-cultivated, barren and undulating type.

4.10.9.2 Consultation with land owners

Consultation with land owners from the only one village were held on 14 April'16 at neutral place of Chilkepale. Consultation with 3 landowners out of the 16 which was sale deed completed. Private land has been purchased for all 15 WTG locations. Based on land owner's consultation, Sale deed was signed after mutual agreement between the landowners and M/s Enerfra India Pvt. Ltd. Average land holding size in the project area villages is around 3-4 acre per household. The sold land is mostly single cropped and only rainfed, without any irrigation system. However, limited farmers have numbers of borewlls facilities are available in the project area villages. During consultations, the landowners reported that the land sale is on willing buyer – willing seller basis. Only one land owners out of three reported to purchase another residential parcels in Hyderabad city. Two landowners to use money to pay bank loan which they taken for agricultural purpose, FD and daughter marriage. Details of consulted land owners is provided in ***Annexure* X.**

4.10.10 Grievance Redressal Mechanism (GRM) and Public Discloser

Proposed wind project was under construction during ESIA study. Grievance register were not in place. Project related grievances has addressed by M/s Enerfra land team and Hero project site team. Grievance redressal mechanism should be maintained at site to record all grievances. Further, Hero has developed grievance redressal mechanism procedure to be followed at site to be implemented during construction and operation phases. Community Grievance Register & Procedure described in **Annexure XV.**

Public disclosure about the proposed wind project was not conducted, however, during land purchase process and NOC taken from the village panchayat, it was learnt that villagers were aware of the upcoming project.

4.10.11 Community development Plan under CSR

CSR initiatives has not been taken by HERO in project area villages when the site visit was conducted. However, HERO has a CSR policy with focus area on basic education, drinking water and community health. As reported by Hero, site specific CSR will be implemented by dedicated team. HERO CSR policy is attached as **Annexure XI**.

4.10.12 Recommendations for CSR activities based on need assessment of the Study Area

Analysis of above socio economics description and community consultation in project area villages reveals that concern of villagers are linked with the fulfilment of basic needs and improvement of some infrastructural facilities at community levels. On the basis of discussion with village communities, following needs have been identified which can be addressed by an adequate CSR activities given in **Table 5.1**4:

Table 4-14: Key needs/gaps identified and recommendation for CSR activity

Key Areas	Needs identified	Recommendation for CSR
Drinking water	• Need of alternate clean drinking water sources in addition to bore wells.	• Providing additional bore wells in project affected villages with help of concerned government dept.

Key Areas	Needs identified	Recommendation for CSR
		• Providing R.O treated water in Chilkepalle, Chilepalle and Machnoor villags
Health	• Provision of Health facility is in study area villages	• Organizing awareness camp on water contamination. • Health camps or mobile health clinics can be provided.
Employment opportunities in the area	• Need to have more employment opportunities in the study area.	• Organizing training/capacity building programme for SHGs regarding entrepreneurship and linkages with bank. • Introduction of processing of dairy and other produce related to livestock.

4.10.12.1 Key findings of consultation

- The economy of the project area is mainly depend on rain fed agriculture and main workers are engaged as agriculture labors and cultivators
- Main crops includes sunflower, cotton, maize, paddy, sugarcane.
- Significant number of Self Help Groups/Mahila Mandal are present in most of the project area villages.
- The consulted villages has large population of livestock and small ruminants.
- Ground water is the sole source of drinking and domestic water as reported during consultation.
- Consultation with community revealed that ground water is contaminated with high concentration of fluoride.
- There is only one Primary Health Center (PHC) in seven study area villages located in Machnoor village.
- Road connectivity within the study area villages is good. Most of the WTG locations would be reached via village naksha road.
- Only private land is involved for developing the proposed project
- Sanitation conditions in study area villages is inadequate. On an average 20-40% household have access to sanitation facilities.
- NOC from Gram Panchayat obtained from six villages viz Bardipur, Chilkepalle, Chilepalle, Koppanagar, Machnoor and Yalgoi for the proposed project for developing and using existing internal village road and 33KV electrical line in various area of villages, develop village naksha road and can alter the same in terms of movement of heavy logistic vehicle in the limits of Gram Panchyats

5 ANALYSIS OF ALTERNATIVES AND SITE SELECTION

The section gives analysis of alternatives with respect to the proposed project. The following scenarios have been considered:

- Current or No project Scenario
- Alternate methods of power generation;
- Alternate Location for the proposed project; and

5.1 Current or No project scenario

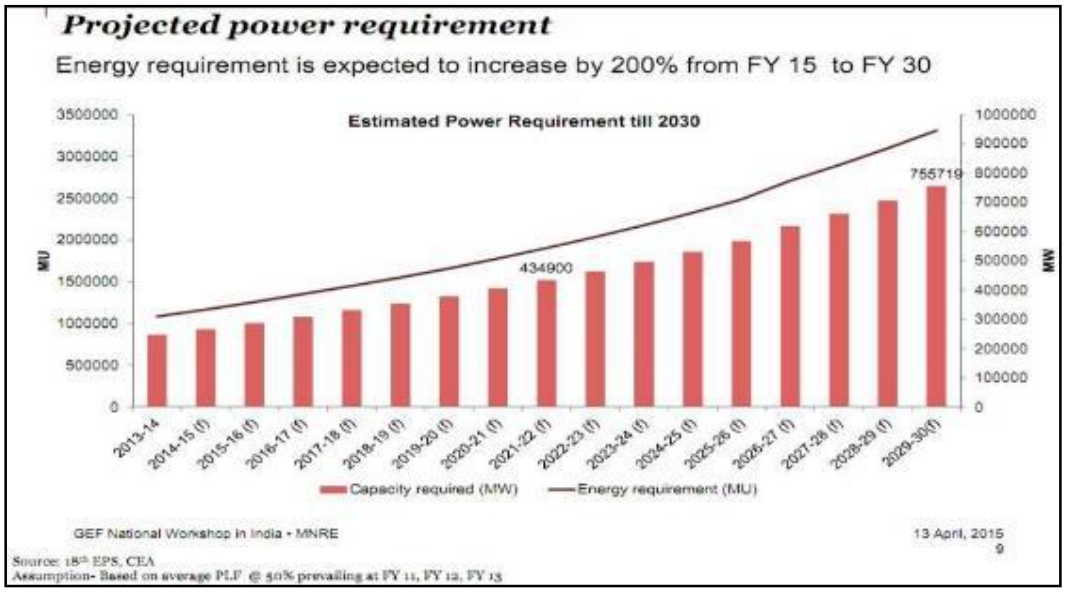
The all India gross electricity generation from utilities, excluding that from the captive generating plants, was 6,23,819 Giga Watt-Hours (GWh) during 2005-06. It rose to 1,022,614 GWh during 2013-14. The production of electricity from utilities has increased from 9,63,811 GWh during 2012-13 to 1,022,614 GWh during 2013-14, registering an annual growth rate of about 6.10%.The total potential for renewable power generation in the country as on 31.03.14 is estimated at 147615 MW. This includes wind power potential of 102772 MW (69.6%), SHP (small-hyd ro power) potential of 19749 MW (13.38%), Biomass power potential of 17,538 MW (11.88%) and 5000 MW (3.39%) from bagasse-based cogeneration in sugar mills.

With many bilateral nuclear agreements in place, India is expected to become a major hub for manufacturing and associated components. Foreign participation in the development and financing of generation and transmission assets, engineering services, equipment supply and technology collaboration in nuclear and clean coal technologies is also expected to increase. During 11th Five Year Plan nearly 55,000 MW of new energy generation capacity was created, yet there continued to be overall energy deficit of 8.7% and peak shortage of 9.0%. Thus to cater to increasing demand of power, renewable energy projects are favoured and various states are coming forward with schemes promoting renewable energy.

5.2 Energy Security:

In 2007 the Ministry of Environment Forests and Climate Change (MoEFCC), Ministry of Power (MoP) and the Bureau of Energy Efficiency (BEE) issued a paper entitled ‘India: Addressing Energy Security and Climate Change’. In India the need for expanding the role of domestic Renewable Energy (RE) sources is a logical next step. Wind power is already in a position to provide a significant portion of India’s planned capacity addition up to 2030, with simple regulatory and grid modernization initiatives. Unlike oil, coal or LNG, wind power is not subject to fluctuating fuel prices which drain India’s limited foreign reserves, and in addition, wind power helps in reducing the carbon footprint of the economy. In the Figure 5.1, India’s projected power requirement uptil 2030 has been indicated.

Figure 5-1: India's Projected Power Requirement



5.3 Power Scenario in Telengana

At a meeting to review the power sector in the state held on 4th February the Telangana Chief Minister said that the government has worked out medium- and long-term plans to ensure it becomes a power surplus State within three years. By 2018 the State would achieve a generation capacity of 21,350 MW in the thermal sector and with hydel power; the total installed capacity will be around 24,000 MW. TSGENCO will be allocated Rs. 1,000 crore in the budget to be announced for the next financial year (2015-16).

As against the current requirement of 6,000 MW, the available capacity is 4,300 MW and the rest is being bridged with supplies from other sources, including Central generating stations. During the rabi crop season and the summer months, the State is likely to face demand- supply gap and this would be potentially met with additional purchases. By next year, the State will be able to procure about 1,000 MW from Chhattisgarh. The power plant of Singareni Collieries is likely to contribute around 1,000 MW.

Source: Central Electricity Authority Databas

5.4 Promotion of Renewable Energy in Karnataka

To improve this power shortage scenario, state government has provided financial support of INR 10,289 Crores for power sector mainly for coal-based capacity. However projects based on coal are expected to get delayed due to environmental concerns and coal shortages. To overcome this, the state government is aggressively exploring accelerated capacity addition of renewable projects in the state. The Telengana Renewable Energy Development Corporation Limited (TNREDCL) is an organization working to promote renewable energy in the state.

5.5 Alternate Methods of Power Generation

There are various non-renewable and renewable energy sources which can be utilized for power generation. Each option has its own advantages and disadvantages. Based on the site conditions, availability of resources, environmental & social concerns and project cost, suitable option for power generation need to be selected. Comparison of advantages and disadvantages of various non-renewable and renewable energy is represented in table given below.

Source of Energy	Advantages	Disadvantages
Coal	• Relatively cheap form of energy availability in large scale worldwide • Easily transported to power stations • GHG emission as low as 756 tonnes CO2e/GWh	• Non-renewable energy source • Large water requirement • High emission and generation of fly ash • When burned, coal releases lots of greenhouse gases • Mining of coal causes impacts on land and surrounding environment.
Oil & Gas	• Oil and natural gas are found in lots of places around the world. • Oil and gas can be easily transported by pipes or ships. • Natural gas is the “cleanest” of the fossil fuels • GHG emission as low as 547 and 362 tonnes CO2e/GWh for oil & gas	• Non-renewable energy source • Working environment risks to staff and environment • Burning oil and gas releases can cause pollution & health impacts
Nuclear	• Nuclear fuel does not create greenhouse gases when making energy. • Only a very small amount of nuclear fuel is needed to make a lot of energy. • Does not produce significant atmospheric pollutants. • GHG emission as low as 2 tonnes CO2e/GWh	• Expensive, especially in capital • costs, maintenance costs and safety issues • The waste produced from nuclear energy is radioactive and Safe long-term disposal of nuclear waste can be difficult.
Solar	• Energy from the sun is exhaustive & free. • Solar energy does not create greenhouse gases.	• Solar power stations are expensive to build at the moment. • Only specified places are suitable for solar power.

Source of Energy	Advantages	Disadvantages
	• GHG emission as low as 13 tonnes CO2e/GWh	• Solar energy cannot be made at night
Wind	• Wind power does not create greenhouse gases. • The energy used to build one of the large turbines is repaid in 3-6 months. They last for 25 years. • GHG emission as low as 6 tonnes CO2e/GWh	• Needs a required of turbines to make electricity. • Wind turbines can only be used where wind potential is available. On days where there is little wind, less energy will be generated.
Hydroelectric	• Hydroelectricity creates no greenhouse gases. • Energy from water is free and will not run out. • Hydroelectric energy is more reliable than wind or solar power. • GHG emission as low as 2 tonnes • CO2e/GWh	• Hydroelectric power needs enough water to turn the turbines. • Dams are expensive to build. • Building large dams can cause damage to water courses which affects people and wildlife and it can be difficult to find the right site. • Small dams for local buildings on weirs do not have these problems.
Biomass	• Biomass fuel is cheap and could use rubbish that we might otherwise throw away. • Biomass fuels will not run out. • Biomass crops that are grown absorb the same amount of pollution whilst they are growing as they release when they are burned, so do not create extra greenhouse gases in the atmosphere. • GHG emission as low as 10 tonnes CO2e/GWh	• Growing biomass crops needs a lot of space and could replace growing valuable food crops. • Biomass fuels that are not grown (such as waste products) create greenhouse gases when burned.

The conventional sources of power generation have high environmental cost when compared to non-conventional sources like wind, solar, hydro, etc. its construction periods are longer with higher environmental risks from emissions. On the contrary power source from wind energy is most eco-friendly mode available for power generation. It does not have any kind of emissions during operation. As per MNRE, 2015, the installed capacity of wind power in India until March 2016 is 26773 MW. The power generation with wind energy is a clean power with no emissions and feasible for the proposed project area keeping in mind the good wind potential of Andhra Pradesh throughout the year.

5.6 Alternate Location for the Project

Wind energy projects are site specific and its feasibility depends on a number of factors which can be broadly categorized as wind resource assessment, land availability, cost of land and impact on community.

5.6.1 Identification of sites for WTG's

As per Telangana Renewable Energy Development Corporation Limited (TNREDCL), Telangana has good potential for wind power development with wind power density of 217 W/m2 at 50 m height.

The key factors considered for the final selection of WTG sites included the following:

- The locations selected for wind turbine erections mostly fall on arid & rain fed agricultural land.
- Privately owned land is selected for WTG sites, creating access routes and erection of transmission towers.
- The WTG locations were selected keeping in mind the distance from settlements. The proposed sites for WTGs are located away from major settlements. Care has been taken find location that fulfils the minimum distance requirement and cause minimal inconvenience in terms of visual intrusions, noise, and shadow flicker.
- Absence of any ecologically sensitive area such as national park, wildlife sanctuary within 5 km radius of the entire project site makes it a suitable choice for having wind farm.
- The distance of the wind mill turbines from the highways, village habitation shall be at a safe distance, and in normal course, a distance of 300 m would be considered safe.

5.6.2 Alternate routes for transmission lines

Laying of transmission line comprises of 220 KV line up to the grid substation from the proposed pooling substation.

The route for the transmission line has been selected keeping in mind the following factors:

- Transmission line route is planned to avoid any habitations along the route;
- No house or community structures are located under the transmission line;
- Areas requiring extensive clearing of vegetation have been avoided;
- Selection of the transmission route avoids any environmental sensitive site like schools, health centres, etc.;
- Right of way/access roads will be shared with the common user of the substation.

The shortest possible route after considering the above factors has been selected for laying the transmission lines to reduce the environmental and social footprint of the transmission lines.

5.7 Conclusion

Various factors are considered such as wind resource potential at the project site, favourable environmental and social settings, lowest GHG emissions in the project life cycle, availability of land and other resources. Considering these factors it can be concluded that the proposed site is the best location for development of wind power project.

6 ENVIRONMENT AND SOCIAL IMPACT ASSESSMENTS

There may be few potential environmental & social impacts due to the project activity during construction & operation phases. During the construction phase, the impacts may be regarded as temporary or short-term; while a few long term impacts may also be visualized during the operation stage. The project area has been divided into core area (500 m around each WTG location) and buffer area (5 km around each WTG location). Further the impacts have been assessed over the study area of 5 km radius of the project site. The project has overall positive impacts by providing a competitive, cost-effective, pollution free reliable mode of wind power. It will certainly meet the ever increasing demand of power that will bridge the gap between demand and supply of power.

6.1 Approach & Methodology

The social and environmental impact assessment process has been taken into consideration. The risks and impacts of the proposed wind power project has been assessed on the social and physical environment. To study the environmental and social impact, study area was divided into core area and buffer area based on the extent of influence of project activities. Primary impacts are assessed for a radius of 500m around the project site and secondary impacts are assessed beyond this radius for the proposed project. Also, 100 m RoW along the transmission line route is also considered for impact assessment.

The study team adopted following methodologies to identify and understand the possible environmental and social impact of the proposed project:-

- Detailed discussion with project team to understand project status, technical features, and plans/procedures during the construction and operation phase;
- Desktop study of the environmental sensitivities & socio-economy profile of the project area;
- Site visits by ARCADIS team to assess the impacts on the environment;
- Consultation with community, gram panchayats, land owners, other government officials and other relevant stakeholders to collect and verify the information on environmental and social sensitivities.
- Primary environmental monitoring to establish the baseline environment quality within the project area was carried out.
- Noise & shadow flicker modelling was carried out.
- Detailed ecological study was undertaken for assessing the impacts of the project on flora, fauna and avifaunal species.

6.2 Potential Impact Generating Activities

All the project related attributes and activities have been analysed and the possible impacts were identified. Different project phases and related activities have been narrowed down in the vertical axis of the Impact-Aspect matrix. In the horizontal axis of the matrix the relevant receptors or resources which gets impacted are listed. Thus the resultant cell in the Impact aspect matrix denotes the potential interaction between the project activities / attribute with the physical, socioeconomic, ecology and health and safety aspect. This highlights the possible impacts which can arise due to the project activity. There may be situations where the resources or receptors do not interact with the activities or attributes and hence do not generate any impact.

Key project related activities of the wind power project during different phases like Pre-construction phase, Construction phase, Operation & Maintenance phase (O & M) and Decommissioning phase has been listed in **Table 7.1**.

Table 6-1: Project Related Activities in different phase of project

Pre-Construction Phase	Construction Phase	Operation & Maintenance Phase	Decommissioning Phase
Micro siting of WTG locations	Site clearance	Movement of Site vehicles for plant inspection	Dismantling and demolishing of structures
Planning related to power evacuation process	Hauling of earth materials within site	Inspection and operation check for all WTGs	Excavation, backfilling and restoring site to original conditions
Access road leading to WTG site planning	Movement of heavy vehicles carrying Construction material, machinery & its storage	O & M of ancillary facilities like yards and stores.	
Land purchase or lease process	Access road creation	Inspection and operation check of transmission lines	
Various approvals process from government	Setting up of labour camp	Storage of Hazardous material onsite	
Planning of ancillary facilities like yards, stores, etc.	Storage of waste from labour camp	Disposal of hazardous material	
	Waste generation from site	Waste disposal	
	Hazardous waste generation and storage onsite	Addressing the grievances of local people	
	Waste water generation from site and labour camp	Undertaking CSR activities in the project area	
	Erection of WTGs	Substation operation monitoring and power generation	
	Substation construction		
	Transformer yard construction		
	Pole laying and Transmission line erection		

Table 7.2 represents the overall Activity Impact Matrix for the project activities and related impacted resources or receptors. The cells that are coloured “red” denotes the impact that is generated due to the interaction and is likely to cause an impact. It has a potential to cause significant effect on the resource or receptor and can alter the baseline conditions. All the other cells which are coloured “white” are ‘scoped out’ as these may or may not generate any impact on interaction. These impacts are not significant enough to cause any baseline alterations.

Table 6-2: Impact Aspect Matrix for the proposed project

Resources & Receptors		Land use	Topography	Air Quality	Noise Impact	Water Quality	Soil	Visual Aesthetics	Community Health and Safety	Demography	Employment	Land based livelihoods	Traffic and safety	Infrastructure	Cultural Heritage	Labour & Human Rights	Ecology (Vegetation & wildlife)	Occupational Health & Safety
Project Phase	**Activity**																	
Pre-Construction	Micro siting of WTG locations																	
	Planning related to power evacuation process																	
	Access road leading to WTG site planning																	
	Land purchase or lease process	L										L						
	Various approvals process from government																	
	Planning of ancillary facilities like yards, stores, etc.											L						
Construction	Site clearance	L	L	L			L										L	
	Hauling of earth materials within site			L	M		L		L				M					

Project Phase	Activity / Resources & Receptors	Land use	Topography	Air Quality	Noise Impact	Water Quality	Soil	Visual Aesthetics	Community Health and Safety	Demography	Employment	Land based livelihoods	Traffic and safety	Infrastructure	Cultural Heritage	Labour & Human Rights	Ecology (Vegetation & wildlife)	Occupational Health & Safety
	Movement of heavy vehicles carrying construction material, machinery & its storage			L	M				M							M		M
	Access road creation	L	M	L	L	L	L		L								L	L
	Setting up of labour camp			L	L	M	L		M	L						M	L	L
	Storage of waste from labour camp					L	L		L							L		
	Waste generation from site								M									
	Hazardous Waste generation and storage onsite						M		M									M
	Waste water generation from site and labour camp					M			M									M
	Erection of WTGs				L		L	L	L									M
	Substation construction															L		

Resources & Receptors		Land use	Topography	Air Quality	Noise Impact	Water Quality	Soil	Visual Aesthetics	Community Health and Safety	Demography	Employment	Land based livelihoods	Traffic and safety	Infrastructure	Cultural Heritage	Labour & Human Rights	Ecology (Vegetation & wildlife)	Occupational Health & Safety
Project Phase	**Activity**																	
	Transformer yard construction	L	L	L	L	L	L		L									M
	Pole laying and Transmission line erection						L	L	M									M
Operation & Maintenance	Movement of Site vehicles for plant inspection				L				L				M					M
	Inspection and operation check for all WTGs																	M
	O & M of ancillary facilities like yards and stores.																	M
	Inspection and operation check of transmission lines																	M
	Storage of Hazardous material onsite								L					L				
	Waste disposal								L									
Decommissioning	Dismantling and Demolishing of structures		L				L											M
	Excavation and Backfilling		L			L		L										
All phases of project																		

Project Phase	Activity / Resources & Receptors	Land use	Topography	Air Quality	Noise Impact	Water Quality	Soil	Visual Aesthetics	Community Health and Safety	Demography	Employment	Land based livelihoods	Traffic and safety	Infrastructure	Cultural Heritage	Labour & Human Rights	Ecology (Vegetation & wildlife)	Occupational Health & Safety
	Flood	H	H	H	L	H	H	H	H	H	H	H	H	H	L	L	H	L
	Earthquake	H	H	H	L	H	H	H	H	H	H	H	H	H	L	L	H	L
	Storm	H	H	H	L	H	H	H	H	H	H	H	H	H	L	L	H	L
	Fire	H	H	H	L	H	H	H	H	H	H	H	H	H	L	L	H	L

L-Low Impact, M- Medium Impact, H-High Impact

Adverse impact due to project

Positive Impact due to project

6.3 Screening Criteria for Environmental and Social Impact Assessment

A. Distribution of impact: based on the extent of impact's influence, distribution is classified into Low, Medium and High.

- Low distribution represents influence of impact within the footprint of the project i.e. within the project site boundary and RoW of Transmission line
- Medium distribution represents spread of impact within 2 km from the boundary of the project site.
- High distribution represents influence of impact between 2 km – 5km from the project site boundary

B. **Duration of Impact:** classification of impact duration is based on the timeframe within which effect of impact persist. It is categorized into three category viz., ***Short, Medium and Long.***

- Short Duration: effect of impact is limited for duration of less than 1 year.
- Medium Duration: effect of impact may extends up to 2 years
- Long Duration: effect of impact extends beyond 2 years

Intensity

This refers to the severity of impact. Intensity of impact depends on the degree (low, medium, high) to which the activity may adversely affect health of the environment, health of the affected community or to the health of the natural ecosystem and biodiversity of the project area. To determine significance, the severity of the impact must be examined in terms of the type, quality and sensitivity of the resource involved; the location of the proposed project; the duration of the effect (short- or long-term) and other consideration of context. Significance of the impact will vary with the setting of the proposed action and the surrounding area (including residential, industrial, commercial, and natural sites).

Significance Evaluation Matrix

Significance evaluation matrix as shown in Table 7-3 has been used to evaluate the significance of identified potential environmental impacts. This matrix includes criteria as discussed above to analyze the significance of impact. As the proposed project is wind power project and considered in clean category with no release of pollutant, major significant environmental impacts are not anticipated. However, considering the involvement of community during land purchase and project execution, social issues and impact in the proposed wind power project are also anticipated and shall be managed through the mitigation measures as recommended in this report. Social impacts in the proposed project have also been evaluated based on the criteria of impact intensity to affect the people, duration of impact and acceptance level of community. A criterion of acceptance level is subjective and may vary from person to person due to its dependency on human behaviour.

Table 6-3: Impact Significance Matrix

Distribution	Duration	Intensity	Significance
Local	Short	Low	MINOR
Local	Short	Medium	
Local	Medium	Low	
Local	Medium	Medium	
Medium	Short	Low	
Local	Long	Low	

Distribution	Duration	Intensity	Significance
Local	Short	High	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	
Low	Long	High	MAJOR
Medium	Short	High	
Medium	Long	High	
High	Short	High	
High	Medium	High	
High	Long	Medium	
High	Short	Low	
High	Short	High	

6.4 Social Impact Identification

Key Social Impact

Associated social impacts related with the project has been assessed through the social indicators which has been identified and analyzed. Such analysis will also yield the nature of impacts as discussed in **Table 6-4**. Since the project is a clean energy project, absence of pollutant emission and limited social impacts are anticipated that can be controlled through mitigation measures as suggested in the following section.

Table 6-4: social Impacts indicators and Analysis

S.No.	Project Activities	Indicators	Social Impact	Nature of Impact	IFC Ps	Applicability
Pre-Construction Phase						
1	Land procurement	Physical and economic displacement	Involuntary resettlement	No impact	PS-5: Land Acquisition and Involuntary Resettlement	Not applicable
Construction Phase						

S.No.	Project Activities	Indicators	Social Impact	Nature of Impact	IFC Ps	Applicability
2	Engagement of local and migrant labour	Abolition of child labours. forced or compulsory labour Gender equity, non-discrimination and equal opportunity Freedom of association and right to collective bargaining	Lead to conflict between contractor and labour as well as conflict between local and migrant labours	Moderate	PS-2: Labour working condition	Applicable
3	Labour Accommodation (Onsite)	Non-availability of adequate facilities like drinking water, kitchen, etc. Local community interaction	Conflicts between labour and contractors as well as conflict between labours and local community	High	PS-2: Labour working condition	Applicable
4	Access to Common Property Resources	Restriction on free movement or approach to common property resources	Conflict between project developer and community	No impact	PS-7: Indigenous Community	Not applicable
5	Dislocation or damage of physical cultural resources	Existence of ASI declared cultural resources Existence of physical resources with historical, religious, aesthetics, paleontological and any other cultural significance	Community protest	No Impact	PS-8 Cultural Heritage	Not applicable

6.4.1 Socioeconomic Impact and mitigation Measures

This section describes the social impacts associated with various project activities through identified social indicators. On the basis of analysis findings, mitigation measures are identified and recommended for implementation.

6.4.1.1 Land Procurement

In general, the social impact associated with land procurement and land acquisition is involuntary resettlement. Generally, land acquisition causes physical and economic displacement which in turn results in involuntary resettlement. In the proposed wind power project, land has purchased on willing to sell and willing to buy basis and does not involve involuntary acquisition of land.

During ESIA study, it was found that land team of M/s Enerfra India Pvt. Ltd has identified land parcels to setup the proposed project and approached the land owners for procurement of land. After negotiation, identified land parcels will be sold for the proposed project by land owners on a negotiated and mutually agreed price. As per aggregator the negotiated price was higher than the circle rate and market rate. Through land owner consultation it was verified that adequate compensation was being provided by the M/s Enerfra India Pvt. Ltd and so the impact of land procurement process is considered to be insignificant.

A relatively small area of 8mx8m for towers of EHV line, will be used by paying a one-time compensation based on negotiation with land owners (which includes the compensation for crops in the Right of Way of transmission towers & transmission line).

6.4.1.2 Livelihood Impact

The land parcels identified for the proposed project is agricultural land which is rain fed & unirrigated land. Selling of such land may induce economic displacement to the land owners. Type and amount of compensation were mutually agreed and it was also verified with the land owners during stakeholder consultation.

Consultation with the land owners also revealed that agriculture is one of the source of livelihood in the area and people who accepted monetary compensation is also used compensation money to buy another residential plot in Hyderbad city, daughter's marriage and FD in bank. Other sources of income include cattle rearing, working as labourers in nearby town Hyderabad, Pirmal health care industry and stone crusher. Considering the following factors adverse socioeconomic impact on land owners and cultivators due to land selling is anticipated to be Minor.

To mitigate the minor impact the following mitigation measures are suggested:

- Local employment should be encouraged both during construction and operation.
- Stakeholder engagement plan and Community Development Plan should be implemented during construction and operation phase.

The social impact associated with the engagement of local and migrant labour in the proposed project is potential of conflict between labour and contractor or developer which in turn may result in suspension of project and may cause reputational risk to project developer. Also chances of conflict between local & migrant labour on the use of common resources may arise. Indicators as discussed in **Table 6.4.** and discussed here have been used to assess the social impact. Considering the project in construction phase. During the base line study it was found, some of unskilled labourers, security personnel and vehicles like tractor is hired from the local villages. The issues discussed here in the form of indicators IFC PS 2 and Indian Labour Act.

6.4.1.3 Labour Accommodation

The social impact associated with the labour accommodation or setting up labour camp (onsite) is anticipated in the form of conflict between labours and contractors /community. Indicators as mentioned in **Table 6.4** and described below indicate the reasons which can cause conflicts of labour with contractors and community.

Interaction with Local Community

In case of significant migrant labour, may cause conflict with community due to different cultural behaviour and sharing of local resources. Local resources which are presently being used by the community people are expected to be shared by migrant labour and it may cause strain on community.

Mitigation Measures:

- Setup onsite labour camp away from villages to restrict the interaction of migrant labour with local community that may lead to direct conflict.
- Ensure availability of all the basic amenities such as kitchen, drinking water, crèches, rest room and adequate toilets.

6.4.1.4 Impact on CPR and cultural heritage

Absence of any common property resources near the project site & WTG locations makes this impact not applicable in the proposed project. However, WTG location no. 15 is located near a Tomb which is around 300 mtr away. However, access road of Tomb is separated. It was also confirmed that, due to WTG erections CPR will not be affected.

Dislocation of Physical Cultural Resources

During the baseline study, any physical structure declared by Archaeological Survey of India (ASI) was not found in and around the project site. Further, any physical structure with historical, religious and aesthetic significance was also not found in and around the project site. Considering the absence of resources with cultural significance, disturbance to physical cultural resources and impact associated with it is not anticipated. Chance Find Procedure should be followed in case of accidental discovery of artefacts during construction activities. The World Bank Chance Find Procedure is attached as **Annexure II.**

6.5 WTG Profiling

Under the scope of the current work, each proposed WTG location was visited with proposed with Hero official. An attempt was made to observe the surroundings and immovable structures around the proposed location, distance of proposed locations to structures, if any, adjacent to locations, condition of proposed land patches and type of crop grown. All the 15 WTGs are on private land including the substation located in village Machanoor.

Sl. No.	Village name	land (In Acre)	Land type (Private/Forest/Govt.)	WTGs No.
1	Machanoor	6.525	Private	SS Land
2	Chilepalli	4	Private	Location 8
3	Chilepalli	4.45	Private	Location 10
4	Bardipur	2	Private	Location 11
5	Bardipur	3	Private	Location 13
6	Kuppanagar	10	Private	Location 15
7	Chilekepalli	2.725	Private	Location 50
8	Chilekepalli	1.875	Private	Location 52

Sl. No.	Village name	land (In Acre)	Land type (Private/Forest/Govt.)	WTGs No.
9	Chilekepalli	2.275	Private	Location 53
10	Yelgoi	2.75	Private	Location 56
11	Bardipur	3.125	Private	Location 57
12	Chilekepalli	4.975	Private	Location 59
13	Chilekepalli	4.95	Private	Location 60
14	Yelgoi	4.85	Private	Location L4
15	Awaited	-	Private	Location L05
16	Awaited	-	Private	Location L-12

6.6 Land

Total land requirement for 13 WTGs is 50.97 acres while land requirement for two more WTGs (L05 & L12) is not known. Land required for construction of substation is 6.52 acres. During site visit it was informed that, private land has been purchased for 15 WTG locations including land required for access roads on willing buyer and willing seller basis. The compensation for the purchased land is reportedly above the existing government circle and market rate. Land aggregator was involved during the purchase process.

Sr, No	Project Components	Required Land (Acres)	Remarks
1	WTGs	50.97	13 WTGs
2	Pooling Substation	6.525	33KVA
3	Transmission Lines	1.04	To be purchased as one time compassion
4	Access Roads	1.77	900 m length and 8 m width considered for access road creation.
Total		60.30	

6.7 Labour camp

During ESIA study and dialogue with site in charge, Mr. Yogender Reddy of M/s Lotus civil construction, it was informed that, M/s Lotus is responsible for the only civil work for the wind project. Labour licence has expired and yet licence have not taken from the Telangana government. Labour camp found to be in a good condition. Labour camp has constructed at Kuppanagar village with basic amenities which are described in below section-

6.7.1.1 Living condition

Majority of labours are migrated from different state of India (Jharkhand, Karnataka, Bihar, Assam and A.P.). For the migrant labours, small to medium sized 35 thatched sheds has been erected to house a maximum of 100 labours working onsite. However, during visit around 60 workers found to be onsite. On an average each thatched shed accommodates 4-6 labours. About 4-5 women workers have been hired specifically for cooking purpose, but in the labour camp a separate sleeping space has been provided to the cook family workers. Around five child up to 3 to 4 years old found to be in camp. The labour camps were found to be equipped with cots of standard size, beddings, fans and power supply. The thatched sheds were quite ventilated and had sufficient space for natural light. Besides, a separate kitchen has been constructed in the camp itself, where the cooks (4-5 members) prepare food for all labours and site officials. LPG gas cylinders are used as cooking fuel. 3 DG sets (45 kv, 125 kv and 5 kv) have been provided for power supply for some fixed duration.

6.7.1.2 Health and sanitation facility

Mobilize water tanker and portable water is provided to the labours for drinking and domestic purpose. Seven toilets have also been provided to the labours which are connected to a well-constructed septic tank. Cleanness of toilets were in good condition. The kitchen waste generated is composted in a pit near the labour camp, however, compost pit were not maintained.

First aid kit was present in the camp. No records of health check-up was found with the civil contractor. A tie up with the local Govt. hospital located at Zahirabad a distance of 10-15km distance from the labour camp.

6.7.1.3 Safety System

The workers have been provided Proper Personal Protective Equipment's (PPE's) like, helmets, goggles, gloves and safety shoes etc. It was recommended that all workers wear their (PPEs) as per their nature of work during construction related activities to ensure health and safety at workplace. First Aid kits are available in the camp to manage injuries occurring during project activity. Care has also been taken to place fire extinguishers at separate places along with their manual in the site office. The labours are given a hands on training related to foundation work. Induction training and mock drill is provided to workers before starting to the work, however, record was not found during the visit.

A separate storage yard has been constructed within the project site area where the equipment parts are stored. Local emergency contact numbers has not displayed.

6.7.1.4 Workers and labour commutation

The project activity requires both unskilled and skilled workers as per the nature of work. Unskilled labours include both local and migrant labours. The unskilled migrant labour as well as local labours are carried through small vehicles like Sumo, Bolero etc. to the project site. The Company provides a separate vehicle for workers for daily and weekly commutation. No recreation facility were observed for the workers in the camp.

6.7.1.5 Photo documentation

Photo 6-1: Consultation with labour camp in charge , Lotus construction

Photo 6-2: Thatched sheds for workers

Photo 6-3: Ventilated room for worker

Photo 6-4: Separate kitchen

Photo 6-5: water tank for washing and domestic purpose

Photo 6-6: Sanitation facility in camp

Photo 6-7: Portable drinking water facility

Photo 6-8: Fire extinguishers placed at camp

Photo 6-9: First aid kit

Photo 6-10: Labour attendance register

6.8 Consultation details with land owners for 31.5 MW wind project

Venue: Neutral place out of the study area at Hotel Athithi , Zahirabad, Medak

Participants: stakeholder consultation has conducted with total 3 landowners out of 16, which was sale deed completed.

Date: 15th April'16

Sl. No.	Land Owner Name	Survey No.	WTG No.	Village	Key findings	Photo Documents
1	Anil Venkatesh S/o Tulujamma	48-1	59, 60	Chilekepalle	***Total family members:*** *3* ***Earning members:*** *1* ***Livelihood source:*** agriculture and contract worker at Mahindra & Mahindra ***Annual income(INR):*** *100,000* ***How many Sold land to Enerfra India Pvt. Ltd (in Acr):*** 4.89 ***Remaining land after sale (in Acr):*** *currently he has no land, however, a residential plot purchased in Hyderabad city.* ***Utilization plan of compensate amount:*** *a residential plot purchased in Hyderabad city and he has paid bank loaan.* ***Awareness about the project:*** *land aggregator has informed to landowner during purchase process.* ***Activities on sold land:*** *Barren land*	
2	Chakali Ramulu	57	53	Chilekepalle	***Total family members:*** *5* ***Earning members:*** *1* ***Livelihood source:*** *agriculture and coolli* ***Annual income(INR):****40,000-50,000* ***How many Sold land to Enerfra India Pvt. Ltd (in Acr):*** *1.15* ***Remaining land after sale (in Acr):*** *1* ***Utilization plan of compensate amount: :*** *spent money in doughther marrige* ***Awareness about the project:*** *information has not shared with land owner about the project during purchase process* ***Activities on sold land:*** *pulses (tur dal) were cultivated only during rainy season*	

Sl. No.	Land Owner Name	Survey No.	WTG No.	Village	Key findings	Photo Documents
3	Chakali Anuradha (She is widow and relative of Ramulu)	57	53	Chilekepalle	***Total family members:*** *3* ***Earning members:*** *1* ***Livelihood source:*** *House worker* ***Annual income(INR): 3****0,000* ***How many Sold land to Enerfra India Pvt. Ltd (in Acr): 0****.36 Gunta* ***Remaining land after sale (in Acr):*** *currently she has no land* ***Utilization plan of compensate amount:*** *FD in bank for child education* ***Awareness about the project:*** *information has not shared with land owner about the project during purchase process* ***Activities on sold land:*** *pulses (tur dal) were cultivated only during rainy season* ***Remarks:*** *Ramulu has shared information on the behalf of Anuradha*	

Photo 6-11: Consultation with village secretory, Chilepalle

Photo 6-12: Consultation with village secretory, Chilkepalle

Photo 6-13: Consultation with village president, Chilkepalle

Photo 6-14: Consultation with SHGs members at Chilkepalle

Photo 6-15: Consultation with village president, Chiilepalli

Photo 6-16: Consultation with land owners at Hotel Athithi, Zahirabad

Photo 6-17: Consultation with project site team, Zahirabad

Photo 6-18: ARCADIS team visited to forest department

6.9 Environmental Impact Identification

Potential Impact Generation Activities

The construction and operation phase of the proposed project comprises various activities each of which may have an impact on environmental parameters. The impacts of the project are envisaged during the pre-construction phase, construction phase, operation & maintenance and decommissioning phase.

The environmental impacts associated with the project activities have been identified and analyzed to evaluate their significance. Because of clean category projects, environmental impacts are very few with minor significance and can be controlled through mitigation measures as suggested in the following section.

Impact Analysis and Mitigation Measures

6.9.1 Impact on Air Environment

The impact on ambient air quality is anticipated due to the various project activities. Analysis of project activities, significance of associated impact on ambient air quality and mitigation measures are described below:

Construction Phase:

Activities such as movement of project vehicles are expected to cause impact on ambient air quality in the form of emission of NOx, SOx and fugitive dust. Activities like site clearance, road construction and foundation preparation will lead to dust generation. Impacts associated with these activities such as increased concentration of SOx, NOx and particulate matter particularly is assessed as moderate significance because of medium distribution, short duration, temporary and reversible in nature and moderate intensity of impact. Emissions during this phase will be localized and temporary and may affect residents depending upon the prevailing wind directions. Thus impact on local settlements will be negligible owing to the considerable distance from the turbines. The nearest settlement from WTG is located about 650 m from WTG 08.

Construction of transmission lines, from PSS to GSS is about 16 kms, will result in generation of fugitive dust emissions which may involve clearing of ground vegetation. Use of machineries and movement of vehicles will generate dust for a short period at a single point as laying of transmission line will be completed within ten days. Hence impact on air environment is anticipated to be minor.

Mitigation measures

Following mitigation measures are recommended to control the minor impact on air quality during construction phase:

- Vehicles speed to be restricted to 20-30 km/hr on unpaved road. This will reduce dust emission
- Raw material should be covered with tarpaulin sheet where ever required during transportation and in storage area
- Water sprinkling should be practiced wherever required on unpaved area but ensure use of water tanker purchased form suitable vendor only
- All the project vehicles shall have valid PUC certificate
- Ensure regular maintenance of project vehicles during construction and operational phase
- Turn off the machineries which are not in use

Operation Phase

During operational phase, source of emission is absent except operation of 2-3 project vehicles for commuting purpose. Emissions during this phase will be limited to exhaust emissions and dust generation from a low number of vehicle movements for maintenance purposes. Impact on air quality during operation phase is anticipated to be negligible.

The positive impact of the project on air quality will be the benefit provided by the replacement of conventional power generation with renewable energy. Wind energy will replace fossil fuel power energy generation (primarily coal powered), therefore carbon dioxide emissions into the atmosphere will be reduced. Overall the project will have a beneficial impact on air quality due to the replacement of non-renewable energy generation.

Overall Impact Assessment	Construction Phase	Operation Phase
Impact on air environment	Minor	Minor

6.9.2 Impact on Water Environment

Water is mostly required during construction period in wind power project for various activities. Fulfilment of this water requirement through ground water may have impact in terms of ground water depletion. However, severity of impact depends on the ground water potential. Detail analysis of cause of environmental impact and its significance is presented below with the recommendation of mitigation measures to control the impact.

Construction Phase:

The volume of water used during project construction is moderate and during operation is low. Water is required for plant civil works, was sourced from local bore wells/lakes and supplied to the site via water tankers by contractors. During construction period, water requirement would be about 65 KLD per WTG to build foundation of tower and 4-7 KLD for domestic water use considering 100 workers during peak hours. As per Central Ground Water Board the ground water in Medak block is in safe category having 70% of ground water development. Therefore, minor but temporary impact due to consumption of water is anticipated on ground water.

There would be a labour camp proposed for the proposed project. Waste water would be discharged from the labour camp during construction phase. Considering the above observation contamination of surface water due to project activity is anticipated to be minor.

During the construction works, there is a possibility of contaminated runoff from the site as the activities involve the installation of wind turbine foundation, underground cables, soil compaction, increased run off and sedimentation of surface waters. During site visit no water bodies were observed in the study area within 500m from any of the WTGs.

Mitigation measures

The following mitigation measures shall be incorporated to avoid/reduce the impacts:

- Regular inspection for identification of water leakeges and preventing wastage of water from water supply via tankers should be undertaken by contractors and supervised by Suzlon
- Optimizing the use of water for sprinkling, washing of vehicles, concrete mixing, etc.

- Waste water discharge in labour camp should be through proper septic tanks flowing through covered drains.
- Record keeping of water consumption should be maintained during the construction and operation phase.

Operation Phase:

In operational phase water is being used for the domestic use of project staff at the site which is estimated to be around 2-3 KLD. This quantity has been considered for 4 security guards present on site and about 10 technical personnel present on site. Minor volumes of waste water will be generated from toilet facilities at the site office. This will be disposed to septic tank, thus no significant impact is anticipated to surface or groundwater.

Overall Impact Assessment	Construction Phase	Operation Phase
Impact on water quality	Minor	Minor

6.9.3 Impact on Noise

Noise is mostly generated during construction period and operation period. Activities like road excavation, WTG foundation, grading, concrete batching etc. and wind turbine operation, blade movement generate noise. It may have impact on nearby settlements depending on its distance. Further details and mitigation measure have been presented below.

Construction Phase

Noise will be generated mainly during the construction phase of the project. It will involve activities such as excavating and drilling tower foundations, road construction, grading, concrete batching, tower erection, construction of ancillary structures, diesel generators, movement of materials, site cleanup, etc.

Noise generated by construction equipment varies greatly depending upon the type, condition of equipment, operation duration and method. It may vary in the range of 84 to 109 dB (A). The surrounding villages are located at a distance of more than 500m from most WTG locations thus will not have significant impact on existing ambient noise levels at receiving sites as noise generating activities are dispersed. The construction time at a single WTG will be much shorter. Thus negligible impact from the noise generation is anticipated.

During the construction phase, workers will be exposed continuously to high levels of noise of machinery. Thus personal protective equipment like ear plugs/muffs is must for workers and work shifts rotations will be followed and maintained to avoid long duration exposure to high noise levels. Noise levels from different machineries used for site purpose is presented below:

Table 6-5:Indicative noise from different equipment and vehicles

S. No	Type of Vehicle	Description	Typical Sound Power Level (dB)
1.	Passenger Vehicle	Passenger Vehicle	85
2.	Trucks	10 ton capacity	95
3.	Cranes	Overhead and mobile	109
4.	Mobile Construction Vehicles	Front end loaders	100

5.	Mobile Construction Vehicles	Excavators	108
6.	Mobile Construction Vehicles	Bull Dozer	111
7.	Mobile Construction Vehicles	Dump Truck	107
8.	Mobile Construction Vehicles	Water Tanker	95
9.	Stationary construction equipment	Concrete Mixer	110
10.	Compressor	Air compressor	100
11.	Compressor	Vibratory compactor	110

Mitigation measures

The following mitigation measures shall be incorporated to avoid/reduce the impacts of noise during construction phase-

- Restrict major noise generating activities during night time 10:00 pm to 6:00 am.
- Provide personal protective equipment to workers wherever noise is generated due to machinery operation.
- Regular maintenance of project vehicles should be ensured by the contractors.

Operation Phase from Wind Turbines

The sources of noise generation from operating wind turbines can be divided into two categories, mechanical sounds from the interaction of turbine components and aerodynamic sounds produced by the flow of air over the blades.

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

Aerodynamic noise generation is very sensitive to the speed of translation at the very tip of the blade. To limit the generation of aerodynamic noise, modern wind turbines limit the rotor rotation speeds. Large variable wind turbines in general rotates at slower speeds in low winds and its rotational speeds increases with increase in wind speed until the limiting rotor speed reached. This result in much quieter operation in low winds than a comparable constant wind speed turbine. Recent improvement in mechanical design of wind turbines have resulted in significantly reduced mechanical noise from both broadband and pure tones. Thus the noise emission from modern wind turbines is dominated by broadband aerodynamic noise (Fegeant, 1999). Blades moving through the air produce an aerodynamic noise. This noise is detectable when it is greater than the background noise, generally at wind speeds up to 8 meters per second.

Wind Turbines for the proposed project will be of Suzlon make of 2.0 MW. This operational mode and mechanical design improvement contributes considerably to the minimization of noise.

Noise Propagation

During noise propagation, initial energy in noise is distributed over a larger and larger area as the distance from the source increase which leads to reduction in noise pressure level. Thus assuming spherical propagation, the same energy that is distributed over a square meter at a distance of one meter from the source is distributed over 10,000 sq.m. at a distance of 100 m away from the source. (Anthony L. Roagers, march 2004). To estimate the sound pressure level at a desirable distance following simple model calculation is used.

$L_p = L_w - 10 \log_{10} (2\pi R^2) - \alpha R$

Here, Lp = sound pressure level (dB) at a distance of R from a noise source radiating at a power level,

Lw = sound pressure level (dB) at source

R = distance of receptor from source

α = frequency dependent sound absorption coefficient.

The above given equation can be used with either broadband sound power levels and a broadband estimate of the sound absorption coefficient (α = 0.005 dB(A)/meter)

Using the above given equation, it is calculated that at a distance of 200 m from the single wind turbine of sound power level 102 dB(A) the estimated sound pressure level would be 47 dB(A). All WTGs are beyond 500m from any of the settlement area. The average day time ambient noise is 49 dB(A) and for night time is 38.5 dB(A).

Impact due to Wind Turbine Noise

The ability to hear wind turbines noise depends on the ambient noise level. When the background noise level and wind turbine noise are of the same magnitude, the wind turbine noise gets masked by the background noise. Therefore wind turbine noise level of higher magnitude than background noise level can be considered as significant. In case of the proposed project, majority of the villages are located at minimum distance of 500 m from the WTG, however, for two locations minimum distance between WTG and human habitation are recorded below 500 m from wind turbine. Considering the minimum distance of WTG and human habitation in the range of 300 m – 700 m the noise level estimated will be in the range of 43-33 dB (A). Therefore noise impact on nearby communities is expected as minor.

Considering the worst case scenario noise modelling has been carried out for all the 15 WTGs and the noise model map presented below. The assumptions made for modelling are:

- Noise modelling has been conducted using the wind speed (at hub height level) in the range of 4.0 M/s to 10.0 M/s.
- Noise level at the source (hub height) has been taken as 95 dB (A) given in technical brochure of S 97.

The modelling results shows that there is no receptor on which the noise generation from operating WTGs will exceed 45 decibels. As such no impact is anticipated due to noise generated from operating WTGs.

Overall Impact Assessment	Construction Phase	Operation Phase
Impact on noise	Minor	Minor

6.9.4 Impact on Soil

The range of potential project impacts on land include land disturbance (creating erosion and sedimentation), disposal of excess soil, and soil contamination.

Top Soil Loss and Soil Contamination

The environmental impact anticipated in the proposed project is top soil loss and potential soil contamination. These impacts are associated with the project activities such as tower foundations, road construction, storage of diesel, spent oil, generation of used oil from running of DG sets during

construction period. Analysis of project activities, associated impacts, their significance in construction and operational phases and mitigation measures are described below:

Construction & Decommissioning Phase

Activities that cause land disturbance include installation of tower foundations, road preparation, excavation, etc. Excavation will be carried out to the minimum. The soil will be mainly excavated for laying foundation of towers, site levelling and road work. The soil structure of this area is loose and loamy. This excavated earth material be utilized on site for road soling and site levelling as per requirement.

The top soil excavated during construction, will be stock pilled and will be used for plantation. The roads will not be paved and only soling will be done with excavated earth & rock material, so land disturbance will be minimized. The cranes used for construction activities will be placed on hard, flat surface area and if required, ground levelling will be done.

Operation Phase

Care will be taken with regard to possible changes in soil quality due to human activities, such as disposal of waste material and domestic effluents on soil of the surrounding area. Waste water holding tanks / septic tank should be located at more than 500 m away from bore wells or any other underground water holding tanks in surrounding areas.

Very small quantity of solid waste will be generated by workers during project construction and operation, and this material will be handled and disposed of in an approved manner; therefore no soil contamination will result. Any hazardous waste like waste oil, paint containers will be disposed off to authorized vendors. Other waste will be disposed to local waste disposal area with permission of concerned authority/body.

Overall Impact Assessment	Construction Phase	Operation Phase
Impact on soil quality	Minor	Minor

6.9.5 Impact on Ecology

Construction Phase

Vegetation Clearance

Project construction involved land clearance, excavation, filling and levelling, causing the loss of vegetation. The clearance of vegetation will be restricted along a radius of 50 m around each wind turbine site and the entire area procured for each wind turbine may not be cleared. Most of the locations identified for the wind turbine generators do not comprise any trees in the immediate vicinity. Clearing of vegetation will also be done for access route and transmission lines.

The impact on ecological environment is assessed to be minor from the project activities since the cleared area is seemed to be small and presence of undisturbed areas in the vicinity could buffer for the displaced areas. As the proposed project is wind power project where land requirement is low, therefore, impacts due to site clearance activities in terms of loss of vegetation would be limited. Moreover, absence of site boundary and fencing in the wind project (excluding transformers) is beneficial and would not pose any restrictions on movement of animals. The soil compaction will also affect the regeneration of understory vegetation due to heavy equipment usage after construction

phase. The livestock of the area mostly graze on grasses and other ephemeral herbaceous species and the loss of this ground cover will have a minimal impact for a very short phase.

Habitat Loss, Disturbance and Modification

Habitat loss due to wind turbines and associated infrastructures viz., turbine bases, substation and access roads is anticipated from such type of project. As the land requirement to setup the wind turbines is relatively low, therefore high risk in general not anticipated due to habitat loss. But large quantities of earth will be excavated for the purpose of making roads, etc. and vegetation clearance will result in habitat modification in the study area. Moreover, project area is not a designated or qualifying site of national and international importance for biodiversity.

Mitigation Measures

The following measures should be considered in the project design to mitigate the bird and bat impact due to the project:

- Temporary barriers be installed around the excavated areas so that the wildlife and livestock is not trapped in pits.
- Vegetation removal should occur in areas where absolutely necessary.
- Plantation wherever done should be planted with locally occurring native plant species under the guidance of Forest Department.
- Labourers should be asked to stay within the project footprint area.
- Minimal possible number of routes should be authorized for use during construction by the labourers and staff.

Operation Phase

Wind turbine operation has few direct and indirect impact on bird and bat communities. Bird and bat mortalities has been reported from various operational wind farms across the country. The impacts during operation phase of wind farm is discussed in the sections below.

Effect on Bird & Bats

A review of literature based on the impacts of wind farm on the birds and bats identified the main potential hazards as:

- Disturbance & displacement
- Collision mortality
- Loss of habitats resulting from wind turbines and associated infrastructure

Disturbance & displacement

According to Birdlife International's report on effect of wind farm impacts on birds, these effects are variable and species, season and site specific. Disturbance can lead to displacement and exclusion from areas. Human activity during the installation of wind turbine such as movement on access roads may also lead to disturbance. The presence and noise of turbines may affect birds from using an area close to these.

The effect of birds altering their migration flyways or local flight paths to avoid wind farm is another type of displacement. This effect depends on species, type of birds movement, flight height, distance to turbines, wind force and wind direction etc. This can be highly variable ranging from a slight check in flight direction, height or speed to significant diversions which may reduce the number of birds using

areas beyond wind farm. Some study indicates alteration of flight line whereas some other studies says birds will fly between turbines rows (Christensen et al. 2004, Kahlert et al. 2004a).

The wind turbines are arbitrary located with a minimum distance of 250 m-300 m between consecutive turbines due to which cumulative barrier effect on local flight path is slightly envisaged in the area. Moreover, absence of any established migratory flyways in the area lowers the impacts like disturbance and displacement of migratory birds.

Collision Mortality

The collision mortality is another impact due to wind power project, especially in area of more bird usage i.e. important bird area. Direct mortality or lethal injury of birds can result from collision with rotor, towers, nacelles and associated infrastructure such as guy cables, power lines and meteorological masts. Although majority of studies indicates low mortality level from wind turbines (Painter et al. 1999, Erickson et al. 2001). Collision risk depends on a range of factors related to bird species, numbers and behaviour, weather condition, topography and scale of wind farm.

Out of the total 62 species observed, 14 bird species are migratory. A total of six “Schedule-I” species were observed in the study area.

Also, no wildlife sanctuary, national parks or bird sanctuaries are present within 30 kms from the proposed project site. There is no important bird area (IBA) near to the project site. During the site visit no bats were spotted or any suitable habitat, roosts were identified within the study area. The impact on avifauna is anticipated to be minor.

Loss of habitats resulting from wind turbines and associated infrastructure

The loss of habitat, loss or fragmentation of feeding areas, displacement are considered to be major aspects of bird collision risks involved in wind farm projects. So far this site is concerned, no major change will occur in terms of habitat and foraging/feeding areas for birds. The footprint area of WTGs are very limited. Analyzing from these factors, it may be concluded that loss of habitats, displacement and loss of foraging/feeding areas from this project is not envisaged.

Overall Impact Assessment	Construction Phase	Operation Phase
Impact on ecology	Minor	Minor

6.9.6 Impact on Traffic

The road from Hyderabad to Zahirabad will be used for movement of trailor trucks carrying WTG parts and other heavy vehicles for the project activity. Village and village roads originating from this road will be utilized during construction and operation phase for vehicular movement and movement of labours and other project materials.

Construction Phase

The vehicular movement in construction phase will be more compared to operation phase. The village roads are well developed but proper access roads needs to be constructed to reach to every WTG location. Also as the number of vehicles increases the noise in the surrounding area will increase and generation of dust will also slightly increase in the area. The risk of accidents increases as the construction phase will see movement of vehicles and local people using the same village roads. Although low movement of population in surrounding area due to lack of industrial areas and commercial activities, low traffic was observed on village roads but the movement of public buses and

two wheelers were observed to be in good numbers. Low impact is anticipated due to shorter period but adequate preventive measures should be taken to mitigate the risks of accidents.

Suggested Mitigation Measures:

- If the widths of roads are found to be inadequate for the transport requirements of turbine blades and other large construction equipment, permission shall be taken from the respective authorities for required widening.
- Signage shall be erected to identify site access routes and to inform motorists that local roads will be accommodating construction traffic.
- Signage warning for the site access junction locations and an advisory speed restriction of 20-25 kmph shall be erected.
- Widening and strengthening of the carriageway shall be undertaken where necessary, to accommodate the turbine delivery vehicle wheel tracks.
- When practicable, construction traffic movements (equipment and materials) shall be scheduled to avoid the peak traffic periods at the beginning and end of each day and other sensitive periods, in order to minimize any potential disturbance to local traffic.
- Telegraph poles and overhead cables may be relocated where necessary.

Operational Phase

Vehicular movement in operation phase is negligible. Only maintenance staff and their vehicles would be moving on designated access roads.

Overall Impact Assessment	Construction Phase	Operation Phase
Impact on Trafiic	Minor	Minor

6.9.7 Effect on Rainfal

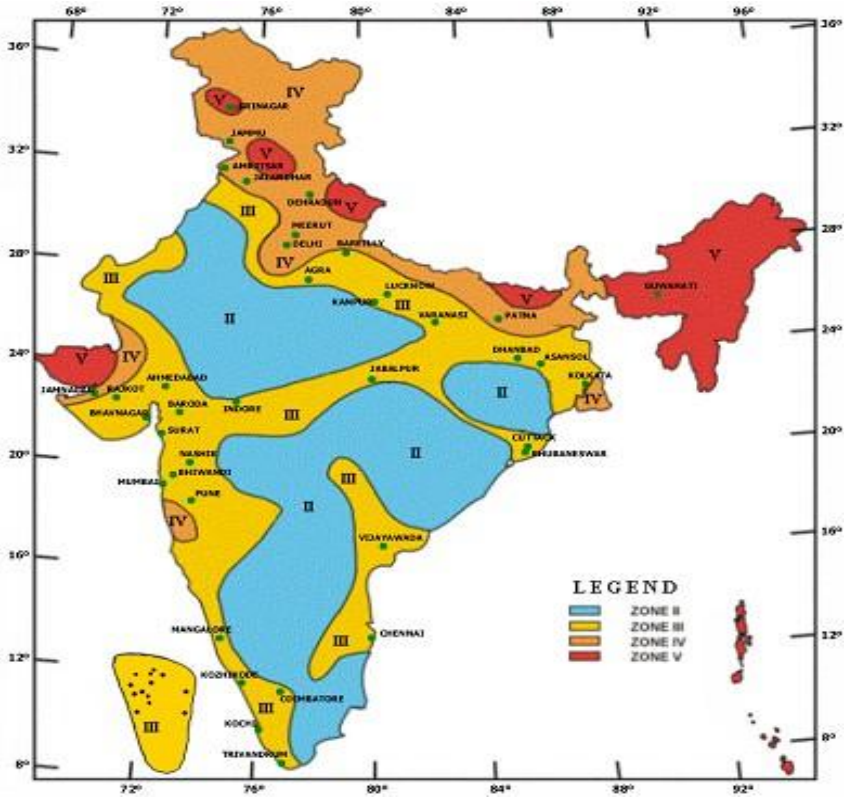
By their designs, wind farms do not act as a solid obstruction to clouds. They do not induce enough vertical velocities to result in any appreciable change in precipitation. The flow computations past the windmill blades show no perceptible change in temperature field. Hence, there would be no change in cloud morphology. Thus windmills have no effect on rainfall.

Overall Impact Assessment	Construction Phase	Operation Phase
Impact on Rainfall	Minor	Minor

6.9.8 Seismic Hazard

The project site is located in seismic zones II as per the seismic zoning map of India (IS 1893–2002). Accordingly, this seismic hazard has been taken into account in the design of the turbine foundations to prevent tower failure in the event of shocks. The seismic zoning map of India has been shown in **Figure 7.1.**

Figure 6-1: Seismic Zone of India



Source: **www.isrt.gov.in**

Overall Impact Assessment	Construction Phase	Operation Phase
Seismic Hazard	Minor	Minor

6.9.9 Aviation Hazard

No aviation hazard will be created by the Project as it is located about 150 km from Belgaum Report but as the project area falls under navigation route hence WTG s to be erected should have proper markings as per recommended norms.

Overall Impact Assessment	Construction Phase	Operation Phase
Aviation Hazaed	Minor	Minor

6.9.10 Impact Due To Shadow Flicker

Shadow Flicker:

Shadow flicker is the light effect caused when the sun is positioned behind a rotating wind turbine. With the sun in the background, large moving shadows can be produced. The shadow flicker impact is the main significant impact of wind farm on nearby communities. The significance of this impact is associated with the acceptance level of community and may impact some people with distasteful

experience. Scientific researches shows that sensitivity of humans to shadow flicker is linked with the rotor speed of turbine blades. A study by Stankovik et. al. shows that flicker rate (hertz) for a range of rotor speed of 3- bladed turbine influence the human perception towards shadow flicker. The result of this scientific research is presented in **Table 7.7.**

Table 6-6: Sensitivity to Shadow Flicker

Flicker Rate (Hertz)	Human Perception	Equivalent RPM Rate for a 3-Bladed Turbine
< 2.5	Negligible Effect	<50
2.5 - 3	May Affect 0.25% of the Population	50-60
3 - 10	Effect is Perceptible	<200
10 - 25	Greatest Sensitivity	200-500
>50	Continuous Light Source	1000

Larger turbines generally operate between 18 and 45 RPM, while smaller turbines generally operate below 150 RPM (Stankovik et al., 2009, p.96). The present design of wind turbines for this project is designed with speed of 11.8 to 17.7 rpm for S97 and 9.4 to 13.0 rpm for S111. According to study of Stankovik et. al. as represented in Table 7.9, RPM rate of wind turbine selected for the project is less than 50 rpm which generate flicker rate less than 2.5 Hz. the human perception associated with the flicker rate (<2.5 Hz) shows negligible effect or high acceptance level. On the basis of this analysis acceptance of shadow flicker with negligible effect is anticipated in this project. However, detailed shadow flicker modelling has also been conducted to estimate the shadow flicker hours on nearby receptors or community.

Shadow Flicker Modelling

The shadow flicker modeling was conducted by Windpro software. This software is widely accepted software and generally used for shadow flickering assessment of wind farm across the globe. This software uses the wind turbine technical specification, sunshine hour's data and topographical data to estimate the shadow flicker impact through worst case and real scenario approach. The sun's path with respect to each turbine location is calculated by the software to determine the cast shadow paths every 2 minutes, every day over a full year. The software provide detailed monthly and annually analysis of shadow flickering hours along with different colored zones (contour lines) to suggest the no. of shadow flicker occurrence (in hours) on the receptors in a year.

Methodology

The worst case modelling approach has been adopted to assess shadow-flicker impact in this project. As an outcome, WindPro software will generate predicted shadow flicker hours throughout a calendar year.

The modelling was conducted by using worst case approach where following data was used as input:

- Turbine locations (coordinates)
- Shadow Flicker receptor locations (coordinates)
- Technical specification of wind turbine S-97

Shadow Flicker results reveals that the shadow impact is anticipated on 24 receptors generated by WTGs- L04, L05, L12, 59, 60,8,10,11,13,15,52,53, 50 and 57as provided in the table below. So, the impact anticipated is of moderate nature due to shadow flicker on receptors from operating WTGs. All the colonies or group of household and individual household existing within 1 km of proposed turbine

locations have been identified as receptors. The geographical coordinate of identified receptors was used as software input.

In addition to the aforesaid input data, following assumption were also taken into consideration for worst case scenario modelling:

- The sun is shining at 3 degree over the horizon

Sunshine probability S (Average daily sunshine hours) [GOA / PANJIM]

- 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

Operational time

- N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
- 156 228 991 1,022 517 147 98 372 1,746 1,914 623 228 8,042

The shadow-flicker model assumptions applied to this project are very conservative and as such, the analysis is expected to over-predict the impacts. Additional general site and receptor-specific assessments such as topographic effect, diurnal and seasonal cloud and fog patterns may further reduce the shadow flicker impacts as predicted through worst case scenario approach.

The outcome of worst case approach will be in the form of cumulative impacted receptors location and number of shadow flicker impact.

Shadow Flicker Analysis Results

Shadow Receptors	Village/Receptor	Coordinates		Shadow hours per year (h/year)	Impacting WTGs	Distance of Receptor from WTG (m)
		Easting	Northing			
V(SR33)	Temporary House	780,994	1,969,161	31:46:00	L-05	561
AC(SRS45)	Solar Power Plant Office	782,359	1,968,741	58:42:00	L-05,L-12,L-04	782
AD(SR29)	Yelgoi village	782,026	1,968,891	96:38:00	L-05, L-12	489
AI(SR27)	Single House	781,987	1,968,295	37:59:00	WTG L-04	472
AQ(SR15)	Chilepalli substation	783,050	1,967,420	95:05:00	WTG 8	287
AR(SR41)	Temporary structure	782,566	1,967,158	45:26:00	WTG 8, 56	475
BI(SR62)	One house	781,871	1,966,590	33:49:00	WTG 5,WTG 56	420
BJ(SR23)	Tomb	782,588	1,966,827	70:41:00	WTG 57	384
BK(SR13)	One house	783,246	1,966,824	34:59:00	WTG 10	405
BL(SR12)	Tin Shed	783,067	1,966,440	98:20:00	WTG 10	318
BM(SR11)	Thatched house	783,219	1,966,082	161:58:00	WTG 11	151
BR(SR9	Single house	783,661	1,965,330	276:13:00	WTG 13	79
BY(140)	Temporary shed	783,751	1,964,514	40:44:00	WTG 15	432
BZ(SR5)	One house	784,321	1,964,512	208:15:00	WTG 15	157
CZ(SR99)	One house	791,159	1,958,569	121:32:00	WTG 60	230
DC(SR75)	Store house	791,487	1,958,585	99:19:00	WTG 60	232
DE(SR100)	CPR	791,299	1,958,239	76:55:00	WTG 53	181
DG (SR97)	One house	791,915	1,957,932	30:44:00	WTG 52	423

Shadow Receptors	Village/Receptor	Coordinates		Shadow hours per year (h/year)	Impacting WTGs	Distance of Receptor from WTG (m)
		Easting	Northing			
DH(SR133)	One house	790,947	1,957,330	251:21:00	WTG 52	158
DI(SRK72	One house near stone crusher	790,936	1,957,163	74:26:00	WTG 52	172
DL(SR77)	One tent house	791,765	1,957,055	30:56:00	WTG 52	706
DP(SR88)	One house	791,395	1,956,399	80:55:00	WTG 50	181

- WTG generating shadow on receptors includes WTG L 04, L-05, L-12, 8,10,11,13,15,52,53 and 60.

The impact due to shadow flickering due to operations of the proposed project is anticipated to be moderate risk for the proposed project. Shadow flicker maps are provided in **Annexure XII.**

Mitigation Measures:

The following site specific mitigation measures have been suggested to reduce the significant impact on nearby communities.

- Total 15 WTGs are proposed in this project considered for shadow flicker impact.
- Out of 15 WTGs, 10 WTGs are generating shadows more than 30 hrs/year considering the worst case assumptions.
- Therefore identified sensitive WTG locations are recommended to avoid. If these locations are unavoidable then following mitigation measures can be used to control the impact.
- Provide curtain and blinds in households with open roof, and windows, doors facing WTGs.
- Plantation shall be encouraged around receptors and provided in the area to make a curtain in the zone where both noise and shadow flickering is expected.
- Provision of plantation will help in minimising the impact of both noise and shadow flickering

Overall Impact Assessment	Construction Phase	Operation Phase
Shadow flicker impact	Moderate	Minor

6.9.11 Visual Effects

Wind turbine erections will lead to significant modification in the built features and natural landscaping of the area. It will either be considered pleasing architectural additions or detractions from the appearance of the local landscape, depending upon the perception of the viewer. These turbines will be 97 m high. There is no operating wind power project in the area, hence people are not aware about the visual effect due the erection of the WTGs. As the nearest settlement is about 50 m away from the nearest WTG hence forth minimal impact is envisaged due to the operation and erection of WTGs on visual aesthetics. Few suggested mitigation measures should be adopted to minimize impact if any:

Mitigation Measures: Visual Aesthetics

- The wind turbines shall be painted in light color (white) to reduce the visibility of the turbine when seen from farther distances;

- Maintaining uniform size and design of turbines by having same direction of rotation, type of turbine and height
- Maintaining a minimum distance (based on the formula: 'Height of the turbine + ½ x rotor diameter + 5 m') from residential settlement/place, highways, schools/building etc to minimize visual impacts and impacts due to shadow flicker and blade glint and prevent risks due to fall down of the turbines;
- Reducing the occurrence of impacts due to blade glint by application of non-reflective paints.

Overall Impact Assessment	Construction Phase	Operation Phase
Visual impact	Minor	Minor

6.9.12 Electromagnetic Field (Emf)

Electro Magnetic Fields (EMF) surrounds us in modern society. All electronic devices, power lines, and generating stations produce EMFs. Wind turbines convert wind energy into electricity. The electricity is carried from the turbine by a cable, either underground or overhead, to the main electricity transmission grid for distribution, creating a small magnetic field. When a charged object, such as an animal, crosses the path of this magnetic field, a very small, momentary electric field may be created. There are four potential sources of electric and magnetic fields associated with the wind farm project. These are:

- Transmission line
- Wind turbine generator
- Generator transformer, and
- Underground cable

Though wind power produces EMFs like any other source of power and power transmission there are two major benefits to wind power in respect to safety. Wind turbines are 140 m above the ground the EMF[2]created by the production of energy is generally well above any people who may be in the area.

The electromagnetic fields produced by the generation and export of electricity from a wind farm do not pose a threat to public health. Grid connection is normally made at no more than 132 kilovolts (kV)[3], similar to the voltages used by utilities in existing residential distribution networks. In addition, project developers would design the entire electrical system to adhere to applicable state guidelines and industry standards to minimize EMF exposure from any new overhead transmission lines.

The grid connection lines are similar to other power lines and generate low levels of EMF, comparable to those generated by household appliances. Thus, it can be concluded that the electromagnetic fields produced by the generation and export of electricity from a wind farm do not pose a threat to public health.[4] Hence, no impact anticipated during construction phase and minor impact is anticipated during operation phase for the proposed project.

[2] *Rideout, Karen & Constance Bos. January 2010. Wind Turbines and Health. National Collaborating Centre for Environmental Health. Vancouver, Canada & Sustainable Energy Australia (SEA) Pty. Ltd. The electromagnetic compatibility and electromagnetic field implications for wind farming in Australia. Melbourne and Canberra: Australian Greenhouse Office & Australian Wind Energy Association; 2004 [cited 2009 July 21].*

[3] *The Real Truth About Wind Energy, An Analysis of the Potential Impacts of Wind Turbine Development in Ontario. Sierra Club Canada, June 2010*

[4] *Evidence Review Wind Turbines and Health: A Rapid Review of the Evidence, National Health & Medical Research Council, Govt. of Australia*

Overall Impact Assessment	Construction Phase	Operation Phase
EMF impact	Minor	Minor

6.9.13 Cumulative Impacts

There are no other wind power project located near the proposed project site. Considering the availability of land and good wind potential in the district, establishment of some other wind power project in near future cannot be ruled out. There is a solar power project about 500 m from the established labour camp close to the proposed project site. As the proposed wind power project do not involve forceful acquisition of land and the settlements are located away from turbine locations as such no resettlement issues are there. The proposed project site is located north of Hyderabad and no wind power project is observed close to the site as such visual impacts are not anticipated in the area and no obstruction to common property resources are anticipated.

Overall Impact Assessment	Construction Phase	Operation Phase
Cumulative impact	Minor	Minor

6.9.14 Overall Impact Assessment

The overall impact assessment of the proposed project is presented in Table 7-8.

Table 6-7:Overall Impact Assessment

Environment and Social Parameters	Impact During Construction Phase	Impact during Operation Phase
Establishment of Labour Camp	Moderate	Minor
Livelihood	Minor	Minor
Laying of Transmission Lines	Minor	Minor
Employment generation	Positive Impact	Positive Impact
Air Quality	Minor	Minor
Noise Quality	Minor	Minor
Ground Water Quality	Moderate	Minor
Surface Water Quality	Minor	Minor
Soil Contamination	Minor	Minor
Top Soil Loss	Minor	Minor
Shadow Flicker Analysis	No Impact	Moderate
Impact on Wildlife & Avifauna	Minor	Minor
Visual Effects	Minor	Minor
Aviation Hazard	Minor	Minor
Rainfall	No Impact	No Impact
Occupational Health and Safety	Minor	Minor
Unnatural Events like Earthquake, floods etc.	Minor	Minor

6.9.15 Conclusion

The proposed wind power project will have minor as well as short term impact during construction phase. Minor but temporary impact due to generation of dust and fugitive emissions are expected during construction phase only. Minor impact is expected on resource utilization like land and socio economic conditions of project area villages. Minor impact is anticipated on the livelihood of the community. There is no resettlement or land acquisition involved in the proposed project. There will be no impact on cultural resources as well as indigenous people due to their absence in the study area. Overall minor impact is anticipated due to generation of noise from the operating WTGs and moderate impact anticipated due to shadow flicker generation from operating WTGs. Rest of the impacts on environment and social parameters is assessed to be minor during operation phase of the proposed project.

The project also have a positive impact in terms of employment generation and socio economic conditions for the local people during entire project lifecycle. The impacts identified both during construction and operation phase can be minimized and mitigated by adopting suitable mitigation measures as suggested in the ESIA report. Based on the conclusion drawn from the ESIA study the proposed project can be categorized as Category B (as per IFCs categorization of projects), which specifies that this project is expected to have limited adverse environment and social impacts which can be mitigated by adopting suitable mitigating measures.

7 ENVIRONEMENT & SOCIAL MANAGEMENT PLAN

This chapter addresses the requirement of IFC Performance Standard-1 which highlights the importance of managing the social and environmental performance throughout the life of the project. Hero 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. The outcomes of the Environmental and Social Impact Assessment of the proposed project have been used to formulate a Social and Environmental Management & Monitoring Plan for the project, presented in **Table 8.1**. The Plan specifies measures for addressing the limited negative risks and impacts, for enhancing the beneficial impacts. In addition, organizational capacity and training requirements, required to check and ensure effectiveness of the plan throughout the lifecycle of the project, have also been discussed.

7.1 Organizational Structure

The overall management and coordination of the Project will be managed by Chairman of Hero Group, who shall be supported by the EHS Manager at the corporate and on site. The EHS Manager is supported by site head, site engineers, civil, electrical and mechanical personnel and will be supported by the HSE personnel of Hero. The contractors shall work in co-ordination with the Site-In-Charge cum EHS Supervisor and be part of the Project management team. The construction contractor shall have an Environment Health and Safety (EHS) supervisor in their team. Given the footprint of the project will be limited to the turbine sites and their immediate vicinity and the range of stakeholders dependent on the project site for various usages, Hero shall ensure that the EPC and O&M Contractor deploys a Social Officer or Site –In-charge to manage social (including labour and community) issues.

7.2 Training of Personnel & Contractors

Hero should ensure that the job specific training and EHS Induction training needs are identified based on the specific requirements of ESMS and existing capacity of site and project personnel (including the Contractors and Sub-contractors). Special emphasis shall be placed on traffic management, operation of cranes, stakeholder's engagement and grievance redressal. General environmental awareness shall be increased among the project's team to encourage the implementation of environmentally sound practices and compliance requirements of the project activities. This will help in minimizing adverse environmental impacts, ensuring compliance with the applicable regulations and standards, and achieving performance beyond compliance. The same level of awareness and commitment shall be imparted to the contractors and sub- contractors prior to the commencement of the project.

An environmental and social management training programme shall be conducted to ensure effective implementation of the management and control measures during construction and operation of the project. The training programme shall 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 shall 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 must receive dedicated training sReo as not to inadvertently aggravate exposures and health hazards to themselves or their co-workers.
- Through appropriate contract specifications and monitoring, the employer shall ensure that service providers, as well as contracted and subcontracted labour, are trained adequately before assignments begin.

7.3 Monitoring

In order to implement the ESMP, the on-site team shall adhere to a 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 shall 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 shall cover all stakeholders including contractors, labourers, suppliers and the local community impacted by the project activities and associated facilities thereby increasing the effectiveness of suggested mitigations measures. Suzlon should ensure that all the contractors comply with the requirements of conditions for all applicable permits, suggested action plans and scheduled monitoring. The inspections and audits shall be carried out by an internal trained team and external agencies/experts. The entire process of inspections and audits shall be documented and key findings of which shall be implemented by the proponent and contractors in their respective areas.

7.4 Documentation & 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.

The following records should be maintained at site:

- Documented Environment 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.

7.5 Environmental Management Plans

Social and Environmental Management & Monitoring Plan for the project, presented in **Table 7.1**.

Table 7-1: Indicative noise from different equipment and vehicles

S. N	Environmental/ Social Aspect or Issue	Impacts/Issue	Mitigation Measures	Responsibility	Reference
CONSTRUCTION PHASE					
A	**Environmental Management Plan**				
1	**Land Use- Land disturbances**	Change in land use	• Are to be demarcated where site clearing activities for construction activities are to be initiated. • Site clearing to be done only for the project site locations such as WTG land parcels, proposed internal roads, and internal transmission line ROW.	Civil works and WTG construction department	IFC performance Standards
2	**Topography**	Change in local topography	Don't allow the considerable alteration of contour level	Contractor and sub-contractors of Suzlon under the supervision of Hero Personnel	IFC performance Standards
3.1	**Air Quality- Air emission impact along the access road.** Fugitive Dust due to movement of project vehicles, piling and Emission from Diesel Generators	Impact on health due to emissions.	• Vehicles speed to be restricted to 20-30 km/hr. on unpaved road. This will reduce dust emission • Practice water sprinkling wherever required on unpaved area & during piling to set dust but ensure use of tanker water purchased form authorized local vendor only • Ensure regularly maintenance of project vehicles during construction and operational phase. • Turn off the DG sets & machineries which are not in use • DG sets (used during construction phase only) preferably should be placed away from settlement area.	Contractor and sub-contractors under the supervision of Hero' s Personnel	EHS guidelines Wind energy- IFC and World Bank Group
3.2	**Air Quality- at wind farm site**	Impact on health due to dust and exhaust gas emissions	• Excavated and construction material to be kept covered on site especially during high wind conditions • The impacts of emissions from vehicles bringing construction material to be minimised by proper upkeep of		EHS guidelines Wind energy- IFC and World Bank Group

S. N	Environmental/ Social Aspect or Issue	Impacts/Issue	Mitigation Measures	Responsibility	Reference
			maintenance of vehicles, restriction on vehicle speed, sprinkling of water and planned movement of vehicles. • Dust generating activities to be restricted and avoided in high wind conditions.		
4.1	**Noise Quality- At site and access roads due to vehicular and machinery movement and its operation.**	Disturbance to habitants due to increase in noise levels	• Keep stationary source of noise such as DG sets (during construction phase) such at farthest point from the settlements • Restrict major noise generating activities during night time 10:00 pm to 6:00 am which will be within the desired permissible limits. • Use inherently quiet equipments and machinery (Dg sets, concrete mixing) as far as practically possible. Regularly maintain them to keep noise levels within limits. • Integral noise shields to be used and fixed noise sources to be acoustically treated eg. Silencers, acoustic louvers, etc.	Contractor and sub-contractors of Suzlon under the supervision of Hero	EHS guidelines Wind energy- IFC and World Bank Group
4.2	**Noise Quality- At project site**	Impact on health of labours due to long exposure to high noise levels	• Provide personal protective equipment to workers working near high noise source • Use inherently quiet equipments and machinery (DG sets, concrete mixing) as far as practically possible. Regularly maintain them to keep noise levels within limits.		EHS guidelines Wind energy- IFC and World Bank Group
5.1	**Water resource-depleting water resources** **Contamination due to unmanaged release of sanitary waste water**	Loss of water resources and ground water contamination	• Construction labour deputed onsite to be sensitized about water conservation and promote optimised use of water. • Regular inspection maintenance of any leakages and preventing wastage of water from camp area. • Optimum use of water during sprinkling on roads, washing vehicles and concrete mixing.	Contractor and sub-contractors under the supervision of Hero	EHS guidelines Wind energy- IFC and World Bank Group
5.2	**Water Quality- improper management of construction waste**	Water contamination and pollution	• Prevent surface runoff from construction site and contamination of receiving body. • Labours should be trained for proactive usage of bins for disposal and encouraged for the use of toilets.		EHS guidelines Wind energy- IFC and World Bank Group

S. N	Environmental/ Social Aspect or Issue	Impacts/Issue	Mitigation Measures	Responsibility	Reference
			• Spill/leakage clearance plans should be adopted for immediate cleaning of spills and leakages.		
6.1	**Soil Resource**	Top Soil Loss	• Provide appropriate storage of top soil in an isolated and covered area to prevent its loss in high wind and runoff. • Allow only covered transportation of top soil within project site. • Use top soil at the time of plantation and it can be given to nearby agricultural field after taking consent with the landowners/farmers • Disturbed areas near to the settlement should be monitored for any chances of wind erosion. • Identify areas where top soil can be used before stripping of top soil.	Contractor and sub-contractors under the supervision of Hero	IFC Performance Standards
6.2	**Soil Quality**	Soil Contamination	• Inspect seepage, leakage or any soil discoloration signs indication soil pollution/contamination as part of routine inspections especially near the places of storage or use of hazardous material. • Store hazardous material (like used oil, if any) in isolated room with impervious surface. • Filling and transfer of oil to and from the container shall be on impervious surface.		IFC Performance Standards
7	**Visual Aesthetics**	Large scale change in existing landscape due to construction of wind farm	• The wind turbines shall be painted in light colour (white) to reduce the visibility of the turbine when seen from farther distances; • Reducing the occurrence of impacts due to blade glint by application of non-reflective paints.	Contractor and sub-contractors under the supervision of Hero	EHS guidelines Wind energy- IFC and World Bank Group
8	**Ecological impacts- disturbance in wildlife movements**	Impact on wildlife- land clearing and construction activities will lead to habitat disturbance	• Project related activities to be minimized during night time. • Removal of vegetation and construction footprint should be limited to the extent possible to avoid habitat disturbance.	Contractor and sub-contractors under the supervision of Hero	IFC Performance Standards

S. N	Environmental/ Social Aspect or Issue	Impacts/Issue	Mitigation Measures	Responsibility	Reference
			• Temporary barriers/fencing to be installed on excavated areas. • Minimum possible routes to be fixed for use during construction and speed of vehicles plying on these roads to be kept 20-25 Km/hr to avoid road kill. • Plantations along the approach roads, site office is one of the preferred methods to increase the green cover of the area but also serve as a sink for air pollutants. • Any animal if trapped would be released to original habitat and seek veterinary help in case of emergency. • All sightings of wildlife in and around the project will be reported (if any) and adequate steps will be taken with the help of forest personnel.		
9	**Occupational Health & Safety of workers**	Electrocution; Fire due to short-circuit; Incidents/Accidents like cutting, chipping during construction; Diseases due to unhygienic condition	• Check the integrity of equipment and machinery before taking up work. • Compulsorily provide and ensure wearing of personal protective equipment viz., gloves, helmets, ear plug, safety belt etc. and fall protection gears. • Training of workers on working at height and other occupational safety should be conducted. • Availability of clean drinking water facility for labours and workers. • Ensure hygienic condition in rest rooms, kitchen and dining area. • Ensure separate washrooms for women labours. • Ensure restriction for outsiders to excavated area and maintain tight security to these areas while construction. • Safety of employees and labours to be ensured at all times during construction. • On completion of the construction activities the debris to be removed, all the pits to filled up.	EHS personnel of Suzlon under the supervision of Hero's EHS Manager	EHS guidelines Wind energy- IFC and World Bank Group

S. N	Environmental/ Social Aspect or Issue	Impacts/Issue	Mitigation Measures	Responsibility	Reference
			• Ensure proper handling and disposal of solid waste to avoid spreading of any diseases. • Ensure proper handling and disposal of hazardous waste through authorised vendor to avoid contamination of local resources.		
10.1	**Community Health & Safety**	Incident / accident due to negligence driving, loading / unloading or any discomfort to people and their property communicable diseases due to poor hygienic conditions	• Dug areas should be fenced and sign boards in local languages to be installed. • Movement of heavy vehicles, equipments or WTG parts to be avoided during peak hours to avoid inconvenience. • Speed of the vehicles plying through village roads should be limited to 20-25 km/hr and driver be trained for safe driving. • Use warning signs to alert public risks. • Ensure proper handling and disposal of solid waste to avoid spreading of any diseases. • Ensure proper handling and disposal of hazardous waste through authorised vendor to avoid contamination of local resources.	EHS personnel of Suzlon under the supervision of Hero's EHS Manager	EHS guidelines Wind energy- IFC and World Bank Group
B	**Social Management Plan**				
1	Engagement of local and migrant labour	Conflicts between labour and contractor	Employment will be provided to local people wherever possible, especially as unskilled construction workers and security guards Hero should include clause or provisions related with non-engagement of forced and child labour, gender equity, non-discrimination on employment and opportunity and freedom to express their view in contractors agreement and HR policy Hero through its contractors should ensure that labour is being adequately paid by contractors. Also ensure that wages is being paid as per the requirement of minimum wages act Hero shall conduct internal audits as when required to monitor the performance of contractor.	Contractor and sub-contractors under the supervision of Hero' s Personnel	IFC performance Standards and EHS guidelines Wind energy- IFC and World Bank Group

S. N	Environmental/ Social Aspect or Issue	Impacts/Issue	Mitigation Measures	Responsibility	Reference
			Hero through the contractor inform the labour about emergency preparedness plan and communication system to be followed during emergency situation Hero through contractor should ensure that labour receive training on health and safety issues involved in the proposed project.		
2	Labour Accommodation (Onsite Labour camp)	Conflicts between labour and local community	Setup onsite labour camp for labours employed through contractors to restrict the interaction of migrated labour with local community as to avoid any conflict.	Contractor and sub-contractors under the supervision of Hero's Personnel	IFC performance Standards and ILO guidelines
3	Corporate Social Responsibility	Community empowerment	Employment will be provided to local people wherever possible, especially as unskilled construction workers and security guards	Hero/ Contractor/Operator	Hero's CSR policy
			Developmental needs and expectations (such as employment in the project or up-gradation of educational health care facilities, cultural property and infrastructure) of local communities will be identified through the Gram Panchayat, villagers and local administration.	Hero	
			Opportunities for contributing to the economic and developmental needs of villagers through skill training will be explored.	Hero	
4	Community Engagement	Community empowerment	Given the short duration of the Project construction phase efforts will be made to engage with the community through the Panchayati Raj Institution representatives and key identified leaders of the community.	Hero/ PRI representatives	CSR policy of Hero
5	Grievance Redressal Mechanism	Conflicts of the community/labour	To ensure that any conflicts or disagreement or suggestion of the community are resolved and addressed in a timely and appropriate manner. The contractors employed by Suzlon should inform the labour about the grievance redressal mechanism by which they can inform about any grievances	Hero/Contractor	IFC performance standards

S. N	Environmental/ Social Aspect or Issue	Impacts/Issue	Mitigation Measures	Responsibility	Reference
			Grievances related with non-fulfilment of labour welfare measures shall be monitored through its contractors.		
OPERATION & MAINTENANCE PHASE					
A	**Environmental Management Plan**				
1	**Air Quality- Air emission impact along the access road.** Fugitive Dust due to movement of project vehicles	Impact on health due to emissions.	• Vehicles speed to be restricted to 20-30 km/hr. on unpaved road. This will reduce dust emission • Practice water sprinkling wherever required on unpaved area & during piling to set dust but ensure use of tanker water purchased form authorized local vendor only • All the project vehicles shall have valid PUC certificate • Ensure regularly maintenance of project vehicles during construction and operational phase.	Hero & Suzlon's Contractors & sub-contractors	EHS guidelines Wind energy- IFC and World Bank Group
2	**Soil Quality- Generation of hazardous waste**	Soil Contamination- due to hazardous waste generation during WTG maintenance activities.	• Store hazardous material (like used oil, if any) in isolated room with impervious surface. • Filling and transfer of oil to and from the container shall be on impervious surface. • Oil and waste oil storage onsite should be proper with impervious material below and have secondary containment system. • Disposal should be through approved and authorized vendors regularly.		EHS guidelines Wind energy- IFC and World Bank Group
3	**Noise Quality-**	Impact on health of labours due to long exposure to high noise levels as well as on nearby settlements	• Regular maintenance of WTGs. • In case of complaints of high noise levels from inhabitants of nearby settlements, possibility of putting noise barriers near to receptors should be considered. • Provide personal protective equipment to workers working near high noise source		EHS guidelines Wind energy- IFC and World Bank Group

S. N	Environmental/ Social Aspect or Issue	Impacts/Issue	Mitigation Measures	Responsibility	Reference
			• Use inherently quiet equipments and machinery (Dg sets, concrete mixing) as far as practically possible. Regularly maintain them to keep noise levels within limits. • If feasible, install WTG models with inbuilt noise reducing technologies.		
3	**Occupational health and safety of workers**	Electrocution; Firing due to short-circuit; Incidents/Accidents; Diseases due to unhygienic condition	• Training of workers on Occupational safety. • Ensure separate washrooms for women labours. • Ensure restriction for outsiders to excavated area and maintain tight security to these areas while construction. • Safety of employees to be ensured at all times • Ensure proper handling and disposal of solid waste to avoid spreading of any diseases. • Ensure proper handling and disposal of hazardous waste through authorised vendor to avoid contamination of local resources.	Hero & Suzlon's sub-contractors	EHS guidelines Wind energy- IFC and World Bank Group
4.1	**Community health & safety**	Discomfort to people near WTGs. Incidents/Accidents	• Regularly consult and obtain feedback from affected people and take corrective actions. • Train drivers for safe driving and follow road signs to avoid accidents. • Speed limits should be maintained at 20- 25 km/hr.		EHS guidelines Wind energy- IFC and World Bank Group
4.2	**Shadow Flicker**	Impact on nearby community	• There will be close monitoring through engagement with residents (as part of community engagement plan) where there are predicted impacts from shadow flicker. • Plant trees around the receptor and ensure increase in dense vegetation coverage to screen the affected receptor locations in case of households near to the WTG. • Installation of blinds such as curtains at the concerned window facing the turbines generating shadow flicker impact on residents.	EHS Manager on site of Suzlon	EHS guidelines Wind energy- IFC and World Bank Group

S. N	Environmental/ Social Aspect or Issue	Impacts/Issue	Mitigation Measures	Responsibility	Reference
			• It is predicted that the following mitigation measures if properly implemented will avoid the shutting down of turbines during certain environmental conditions.		
5.2	**Biodiversity-Collision risk of avifauna**	Impact on avifauna of the area.	• The project site layout provides adequate spaces between each turbine for movement of birds which reduces the potential for accidental collision; • Daytime visual markers shall be provided on any guy wires used to support towers to enhance visibility of towers for bird; • The tip of blades should be painted to increase visibility and avoid collision. • Any dead animals/carcass shall be removed in time from the site so that it does not attract movement of vultures; • Training of local staff, villagers for identification of any of the rare species and reporting of any bird carcasses. This will help to ensure the strategic actions, when the species are spotted in the region. • Towers be regularly checked to avoid any nesting in any suitable gaps or platforms. • Flash lamps on the WTGs should be installed to reduce the collision risks during nights.	Hero & Suzlon's O& M team	

7.6 Occupational Health & Safety Management Plan

Scope and Purpose

The occupational health & safety (OHS) plan is formulated to address the key occupational health and safety related concerns of contractor workers and site personnel during both construction and operational phase.

- Work at height
- Work in confined spaces
- Lifting operations
- Blasting Operations

The main focus when managing working at height should be the prevention of a fall, however additional hazards that may also need to be considered include: falling objects and adverse weather conditions (wind speed, extreme temperatures, humidity, and wetness). Managing working at height activities requires suitable planning and the allocation of sufficient resources.

Recommendations for managing OHS for the proposed project.

Work in height Work in confined spaces:

- Eliminate or reduce the requirement to work at height. During the planning and design phases of an installation, specific tasks should be assessed with the aim of removing the need to work at height, if practicable such as assembling structures and carrying out ancillary works at ground level, then lifting the complete structure into position to the extent that is feasible and cost effective.
- Collective protection systems such as edge protection or guardrails should be implemented before resorting to individual fall arrest equipment
- Ensure all structures are designed and built to the appropriate standards, and have the appropriate means of working at height systems fitted.
- Suitable exclusion zones should be established and maintained underneath any working at height activities, where possible, to protect workers from falling objects.
- Ensure all employees working at height following work permit system, are trained and competent in the use of all working at height and rescue systems in place.
- Provide workers with a suitable work-positioning device; also ensure the connectors on positioning systems are compatible with the tower components to which they are attached.
- Ensure that hoisting equipment is properly rated and maintained and that hoist operators are properly trained.
- When working at height, all tools and equipment should be fitted with a lanyard, where possible, and capture netting should be used if practicable.
- Signs and other obstructions should be removed from poles or structures prior to undertaking work.
- An approved tool bag should be used for raising or lowering tools or materials to workers on elevated structures.
- Avoid conducting tower installation or maintenance work during poor weather conditions and especially where there is a risk of lightning strikes.
- An emergency rescue plan should be in place detailing the methods to be used to rescue operatives should they become stranded or incapacitated while at height.

Blasting Operations:

The facility site may include excavation/blasting for construction materials such as sands and gravels, and access road construction. Suzlon and its team should follow the laid down procedure to avoid any hazard to life during the blasting operation.

The OHS plan will also be serving as a reference document for finalization of safety procedures with respect to other construction and operational activities. The suggested measures to be implemented both during construction and operational phase have been discussed below:

- The onsite workers shall be provided with proper personal protective equipment (PPEs) i.e. safety shoes & goggle, helmet, coverall, gloves, ear plugs, safety harness in case working at height etc during construction related activities to ensure health and safety of the workers at workplace.
- Provision of first-aid kits at all work-areas onsite. Appropriately equipped first-aid stations should be easily accessible throughout the place of work
- Adequate light and ventilation shall be provided for the workers working in confined spaces.
- Passageways for pedestrians and vehicles within and outside buildings should be segregated and provide for easy, safe, and appropriate access
- Hand, knee and foot railings should be installed on stairs, fixed ladders, platforms, permanent and interim floor openings, loading bays, ramps, etc.
- Eye-wash stations will be provided close to all workstations where immediate flushing with water is the recommended first-aid response
- Safety signage and posters will be displayed at strategic locations within the site. Hazardous areas (electrical rooms, compressor rooms, etc), installations, materials, safety measures, and emergency exits, etc. should be marked appropriately.
- Monitoring weather forecasts for outdoor work to provide advance warning of extreme weather and scheduling work accordingly
- Provisions should be made to provide OHS orientation training to all new employees to ensure they are apprised of the basic site rules of work at / on the site and of personal protection and preventing injury to fellow employees.
- Training should consist of basic hazard awareness, site specific hazards, safe work practices, and emergency procedures for fire, evacuation, and natural disaster, as appropriate. Any site-specific hazard or colour coding in use should be thoroughly reviewed as part of orientation training.
- Ready reference to ReNew's H & S Policy EHS Manual should be referred to maintain health and safety on site both during construction and operation phase of the project.

7.7 Road Safety & Traffic Management Plan

Scope and Purpose

The plan encompasses the addressal of community safety related impacts that may arise from the increased vehicular traffic due to movement of heavy equipment/machineries and vehicles along the site access and approach roads particularly during construction phase. The plan will be regularly updated by the contractor with the project progress and as vehicle movement requirements are identified in detail. Designated traffic coordinator will be responsible for overall coordination of traffic management.

During Construction Phase

The following mitigation measures will be implemented during this phase:

- Project vehicular movement will be restricted to defined access routes.
- Proper signage should be displayed at important traffic junctions along the vehicular access routes to be used by construction phase traffic. The signage will serve to prevent any diversion from designated routes and ensure proper speed limits are maintained near residential areas.
- Any road diversions and closures should be informed in advance to the project vehicles accessing the above route. Usage of horns by project vehicles will be restricted near sensitive receptors viz. schools, settlements etc.
- Temporary parking facilities shall be provided within the work areas and the construction sites to avoid road congestion.
- Adequate training on traffic and road safety operations will be imparted to the drivers of project vehicles. Road safety awareness programs will be organized in coordination with local authorities to sensitize target groups viz. school children, commuters on traffic safety rules and signages.
- The contractor(s) should frame and implement a “No Drug No Alcohol” Policy to prevent road accidents/incidents.

During Operational Phase

Since limited vehicular movement is anticipated during operational phase considering only the daily movement of project personnel any impacts arising from the same can be effectively addressed through implementation of mitigation measures as discussed during the construction phase. In addiction following measures will be emphasised.

- Use of horns near the villages along the access road to villages, main plant and internal roads should be restricted.
- All the vehicles entering the access roads and plant shall have Pollution under Control (PUC) certificates.
- The speed limit in the internal roads shall be restricted to 25 km/hr. Proper warning signs and road safety awareness posters shall be displayed to create road safety awareness among the personnel accessing the site.
- Periodic Road Safety and Traffic Management campaigns and awareness sessions shall be carried out among the villagers and the plant workers/personnel to develop road safety awareness among the people likely to be impacted by the project.
- The Proponent shall frame and implement a “No Drug No Alcohol” Policy to prevent road accidents/incidents.

7.8 Emergency Response Management Plan (ERMP)

Purpose

Hero should develop a site specific Emergency Response Management Plan for implementation at the proposed site in the event of an emergency situation so that any loss of life and damage to the properties & natural resources are minimized and avoided. This plan outlines a series of emergency actions that will be executed by Suzlon and its Contractors to ensure preparedness and response to emergency situations throughout the life-cycle of the project.

Definition(s)

Emergency - Any unplanned situation, which presents a threat to the safety of workers and/or damage to the properties and other natural resources deemed valuable at the project site.

Emergencies

The emergency situations that are probable to occur at the site and the probable causes are listed below:

- Fire at site during temporary construction phase which cannot be doused by fire extinguishers; Also fire due to short circuit at the plant and equipment during both construction & operation phase;
- Collapse of any structure;
- Outbreak of endemic disease among a large section of construction workers due to contaminated drinking water, unhygienic conditions that have developed at workplace etc;
- Protests by the local community or other stakeholders at any point of the project lifecycle due to grievances;
- Serious injury or death of employee or sub-contracted worker at work, due to non-work related illness or work-related accident;
- Onset of any natural disaster like earthquake.

Emergency Management

The following steps shall be taken to ensure proper management of emergency or crisis situations:

- The nearest civil hospitals, private health care centers or practitioner clinic shall be identified and a agreements shall be made with the aforesaid medical centers/practitioners to provide prompt health care services (including ambulance services) in the event of an emergency situation at site.
- A list of important telephone numbers such as fire brigade, health care facility/practitioner, police station, EHS and Social Coordinator, project office, head offices etc shall be displayed at all the prime locations at site & the worker's camp (during construction phase).
- Regular liaisoning with the police, Gram Panchayat, district administration shall be carried out to ensure that prompt assistance is readily available in the event of an emergency.
- An Emergency Management (including Disaster Management) team comprising of 4-6 professionals both from the developer and contractors' side, during construction phase and 2-3 professionals during operation of the proposed project; shall be formed to combat any emergency situation and ensure safety of the life and property at site. For this purpose 2-3 personnel employed in the plant during operation phase shall be trained on Emergency scenarios and their management measures including their roles and responsibilities in case of an emergency situation.
- The workers (staff & contractual workers from both Hero & Contractors) should be trained on their duties and emergency preparedness during an emergency. In case of an emergency, all site personnel shall be trained to follow the communication lines given below:
- The SEHS Coordinator takes charge of the emergency response and direct further action and co-ordination, including escalating the matter to the CEO or other top-level managers as required.

Responsibilities

The SEHS Coordinator will be responsible for implementing this procedure, which includes

- Ensuring that the emergency preparedness measures are in place;

- Providing training to the personnel at site regarding reporting of the emergencies, and to site office personnel regarding response to emergency calls from the site personnel,
- Direct action-and co-ordination at the time of an emergency.

7.9 Community Health & Safety Plan

Community health and safety hazards specific to wind energy facilities primarily include the following:

Setback: Turbines must be sited at an acceptable distance ("setback") between wind turbines and adjacent users, including buildings, roads, and wildlife, in an effort to, among others, ensure acceptable noise levels and visual disturbance. In the proposed project the wind turbines are located beyond 500 m from the nearest settlements except two wind turbines which are close to the settlements (within 500 m).

Electromagnetic Interference and Radiation: Wind turbines could potentially cause electromagnetic interference with telecommunication systems (e.g., microwave, television, and radio). This interference could be caused by path obstruction, shadowing, reflection, scattering, or re-radiation. The nature of the potential impacts depends primarily on the location of the wind turbine relative to the transmitter and receiver, characteristics of the rotor blades, signal frequency receiver characteristics, and radio wave propagation characteristics in the local atmosphere. Suitable mitigation measures to enhance the quality of the television signal and lower the impact of wind turbine on telecommunication need to be adopted.

Public Access: Safety issues may arise with public access to wind turbines (e.g., unauthorized climbing of the turbine) or to the wind energy facility substation. Any public rights of way located within and close to the wind energy facility site should be identified prior to construction to establish any measures that may be required to ensure the safety of their users.

Blade Throw: A failure of the rotor blade can result in the “throwing” of a rotor blade, or part thereof, which may affect public safety. The overall risk of blade throw is extremely low. Blade throw risk management strategies include:

- Establish setback distances between turbines and populated locations. The minimum recommended setback distance is 2 x hub height, although it can vary with the size, shape, weight, and speed of the blades, and the height of the turbine.
- 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.

Community Liaison Plan

Introduction

The Community Liaison Plan is a critical element of the overall Social Management Plans. Regular transparent communication between both the project and the communities and vice versa is crucial in building positive relationships between the two parties. This relationship should be crucial for managing unexpected situations which might arise during the course of the project.

Objectives

IFC Performance Standards mandates continuous communication between project and the different stakeholders e.g. workers, local community & contractors. The onus of initiating the process of communication rests on the project proponent. The project proponent should ensure that disclosure of relevant project information that would help the affected communities understand the risks, impacts and opportunities of the project. The Community Liaison Plan is developed to ensure a clear communication channel between the project and the local community. Even though the focus of the plan is primarily on communication with the community areas where there are likely interactions between the community and the Contractors such areas have also been covered.

The community liaison plan would concentrate on the following aspects:

1. **Communication with the Community**: As mandated in the IFC Performance standards Hero would disclose the project details to make the community aware of the important features of the project. A Project Information Booklet would be prepared and distributed in the project affected villages. This booklet should preferably be presented in local language. The booklet in addition to containing the salient features of the project should have a map depicting the boundaries of the plant and its ancillary facilities. The important landmarks e.g. the settlement, schools and the roads, etc. should also be demarcated so that it becomes easy for the people in the villages to relate to the ground conditions. In addition to the project information the booklet should also highlight the impacts on the community as presented in the ESA document and the commitments for the safeguards including the entitlement matrix. To ensure wide circulation of the Project Information Booklet the booklet would be made available at all the schools, Anganwadi centers, and other public facilities in the project affected village.
2. To ensure continuity of the flow of information to the community it is suggested that a quarterly **Community Information Booklet** should be published. During the construction phase the booklet would contain the information about the progress of the project and also information which are pertinent to community e.g. disruption of the transportation links, outcome of consultation process on community development etc. It is proposed that the community Information Booklet be continued even during the operations stage where this also acts as a transfer of information from the project to the community.

7.10 Grievance Redressal Mechanism

IFC PS requires that the client should establish a grievance mechanism to receive and address specific concerns about compensation and relocation that are raised by displaced persons or members of host communities, including a recourse mechanism designed to resolve disputes in an impartial manner. The grievance mechanism should be scaled to the risks and adverse impacts of the project. It should address concerns promptly, using an understandable and transparent process that is culturally appropriate and readily accessible to all segments of the affected communities, and at no cost and without retribution. The client will inform the affected communities about the mechanism in the course of its community engagement process.

7.11 Stakeholder Engagement Plan (SEP)

Hero should develop a broad level Stakeholder Engagement Plan

The main objectives of the SEP is to:

- Enable management to develop effective stakeholders management strategies for the various projects in order to build longer term relationships so as to ensure smooth functioning of the projects;

- To define and standardise the processes that the projects will use to communicate with respective stakeholders;
- To ensure regular and timely sharing of information with project teams 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 Stakeholder Engagement Plan and ensuring the project's 'Social License to Operate'

7.11.1 Stakeholder Identification, Mapping & Analysis

"Stakeholder mapping" is a process of examining the relative influence that different individuals and groups have over a project as well as the influence of the project over them. Effective stakeholder mapping is done by identifying the people/groups that have stakes/ interests in the Project either directly or indirectly and the manner in which both can mutually benefit from each other.

7.11.2 Categorization of Stakeholders

A stakeholder is "a person, group, or organization that has a direct or indirect stake in a project/organization because it can affect or be affected by the Project/organization's actions, objectives, and policies". Stakeholders thus vary in terms of degree of interest, influence and control they have over the project. While those stakeholders who have a direct impact on or are directly impacted by the project are known as **Primary Stakeholders**, those who have an indirect impact or are indirectly impacted are known as **Secondary Stakeholders.**

Stakeholder Groups	Primary Stakeholders	Secondary Stakeholders
Community	Sub-contractors Local Labourers	Local community Agricultural Labourers Vulnerable Community
Institutional Stakeholders	*Gram Panchayats* Project investors	Village Institutions (schools, health centres);
Government Bodies	Regulatory Authorities; District Administration	
Other Groups		Media, NGO, Other industries/projects

7.12 Environmental Monitoring Programme

Monitoring is one of the most important components of a management system. Continuous monitoring needs to be carried out for regulatory requirements, to monitor the environmental quality and to determine performance of proposed mitigation measures. Monitoring indicators have been developed for each of the activity considering the mitigation measures proposed. Indicators have been developed for ascertaining the environmental quality and the performance of the EMP implementation through Environmental Quality Indicators (EQI's) and Environmental Performance Indicators (EPI's) respectively. This focuses not only on quantifying or indexing activity-environment interactions but also may potentially impact the environment. At the same time it also help in comparing different components of environmental quality against previously established baseline status. Monitoring results would be documented, analyzed and reported internally to Head – HSE of Hero. Monitoring requirements (including monitoring frequency) have been presented in the following **Table 8.2.**

Table 7-2:Proposed Monitoring Requirement of the Proposed Project

A. Environment Monitoring

EPI No.	Environmental Performance Indicator (EPI)	Monitoring Parameter	Location	Period & Frequency	Monitoring Entity	Applicable IFC PS
A.	**CONSTRUCTION PHASE**					
A1	Soil compaction and contamination	Dumping of construction material on site and adjacent agriculture fields	Near WTG locations	Monthly	Suzlon and Hero's Site team	PS I: Assessment and Management of Environment and Social Risks and Impacts
A2	Rise of emergency conditions and accidents. Forms integral part of Occupational H & S Management system	Training for work at height, use of PPEs and health and safety on site for workers and client personnel		On routine basis through daily tool box talks and a one 1 day training to site supervisors on PPEs and occupational health and safety.		PS I: Assessment and Management of Environment and Social Risks and Impacts
A3	Integral part of Management System and occupational health and safety	Audits of the contractors and sub-contractors		Quarterly		PS I: Assessment and Management of Environment and Social Risks and Impacts
A4	Air emissions from vehicles and machineries	Inspection of valid PUC Certificates for all vehicles used for project activity	Exhausts near project site	Monthly during construction phase		PS 3: Resource Efficiency and Pollution Prevention
A5	Dust generated from site clearance / levelling	Visual observation of dust generation	Project site & access roads	Weekly during site preparation	HSE Manager of Hero	PS 3: Resource Efficiency and Pollution Prevention

EPI No.	Environmental Performance Indicator (EPI)	Monitoring Parameter	Location	Period & Frequency	Monitoring Entity	Applicable IFC PS
A6	Noise emissions from vehicles and machineries	Noise pressure level in dB(A) Compliance with CPCB noise limits specified for DG sets Check for valid certificates of Type Approval and also valid certificates of Conformity of Production for equipment particularly DG sets.	Near WTG sites	Monthly during site preparation		PS 3: Resource Efficiency and Pollution Prevention
A7	Gaseous pollutant emissions from DG Set	Inspection of stack emission report for DGs to be used on site. Pollutant concentrations in gaseous emissions and maintenance parameters (air, fuel filters & air-fuel ratio) of DG sets influencing air emissions	DG Stack	Monthly during construction phase	Suzlon and Hero Site team	PS 3: Resource Efficiency and Pollution Prevention
A8	Sourcing of water	Volume of water sourced and consumed for construction work	Sourcing and usage areas	Monthly		PS 3: Resource Efficiency and Pollution Prevention
A9	Fugitive emissions from handling and storage of raw materials	Visual observation	Material stockpiles	Monthly during construction phase	HSE Manager onsite and corporate HSE Head at corporate level	PS 3: Resource Efficiency and Pollution Prevention
A10	Community health and safety	Complaints registered by the local communities No. of. Accidents reported if any.	Grievance Records Safety Records	Monthly during construction phase.		PS 4: Community Health Safety and Security
A11	Occupational health and safety	Health surveillance of workers	Medical records	Monthly during construction phase		PS I: Assessment and Management of Environment and Social Risks and Impacts

EPI No.	Environmental Performance Indicator (EPI)	Monitoring Parameter	Location	Period & Frequency	Monitoring Entity	Applicable IFC PS
		Sanitation status of labors working during construction phase	Onsite records			PS I: Assessment and Management of Environment and Social Risks and Impacts
		Potable nature of drinking water viz. coliform, pH, TSS, Residual chlorine	Drinking water storage tanks			PS I: Assessment and Management of Environment and Social Risks and Impacts
		Usage of proper PPEs Safety performance indicators viz. LTIs. Near misses, fatalities etc	Construction site	Daily during construction phase		PS I: Assessment and Management of Environment and Social Risks and Impacts
A12	Disposal of sewage	Visual observation of leaks, overflows etc and odour problems if any.	Septic tank and soak pits	Daily during construction phase		
A13	Surface run-off discharge	Visual observation of water logging due to drainage disruption	Areas abutting construction site	In the event of storm/floods during construction	EHS Manager and head of Hero	PS 3: Resource Efficiency and Pollution Prevention
		CPCB Inland Water Discharge Parameters	Discharge point			PS 3: Resource Efficiency and Pollution Prevention
A14	Domestic waste generation, storage, handling and disposal	Quantity of waste generated from labour camp and recycled Visual observation of waste segregation and storage conditions viz. usage of labelled and covered bins, insect repellents etc.	Waste generating areas viz.labour camp, canteen, site office.	Weekly during construction phase		PS 3: Resource Efficiency and Pollution Prevention

EPI No.	Environmental Performance Indicator (EPI)	Monitoring Parameter	Location	Period & Frequency	Monitoring Entity	Applicable IFC PS
		Awareness level of onsite workers	Workers involved in waste handling and storage			
A18	Hazardous chemicals and waste storage, handling and disposal	Quantity of fuel consumed	Chemical and fuel storage and consumption areas	Daily during construction phase	Head EHS Manager	PS I: Assessment and Management of Environment and Social Risks and Impacts
		Visual observation of fuel and chemical storage conditions viz. presence of spill kits, drip trays, fire extinguisher, etc				
		Quantity of waste oil and other hazardous waste generated and recycled to registered recyclers	Hazardous waste storage areas	Weekly during construction phase		PS I: Assessment and Management of Environment and Social Risks and Impacts
		Awareness level of onsite workers	Workers involved in waste handling and storage			
B.	**OPERATIONAL PHASE**					
B1	Noise generated from operation of wind mill	Noise pressure level in dB(A)	Near receptors (if there is any complaint from the community)	Quarterly during operational phase	EHS Manager on site Hero	PS 3: Resource Efficiency and Pollution Prevention
		Maintenance parameter check with respect to noise attenuation and control	Noise generating equipment	As per supplier manual		PS 3: Resource Efficiency and Pollution Prevention
B2	Water sourcing and consumption	Record keeping of volume of water sourced and consumed	Water usage areas	Daily during operational phase		PS 3: Resource Efficiency and Pollution Prevention

EPI No.	Environmental Performance Indicator (EPI)	Monitoring Parameter	Location	Period & Frequency	Monitoring Entity	Applicable IFC PS
B3	Surface run-off discharge	Visual observation of water logging due to any possible drainage disruption	Areas abutting plant site	In the event of storm/flood during operation		PS 3: Resource Efficiency and Pollution Prevention
		CPCB Inland Water Discharge Parameters and Effluent Standards of IFC Thermal Power Plant EHS Guidelines	Discharge point			PS 3: Resource Efficiency and Pollution Prevention
B5	Hazardous chemicals and waste storage, handling and disposal	Visual observation of chemical storage conditions viz. presence of spill kits, drip trays, fire extinguisher, display of MSDS etc.	Chemical and fuel storage and consumption areas	Daily during operational phase	Head EHS Manager	PS I: Assessment and Management of Environment and Social Risks and Impacts
		Quantity of waste oil and other hazardous waste generated and recycled to registered recyclers Awareness level of operational workforce	Hazardous waste storage areas Workforce involved in waste handling and storage	Weekly during operational phase	Head EHS Manager	PS I: Assessment and Management of Environment and Social Risks and Impacts
B6	Community health and safety	Complaints registered by the local communities No. of. Accidents to be reported	Grievance Records Safety Records	Monthly during operational phase	EHS Head at corporate level	PS 4: Community Health Safety and Security
B8	Occupational health and safety	Health surveillance of workers	Medical records	Monthly during operational phase	EHS Manager-Hero	PS 2: Labour and Working Conditions
		Sanitation status of onsite office building and canteen	Office building maintenance records		EHS Manager-Hero	PS 2: Labour and Working Conditions

EPI No.	Environmental Performance Indicator (EPI)	Monitoring Parameter	Location	Period & Frequency	Monitoring Entity	Applicable IFC PS
		Potable nature of drinking water viz. coliform, pH, TSS, Residual chlorine	Drinking water storage tank		EHS Manager-Hero	PS 2: Labor and Working Conditions
		Usage of proper PPEs Safety performance indicators viz. LTIs. Near misses, fatalities etc	Operational sites	Daily during operational phase	EHS Manager-Hero	PS 2: Labor and Working Conditions
B11	Monitoring of Collision mortality of bird and bats	Monitoring, reporting, Inspection and record keeping	WTGs, transmission line route and near substation	Monthly monitoring, reporting and record keeping	Onsite EHS manager-Hero	

B. Environmental Quality Monitoring

EQI No	Environmental Quality Indicator (EQI)	Monitoring Parameter	Location	Period & Frequency
A.	**CONSTRUCTION PHASE** **Not required**			
B.	**OPERATIONAL PHASE**			
B1	Ambient Noise quality	Measurement of Noise Pressure Level in dB(A)	Nearest receptor viz. villages, schools, ecological habitat (if there is any complaint/grievance revived from the community)	Quarterly during operational phase

ANNEXURE

Annexure - I: ILO Workers' Accommodation Requirements

No.6

ILO HELPDESK

ASSISTANCE@ILO.ORG

International Labour Organization

Workers' housing

Housing provided to workers as part of the employment contract should meet certain minimum specifications in respect of the nature and standard of the accommodation and facilities to be made available.

The following guidance is based on international labour standards. National or state regulation will often set baseline specifications as part of housing, labour, health or even fire safety regulations; they should be checked and followed. National employers and workers organizations may also be a good source of information on national law, collective bargaining agreements and customs pertaining to housing for workers; or may be able to refer you to the appropriate statutory authority.

Guiding principles

➡ In providing worker[1] housing, the objective should be to ensure "adequate and decent housing accommodation and a suitable living environment"[2] for workers. This includes upkeep, improvement and modernisation of housing and related community facilities.[3]

It is "generally not desirable that employers should provide housing for their workers directly".[4] Employers are encouraged to help their workers to obtain housing through autonomous private agencies, public housing schemes, or cooperatives.[5] This is because workers living at the work site on property owned or controlled by the employer tend to be less integrated into the local community, and more dependent on the employer. However, certain circumstances, such as when an undertaking is located far from normal centres of population, or where the nature of the employment requires that the worker should be available at short notice may require the employer to provide housing for his or her workers.[6]

If housing is provided by the employer "the fundamental human rights of the workers, in particular freedom of association, should be recognised."[7] Arrangements where accommodation and communal services are provided as payment for work should take care to ensure that the interests of the workers are protected. If rent is charged, it should not cost the worker more than a reasonable proportion of his or her income.[8]

Siting and construction

➡ The housing and related community facilities should be of durable construction, taking into account local conditions, such as liability to earthquakes.[9]

The location of workers' housing should ensure that workers are not affected by air pollution, surface run-off or sewage or other wastes.[10]

Housing Standards

➡ Housing should ensure "structural safety and reasonable levels of decency, hygiene and comfort".[11] The undertaking should ensure the following:

a) a separate bed for each worker;
b) adequate headroom, providing full and free movement, of not less than 203 centimetres;
c) the minimum inside dimensions of a sleeping space should be at least 198 centimetres by 80 centimetres;
d) beds should not be arranged in tiers of more than two;
e) bedding materials should be reasonably comfortable;
f) bedding and bedframe materials should be designed to deter vermin;
g) separate accommodation of the sexes;
h) adequate natural light during the daytime and adequate artificial light;
i) a reading lamp for each bed;
j) adequate ventilation to ensure sufficient movement of air in all conditions of weather and climate;
k) heating where appropriate;
l) adequate supply of safe potable water;
m) adequate sanitary facilities (see below);
n) adequate drainage;
o) adequate furniture for each worker to secure his or her belongings, such as a ventilated clothes locker which can be locked by the occupant to ensure privacy;
p) common dining rooms, canteens or mess rooms, located away from the sleeping areas;
q) appropriately situated and furnished laundry facilities;
r) reasonable access to telephone or other modes of communications, with any charges for the use of these services being reasonable in amount; and

---

[1] Workers' Housing Recommendation, 1961 (No. 115). The section entitled "Suggestions concerning methods of application," Part I, paragraph 5, encourages "equality of treatment between migrant workers and national workers". Therefore, this guidance applies equally to migrant workers and national workers.
[2] R. 115, General Principles, Part II, paragraph 2.
[3] R. 115, paragraph 3.
[4] R. 115, Part IV, paragraph 12(2).
[5] R. 115, Part IV, paragraph 12(1).
[6] R. 115, Part IV, paragraph 12(2).
[7] R. 115, Part IV, paragraph 12(3a).
[8] R. 115, Part II, paragraph 4, Part IV, paragraph 12(3c) and (4).
[9] R. 115, Suggestions Concerning Methods of Application, Part I, paragraphs 10-11.
[10] R. 115, Suggestions Concerning Methods of Application, Part IX, paragraph 43.
[11] R. 115, paragraph 19.

s) rest and recreation rooms and health facilities, where not otherwise available in the community.

In workers' sleeping rooms the floor area should not be less than 7.5 square metres in rooms accommodating two persons; 11.5 square metres in rooms accommodating three persons; or 14.5 square metres in rooms accommodating four persons. If a room accommodates more than four persons, the floor area should be at least 3.6 square metres per person. Rooms should indicate the permitted number of occupants.

As far as practicable, sleeping rooms should be arranged so that shifts are separated and that no workers working during the day share a room with workers on night shifts.

Sanitation facilities

➡ Adequate sanitary facilities should include a minimum of one toilet, one wash basin and one tub or shower for every six persons. They should be provided at a convenient location which prevents nuisances. Sanitary facilities provided should meet minimum standards of health and hygiene. They should also provide reasonable standards of comfort, including hot and cold fresh running water. There should be separate sanitary facilities provided for men and for women. Sanitary facilities should have ventilation to the open air, independently of any other part of the accommodation. Soap and hygienic paper should be adequately stocked.

Health and safety

➡ As far as possible, floors walls, ceilings and equipment should be constructed to minimize health risks.

The accommodations should be kept free of rats, mice, insects and vermin. In areas where mosquitoes are prevalent, workers should be provided netting.

Measures should be taken to prevent the spread of diseases. Separate facilities should be provided for sick workers to prevent the spread of transmissible diseases among the occupants. Fire safety measures should be taken, including installing and maintaining fire equipment (alarms, extinguishers, etc.). Workers should be trained in fire procedures. Bedding should not contain flammable materials. Radiators and other heating apparatus should be placed so as to avoid risk of fire, and shielded where necessary to prevent discomfort to occupants.

Safety exits should be clearly marked. Adequate means of escape should be provided and properly maintained.

Provisions should be made for workers' physical safety and well-being, and protection of their belongings. Measures should be reasonable and not unduly restrict workers' freedom of movement. Workers should be allowed visits for social relations or business, including trade union business.[12]

Inspection of premises

➡ Premises should be inspected frequently to ensure that the accommodation is clean, decently habitable and maintained in a good state of repair. The results of each such inspection should be recorded and be available for review.

Vacating the premises upon termination of employment

➡ When a worker's contract of employment is terminated, the worker should be entitled to a reasonable period of time to vacate the premises, in accordance with national law and custom.[13]

Consultation

➡ In the design of housing for workers, "every effort should be made to consult those bodies representative of future occupants best able to advise on the most suitable means of meeting their housing and environmental needs."[14]

References

➡ Workers' Housing Recommendation, 1961 (No. 115); full text available at: http://www.ilo.org/ilolex/english/recdisp1.htm.

➡ For comparison, you may also wish to consult the Maritime Labour Convention (MLC), 2006, Title 3, which gives detailed guidance for workers' accommodation for seafarers; full text available at: http://www.ilo.org/ilolex/cgi-lex/convde.pl?C186.

[12] R. 115, Suggestions Concerning Methods of Application, Part IV, paragraph 17.

[13] R. 115, General Principles, Part IV, paragraphs 12(3)b) and Suggestions Concerning Methods of Application, Part IV, paragraph 15.

[14] R. 115, Suggestions Concerning Methods of Application, Part IX, paragraph 42.

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Multinational Enterprises Programme
International Labour Office
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assistance@ilo.org

Annexure - II: World Bank Chance Find Procedure

These procedures were developed in accordance with the Lebanese regulations and the World Bank Guidelines - OP 4.11 of August 1999.

These procedures are included as standard provisions in construction contracts to ensure the protection of cultural heritage.

A clause for "Protection of Archaeological and Historical Sites' was added to all bidding documents for the works contract which explains the steps to follow whenever new archaeological remains, antiquity or any other object of cultural or archaeological importance are encountered during construction.

Protection of Archaeological and Historical Sites'

1- Excavation in sites of known archaeological interest should be avoided. Where this is unavoidable, prior discussions must be held with the Directorate of Antiquities in order to undertake pre-construction excavation or assign an archaeologist to log discoveries as construction proceeds. Where historical remains, antiquity or any other object of cultural or archaeological importance are unexpectedly discovered during construction in an area not previously known for its archaeological interest, the following procedures should be applied:

a) Stop construction activities.
b) Delineate the discovered site area.
c) Secure the site to prevent any damage or loss of removable objects. In case of removable antiquities or sensitive remains, a night guard should be present until the responsible authority takes over.
d) Notify the responsible foreman/archaeologist. Who in turn should notify the responsible authorities, the General Directorate of Antiquities and local authorities (within less than 24 hours).
e) Responsible authorities would be in charge of protecting and preserving the site before deciding on the proper procedures to be carried out.
f) An evaluation of the finding will be performed by the General Directorate of Antiquities. The significance and importance of the findings will be assessed according to various criteria relevant to cultural heritage including aesthetic, historic, scientific or research, social and economic values.
g) Decision on how to handle the finding will be reached based on the above assessment and could include changes in the project layout (in case of finding an irrevocable remain of cultural or archaeological importance), conservation, preservation, restoration or salvage.
h) Implementation of the authority decision concerning the management of the finding.
i) Construction work could resume only when permission is given from the General Directorate of Antiquities after the decision concerning the safeguard of the heritage is fully executed.

Annexure - III: Socio-Economic Survey For Village Profile

Name of the village			***Panchayat***		
Taluka/Block			***District***		
Respondent				***Date:***	
Total Population		***Total Male***		***Total Female***	***HH No.***

Religion	***Name***	***%***	***Name***	***%***	
Caste/Group	***Name***	***%***	***Name***	***%***	
	Name	***%***	***Name***	***%***	
Education Level	***Illiterate %***	***Primary %***	***Secondary %***	***H.S. %***	***Graduate %***
Occupation	***Agriculture %***	***Business %***	***Service %***	***Labour %***	***Other %***
Source Drinking water facility	***Tube well***	***Dug well***	***Stream***	***Piped water***	***Hand pumps***
Sanitation facility	***Pit latrine %***	***Sanitary latrine %***	***Open defecation %***	***Other %***	
Electricity (Available %)			***Electricity availability in HH***		
Village road type/transport facility					
Schools (distance)	***Primary***	***Middle***	***H. S.***	***College***	***Anganwadi***
Health Facility (distance)	***Health sub Centre***	***Primary***	***Hospital***	***Others***	
Major diseases					

Major crops cultivated	***Name***	***Period***	***Yield (q/acr)***	***Rate/q***	***Name***	***Period***	***Yield (q/acr)***	***Rate/q***

Irrigation Facility	***Ponds***	***River***	***Groundwater***	***Others***	
Average land holding size					
Land rights					
Livestock	***Cow***	***Buffalo***	***Goat***	***Pig***	***Fowl***
	Duck	***Others***			
Grazing areas					
Cooking medium and source	***Fuel Wood***	***Kerosene***	***Cow Dung cake***	***Crop Residue***	***LPG***

	Others				
Common property Resources(CPR)	***Religious and cultural places***	***Sacred places***	***Community hall***	***community Ponds***	***Cremation ground***
	Streams	***canal***	***river***	***Others***	
Major rituals and festivals	***Name***	***Period***	***Name***	***Period***	
Fishing area		***Name of the***			
Forest	***Wood***	***Timber***	***NTFP***	***Others***	
Any Vulnerable Groups like- landless/homeless- people, Women headed HH, Orphans etc.					
Any program related to child / women health care program					
Any employment generation program					
HH & Cottage industries in the village / area					
Any proposed Scheme / Program related infrastructure / any amenities					
Occurrence any Natural Calamities / industrial / anthropogenic Hazard					

Annexure IV: Demographic Profile of the Study Area Villages

Sl. No	Particular	HH	Total Population	Ave. HH Size	Male Pop.	% M	Female Pop.	% F	Sex Ratio
A	**District level**								
1	Medak	668626	3033288	4.5	1523030	50.21	1510258	49.79	992
B	**Mandal/Tehsil Level**								
1	Jharasangam	9088	44583	4.9	22731	50.99	21852	49.01	961
C	**Study Area Villages**								
1	Chilepalle	270	1826	6.8	956	52.35	870	47.65	910
2	Chilkepalle	251	1123	4.5	551	49.07	572	50.93	1038
3	Yelgoi	621	3233	5.2	1652	51.10	1581	48.90	957
4	Potpalle	487	2237	4.6	1155	51.63	1082	48.37	937
5	Bardipur	393	1878	4.8	946	50.37	932	49.63	985
6	Kuppanagar	610	2940	4.8	1488	50.61	1452	49.39	976
7	Machnoor	437	2161	4.9	1077	49.84	1084	50.16	1006

Source: *Source: census of India, 2011*

Annexure -V: Schedule cast and Schedule tribes Population in Study Area

S. No	Particular	Total Population	SC Population	% SC	ST Population	% ST
A	**District level**					
1	Medak	3033288	537947	17.73	168985	5.57
B	**Mandal/Tehsil Level**					
1	Jharasangam	44583	12946	29.04	1138	2.55
C	**Study Area Villages**					
1	Chilepalle	1826	285	15.61	420	23.00
2	Chilkepalle	1123	327	29.12	5	0.45
3	Yelgoi	3233	905	27.99	104	3.22
4	Potpalle	2237	806	36.03	0	0.00
5	Bardipur	1878	812	43.24	8	0.43
6	Kuppanagar	2940	720	24.49	12	0.41
7	Machnoor	2161	849	39.29	2	0.09

Source: *Source: census of India, 2011*

Annexure -VI: Literacy rates of Study area

S. No	Particular	Total Literate	%	Male Literate	% M	Female Literate	% F	Illiterates	% Illiterates
A	**District level**								
1	Medak	1637137	61.42	953406	71.43	683731	51.37	1028548	38.58
B	**Mandal/Tehsil Level**								
1	Jharasangam	22463	57.49	13368	67.30	9095	47.34	16611	42.51
C	**Study Area Villages**								
1	Chilepalle	870	56.46	478	59.90	392	52.76	671	43.54
2	Chilkepalle	557	55.20	336	68.29	221	42.75	452	44.80
3	Yelgoi	1519	54.76	926	65.30	593	43.73	1255	45.24
4	Potpalle	1077	55.32	663	65.97	414	43.95	870	44.68
5	Bardipur	1065	63.62	617	74.16	448	53.21	609	36.38
6	Kuppanagar	1493	58.21	871	67.10	622	49.09	1072	41.79
7	Machnoor	992	52.88	559	60.50	433	45.48	884	47.12

Source: census of India 2011

Annexure - VII: Workforce Participation for Study Area Villages/Tehsil/District

Particular	Total Worker	Work Participation Rate	% Cultivator	% Agriculture Labour	% Household Worker	% Other Worker
District level						
Medak	1442203	47.55	23.43	29.17	3.71	26.58
Mandal/Tehsil Level						
Jharasangam	22982	51.55	18.06	47.80	0.83	15.41
Study Area Villages						
Chilepalle	868	47.54	30.07	35.60	2.07	10.14
Chilkepalle	606	53.96	6.93	79.04	0.66	12.05
Yelgoi	1613	49.89	11.04	49.10	2.23	16.31
Potpalle	1276	57.04	1.80	74.69	0.31	22.10
Bardipur	877	46.70	15.51	19.95	0.00	15.05
Kuppanagar	1437	48.88	16.28	61.86	0.28	21.02
Machnoor	973	45.03	15.11	46.76	1.23	19.73

Source: census of India 2011

Annexure - XVIII: Village Amenities in Study Area Villages

Sr. No.	Village	Educational Institution	Health Facilities	Drinking water supply	Communication (PO&PH)	Transportation (Bus & Rail)	Approach Road	Power Supply
District: Medak								
Mandal/ (Taluka): Jharasangam								
1	Chilepalle	P(2), M(1)	-	TPW, TW, HP	PH-A	BS	APR, AMR	ED, EA
2	Chilkepalle	P(1)	-	TPW, HP, W	PH-A, PO-A	BS	APR, AMR	ED, EA
3	Yelgoi	P(1), M(1), SS (1)	PHC (1), SHC(1)	TPW, TW, HP	PH-A, PO-A	BS	APR, AMR	ED, EA
4	Potpalle	P(1), M(1)	-	TPW, TW, HP	PH-A	BS	APR, AMR	ED, EA
5	Bardipur	P(1), M(1), SS (1)	-	TPW, TW, HP	PH-A	BS	APR, AMR	ED, EA
6	Kuppanagar	P(1), M(1), SS (1)	SHC(1)	TPW, TW, HP	PH-A, PO-A	BS	APR, AMR	ED, EA
7	Machnoor	P(1)	-	TPW, TW, HP, W	PH-A, PO-A	-	APR, AMR	ED, EA

Source – District Census Handbook, 2011

Abbreviation

Education
P: Primary school
M: Middle school
SS: Senior Secondary School
H: High school
C: Collage
Health Facilities
PHC: Primary Health Centre
HSC: Health Sub Centre
UH: Unani Hospital
DIS: Allopathic Dispensary
PMP: Registered Private Medical Practitioners
PNH: Private Nursing Home
CWC: Child Welfare Centre
A: Available
Drinking water
TPW: Tap water
W: Well water
TW: Tube water
HP: Handpump
Transport facility
BS: Bus service
Post and telegraph
PO: Post office
PH: Telephone connection
Road
APR: Approach paved roads
AMR: Approach mud roads
AFP: Approach foot path
ANC: Approach - navigable canal
Power Supply
ED: Electricity for domestic purpose
EA: Electricity for all purpose

Annexure - IX: Protected Monuments in Medak District

S.No	Name of the Monument	Location	Mandal/District
1	Hill Fort (Built by Rajas of Warangal)	Medak	Medak
2	Mubarak Mahal	Medak	Medak
3	Qutub Shahi Mosque, Arab Khan Mosque and Inscriptions	Medak Fort	Medak
4	Inscriptions(Inscription carved on a Granite Slab)	Medak	Medak
5	Hindu Temples & Inscriptions	Kondapaka	Kondapaka, Medak
6	Stone Circles	Attapur	Kalabgur, Medak
7	Proto-Historic Burials	Kasipalli	Kalabgur, Medak
8	Remains of Hindu Temples and Tombs	Patancheru	Patancheru, Medak
9	Jaina Temples	Patancheru	Patancheru, Medak
10	Ruined Tombs	Siddipet	Siddipet, Medak
11	Proto -Historic Burials	Ponnal	Siddipet, Medak
12	Proto -Historic Burials	Assany_alli	Kulcharam, Medak
13	Cairns	Merpadge	Kondapak, Medak
14	Old Mosque	Komatoor	Medak
15	Qutub Shahi Mosque	Andole	Andole, Medak
16	Cairns	Burgapalli	Yellareddi, Medak
17	Rakasigudi	Mandapally	Chinnakodur, Medak
18	Rakasigudi	Palamkul	Siddipet, Medak
19	Rakasigudi	Nermetta	Nanganoor, Medak
20	Rakasigudi	Pullur	Nanganoor, Medak
21	Siva Temple	Duddeda	Kondapaka, Medak
22	Sri Ramalingeswara Swamy Temple	Nandikandi	Sadasivapet, Medak
23	Subedar Office Building	Patancheru	Patancheru, Medak
24	Kasivisweswaralayam	Kalbagur	Sangareddy, Medak
25	Ancient Temple	Edithanur	Sangareddy, Medak
26	Sri Venkateswara Rukmini Panduranga Temple	GadiMohalla	Zaheerabad, Medak
27	Sri Rechanna Swamy Temple	Badampet	Kohir, Medak
28	Sri Sangameshwar Temple	Mogudampally (Up_p_arpally tanda)	Zaheerabad, Medak
29	Sri Kuchadri Venkateswara Swamy Temple	Kuchanpalli	Medak
30	Sri Basaweshwara Swamy Temple	Jharasangam	Jharasangam, Medak
31	Sri Trilingeswara Alayam	Yellareddypet	Thoguta, Medak

Source; *Archaeology survey of India/Telangana*

Annexure - X: Stakeholders Participants List

Stakeholder holder's participation list

Sr. No.	Person Name	Gender M/F	Designation	Village/township/local govt. institution	Date
1	B.B. Pandey	M	Project Site Manager,	Gamesha, Abbigeri Village	11/2/16
2	Rangaswami	M	EHS Inc incharge	Gamesha	11/2/16
3	Mr. Nagraj	M	Project team	Gamesha	11/2/16
4	R.K. Patil	M	Head Land Aggregator	R.K. Patil Construction	11/2/16
5	I.K. Vastra	M	Head master,	Primary Girl School 1-7, Abbigeri	11/2/16
6	K.F. Miranyak	M	Teacher	Primary Girl School 1-7, Abbigeri	11/2/16
7	P.S. Lamadi	M	Teacher	Primary School, Abbigeri	11/2/16
8	B.R. Rangwal	M	Teacher	"	11/2/16
9	Sapt gumam	M	Teacher	Primary School Abbigeri	11/2/16
10	V.S. Bhavi	M	Asst. officer	Aggriculture dept. Ron	12/2/16
11	Babu Sab	M	Accountant	Aggr. dept. Ron Gadag	12/2/16
12	Chetan Meshram	M	EHS Head	Ostro Energy	11/2/16
13	A.V. Utrapur	M	Land owner	Abbigeri	12/2/16
14	Prakash Naikar	M			
15	Doddabasappa	M	Landowner	Abbigeri village	12/2/16
16	Karabasappa Haddimani	M	Land owner	Abbigeri village	12/2/16
17	Police Patil	M	~~Farmer~~ Leader	Ex. ~~Leader~~ President Right Shang -	12/2/16
18	B.S. Patil	M	Farmer	Abbigeri village	12/2/16
19	Yellappa hiramani	M	Village President	Abbigeri	12/2/16
20	Shivangauda	M	P.D.O.	Abbigeri Panchayat	12/2/16
21	Menasagi	--	—	—	—
22	Raghwendra Kulkarni	M	Gamesha Team memb	Gamesha	12/2/16
23	Girish Shukla	M	Env. Expert	ARCADIS	12/2/16
24	Prakash Dash	M	Ecologist	ARCADIS	12/2/16
25	Dhirendra Singh	M	Social Expt	ARCADIS	12/2/16

Sr. No.	Person Name	Gender M/F	Designation	Village/township/local govt. institution	Date
26	Pramod Y.S.	M	Sub-Registrar	Sub-Registrar office Ron	12/2/16
27	K.M. Gammangatti	M	ACF	Division forest office, Gadag	12/2/16
28					
29					
30					

Dhirendra

SENES Consultants India Private Limited

Annexure - XI: Landowner Consultation

Consultation details with land owners for 31.5 MW wind project

Venue: Neutral place out of the study area at Hotel Athithi , Zahirabad, Medak

Participants: stakeholder consultation has conducted with total 3 landowners out of 16, which was sale deed completed.

Date: 15th April'16

Sl. No.	Land Owner Name	Survey No.	WTG No.	Village	Key findings	Photo Documents
1	Anil Venkatesh S/o Tulujamma	48-1	59, 60	Chilekepalle	***Total family members:*** *3* ***Earning members:*** *1* ***Livelihood source:*** agriculture and contract worker at Mahindra & Mahindra ***Annual income(INR):*** *100,000* ***How many Sold land to Enerfra India Pvt. Ltd (in Acr):*** 4.89 ***Remaining land after sale (in Acr):*** *currently he has no land, however, a residential plot purchased in Hyderabad city.* ***Utilization plan of compensate amount:*** *a residential plot purchased in Hyderabad city and he has paid bank loaan.* ***Awareness about the project:*** *land aggregator has informed to landowner during purchase process.* ***Activities on sold land:*** *Barren land*	

Sl. No.	Land Owner Name	Survey No.	WTG No.	Village	Key findings	Photo Documents
2	Chakali Ramulu	57	53	Chilekepalle	***Total family members:*** *5* ***Earning members:*** *1* ***Livelihood source:*** *agriculture and coolli* ***Annual income(INR):****40,000-50,000* ***How many Sold land to Enerfra India Pvt. Ltd (in Acr):*** *1.15* ***Remaining land after sale (in Acr):*** *1* ***Utilization plan of compensate amount: :*** *spent money in doughther marrige* ***Awareness about the project:*** *information has not shared with land owner about the project during purchase process* ***Activities on sold land:*** *pulses (tur dal) were cultivated only during rainy season*	
3	Chakali Anuradha (She is widow and relative of Ramulu)	57	53	Chilekepalle	***Total family members:*** *3* ***Earning members:*** *1* ***Livelihood source:*** *House worker* ***Annual income(INR):*** *30,000* ***How many Sold land to Enerfra India Pvt. Ltd (in Acr):*** *0.36 Gunta* ***Remaining land after sale (in Acr):*** *currently she has no land* ***Utilization plan of compensate amount:*** *FD in bank for child education* ***Awareness about the project:*** *information has not shared with*	

Sl. No.	Land Owner Name	Survey No.	WTG No.	Village	Key findings	Photo Documents
					land owner about the project during purchase process ***Activities on sold land:*** *pulses (tur dal) were cultivated only during rainy season* ***Remarks:*** *Ramulu has shared information on the behalf of Anuradha*	

Source; Primary consultation

Annexure - XI: Photo Documentation of Stakeholder's Consultation

Photo Error! No text of specified style in document.**-1: Consultation with village secretory, Chilepalle**

Photo Error! No text of specified style in document.**-2: Consultation with village secretory, Chilkepalle**

Photo Error! No text of specified style in document.**-3: Consultation with village president, Chilkepalle**

Photo Error! No text of specified style in document.**-4: Consultation with SHGs members at Chilkepalle**

Photo Error! No text of specified style in document.**-5: Consultation with village president, Chillepalle**

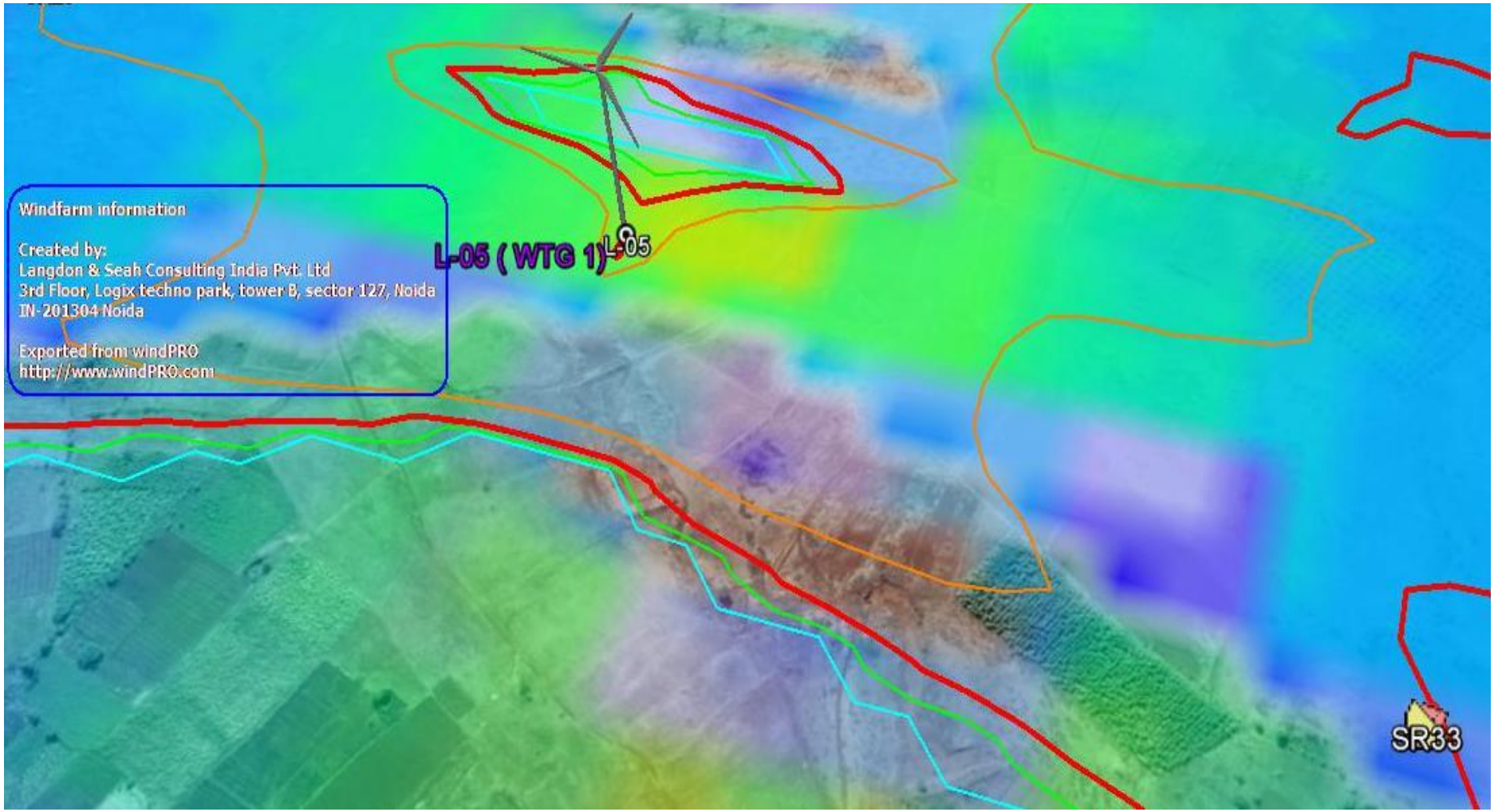
Photo Error! No text of specified style in document.**-6: Consultation with land owners at Hotel Athithi, Zahirabad**

Photo Error! No text of specified style in document.**-7: Consultation with project site team, Zahirabad**

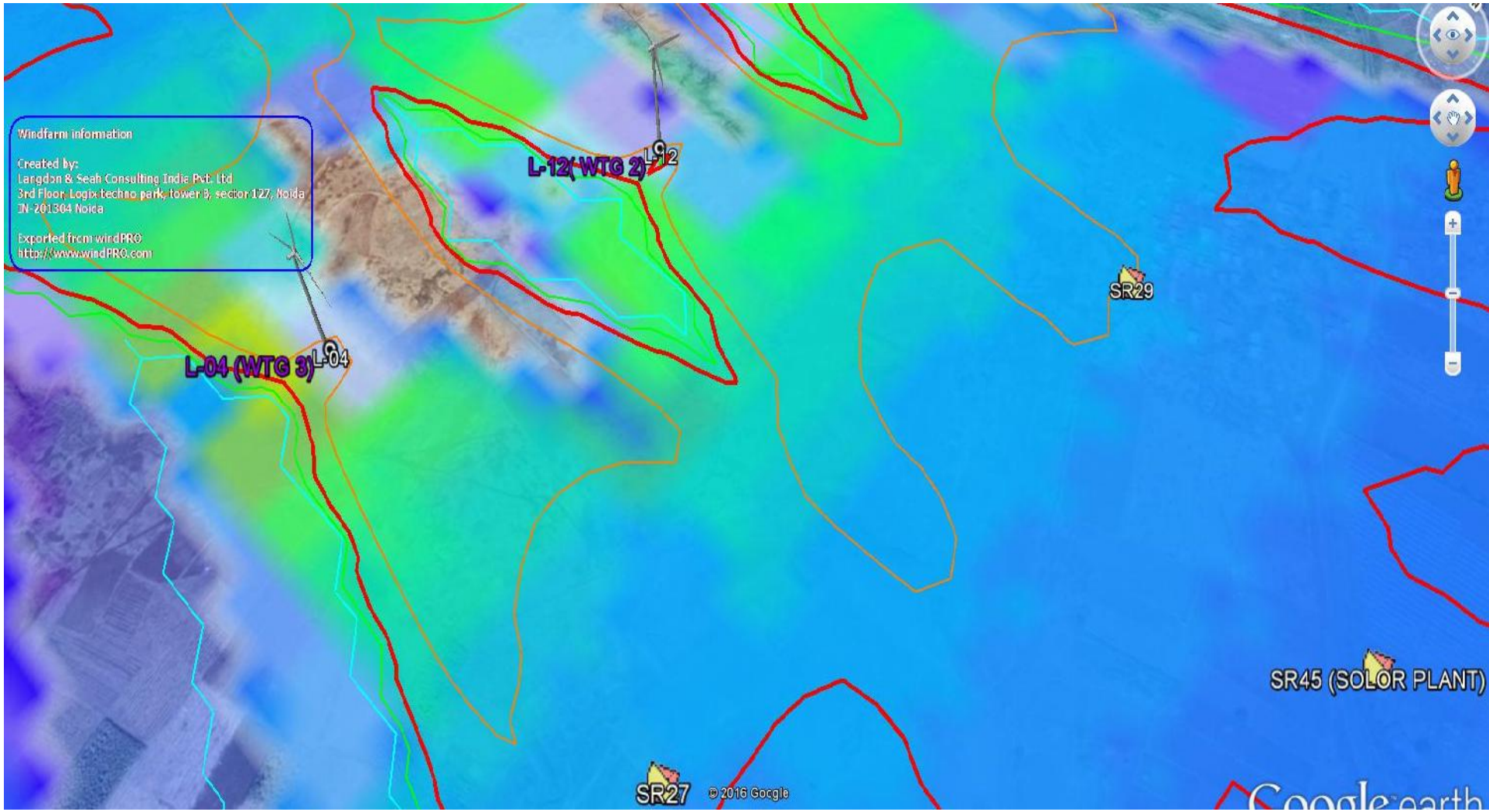
Photo Error! No text of specified style in document.**-8: ARCADIS team visited to forest department**

Annexure - XII: Shadow Flicker Modelling Maps

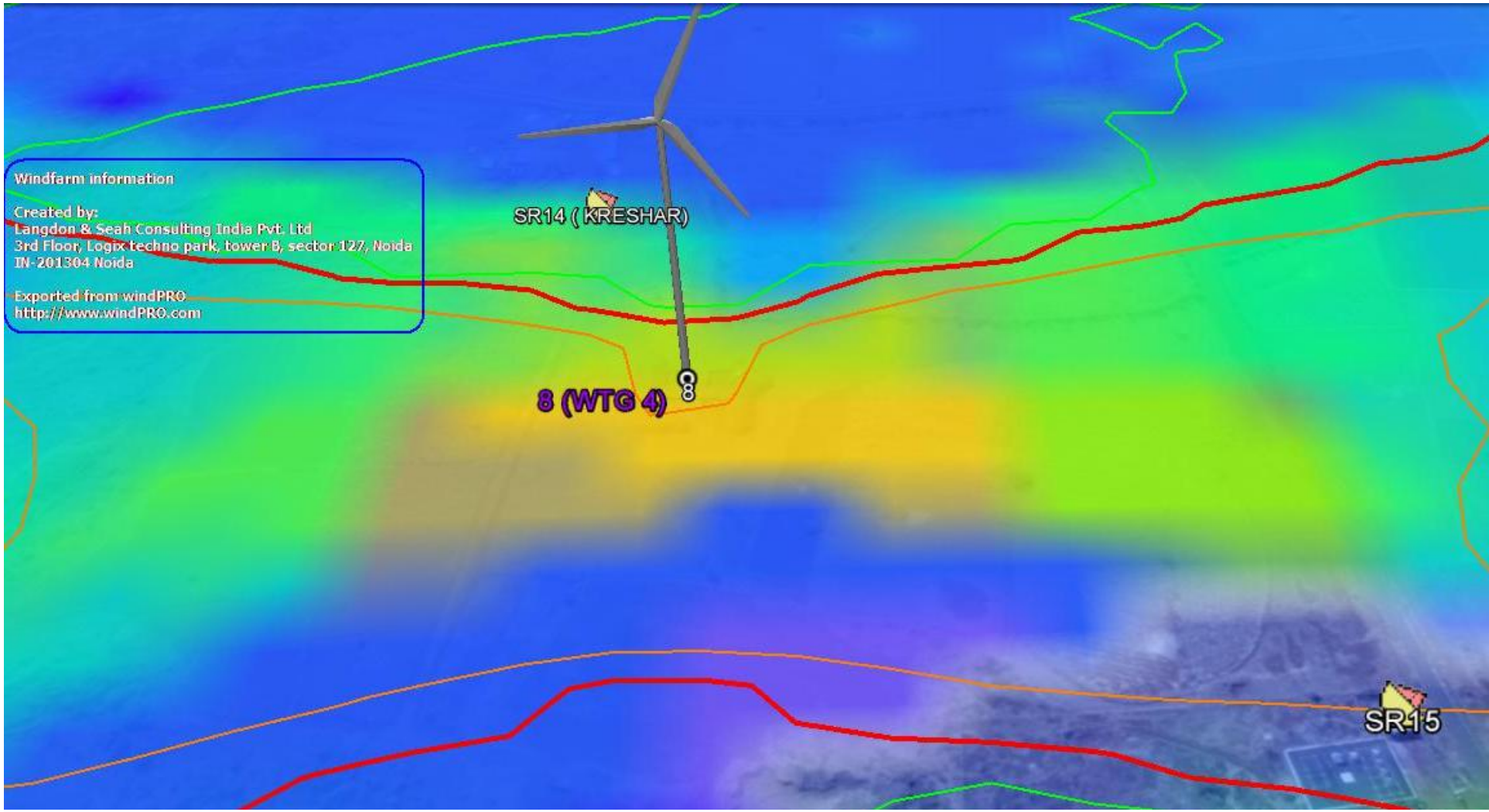
Shadow Flicker Results (SR 33)



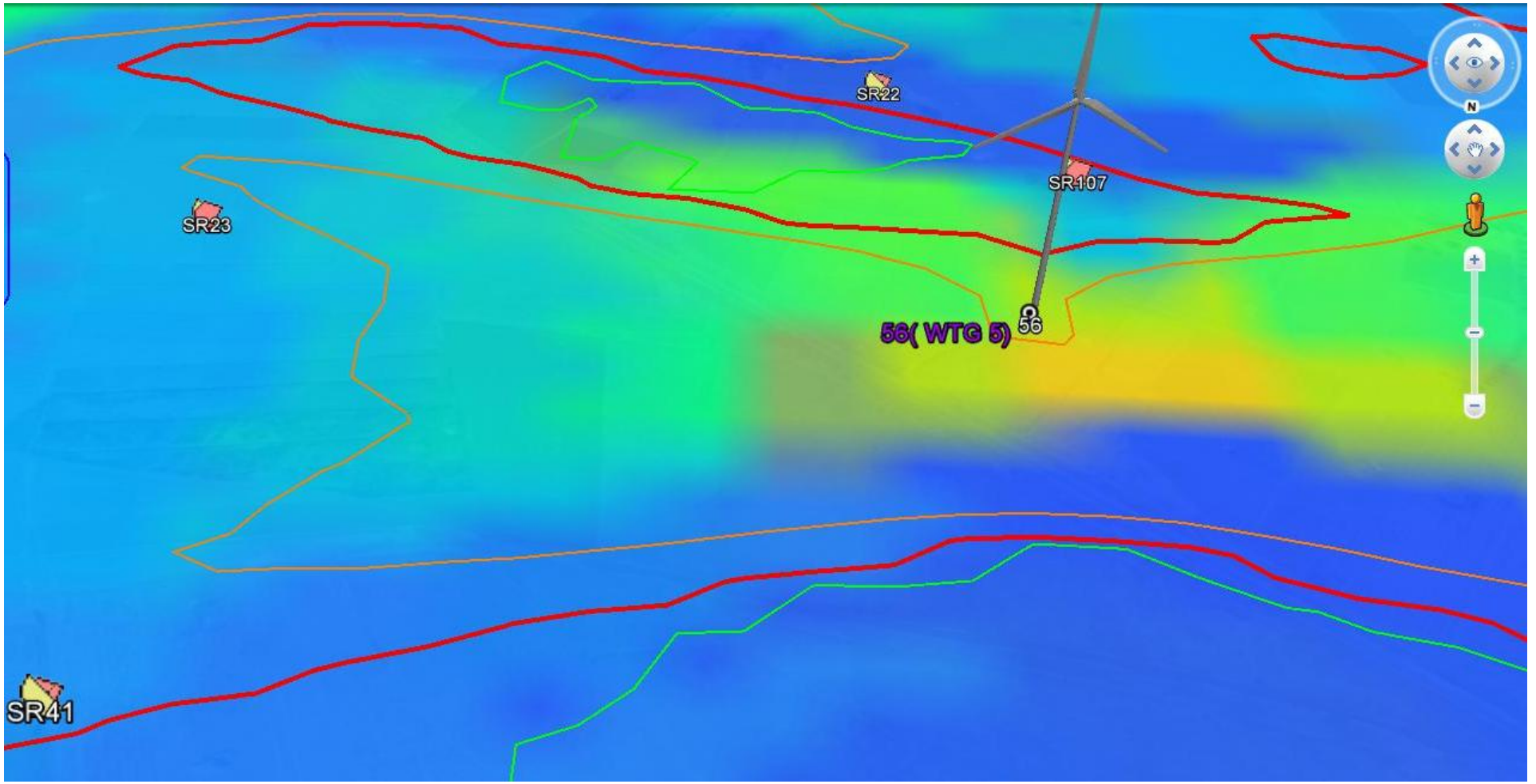
Shadow Flicker Results (SR 45, SR 29 & SR 27)



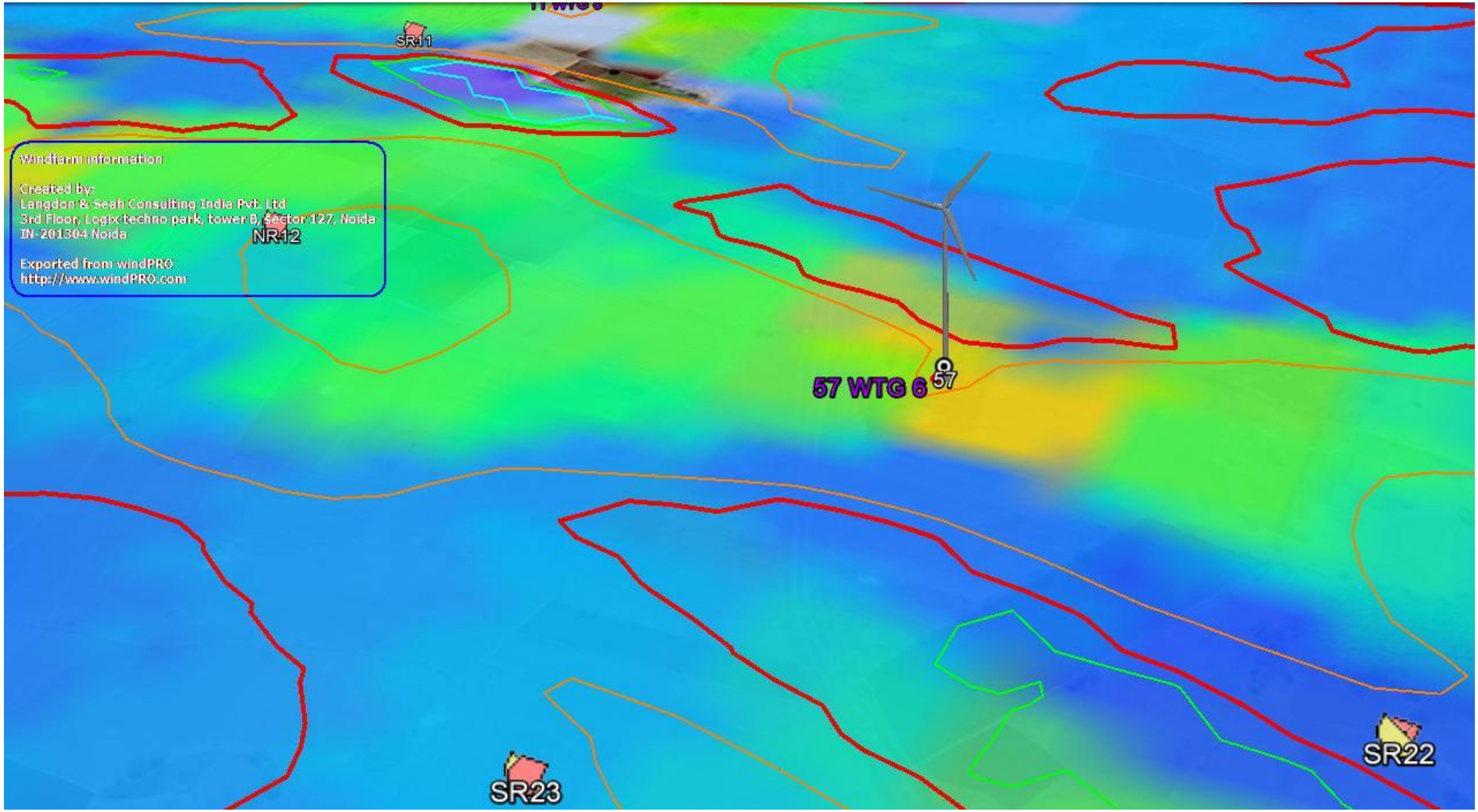
Shadow Flicker Results (SR 15)



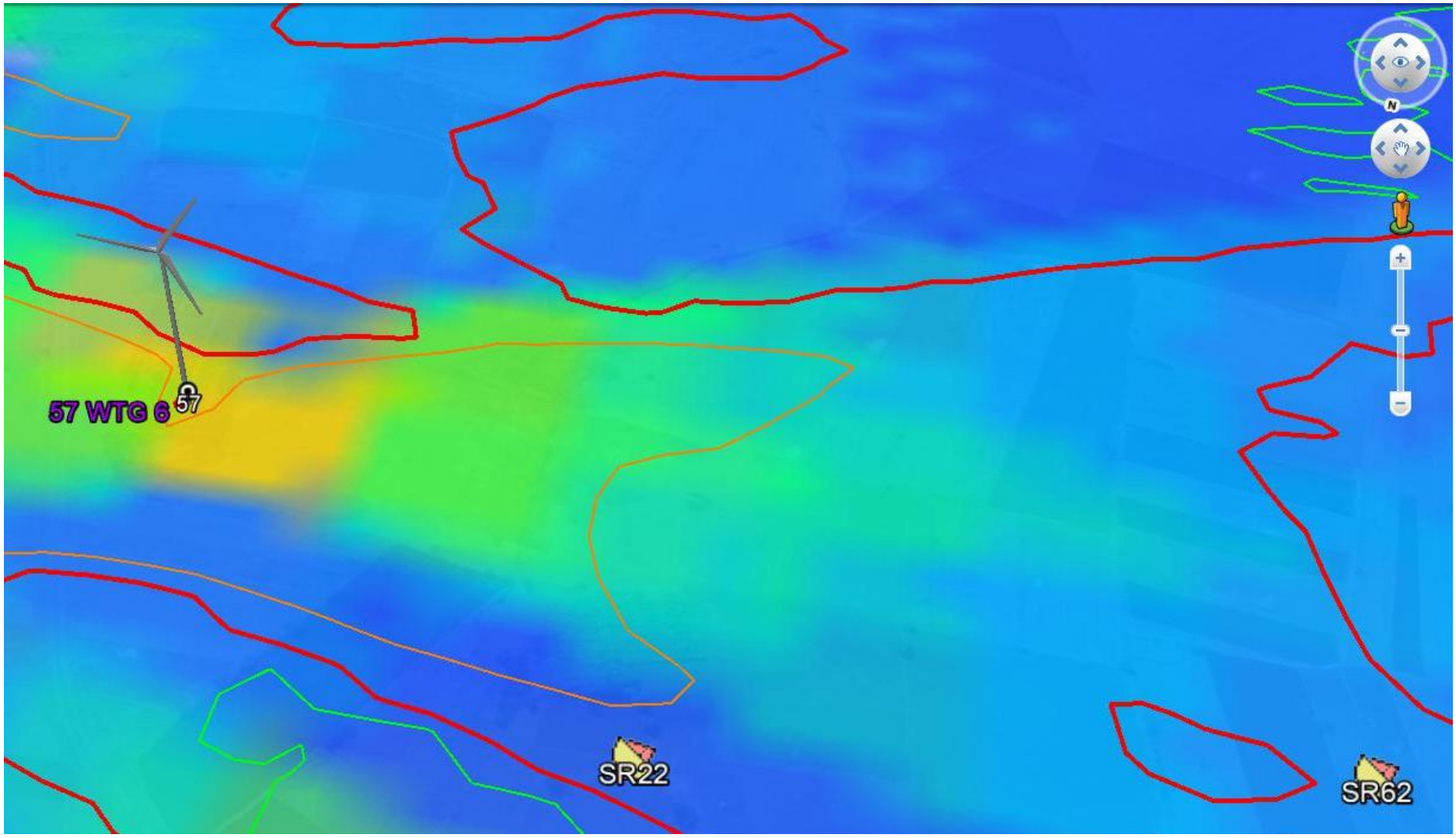
Shadow Flicker Results (SR 41)



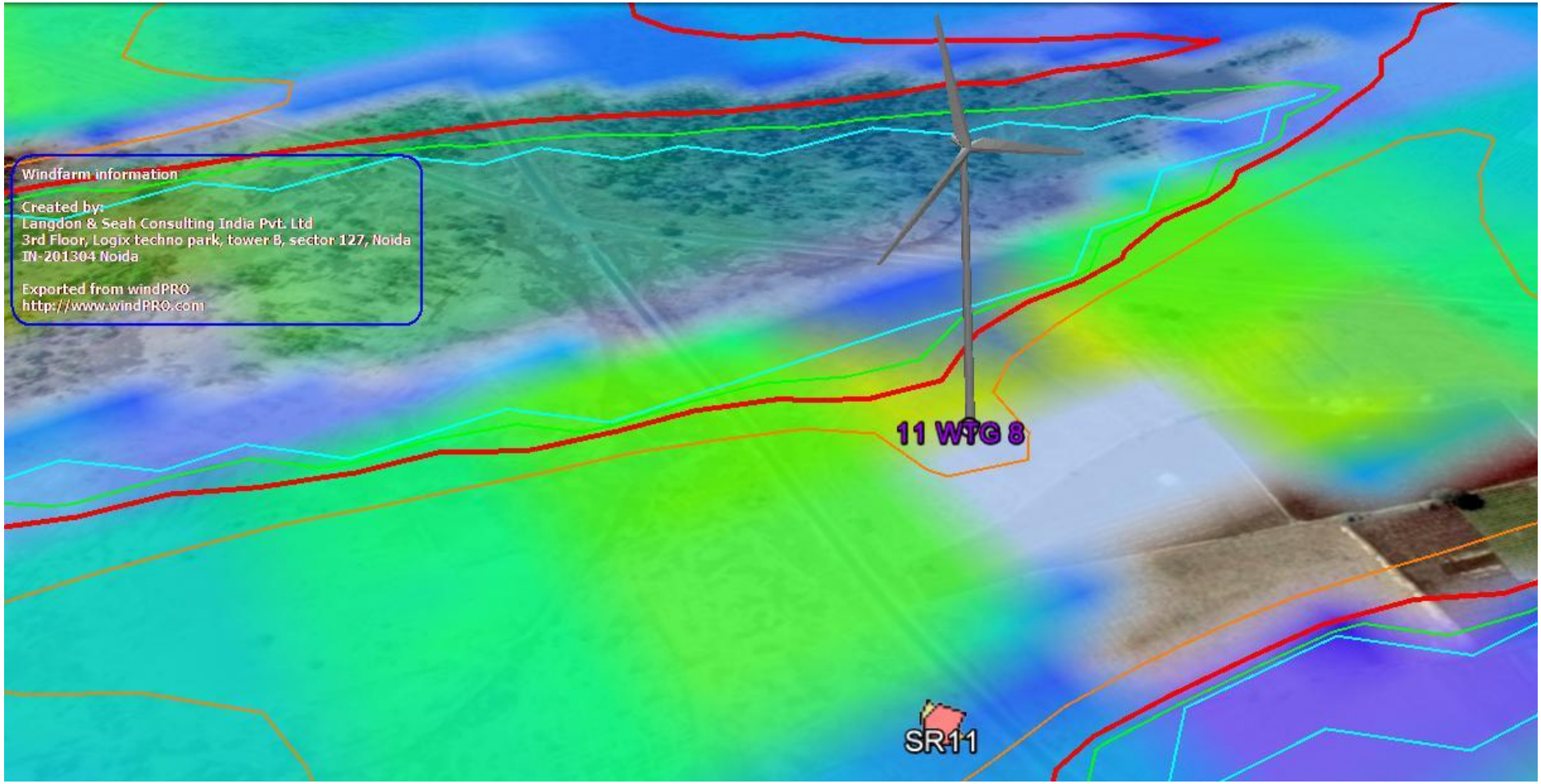
Shadow Flicker Results (SR 22 & SR 23)



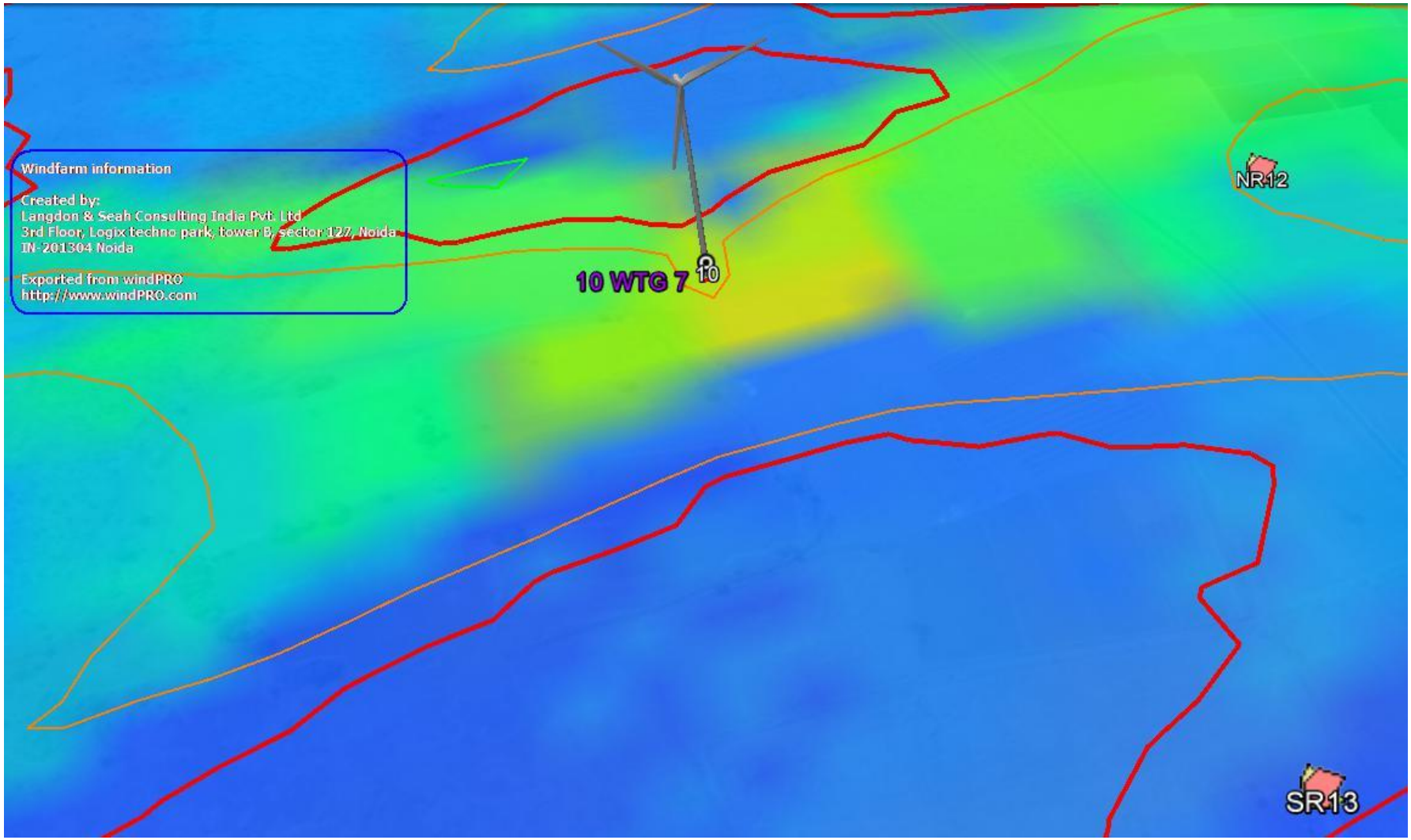
Shadow Flicker Results (SR 62)



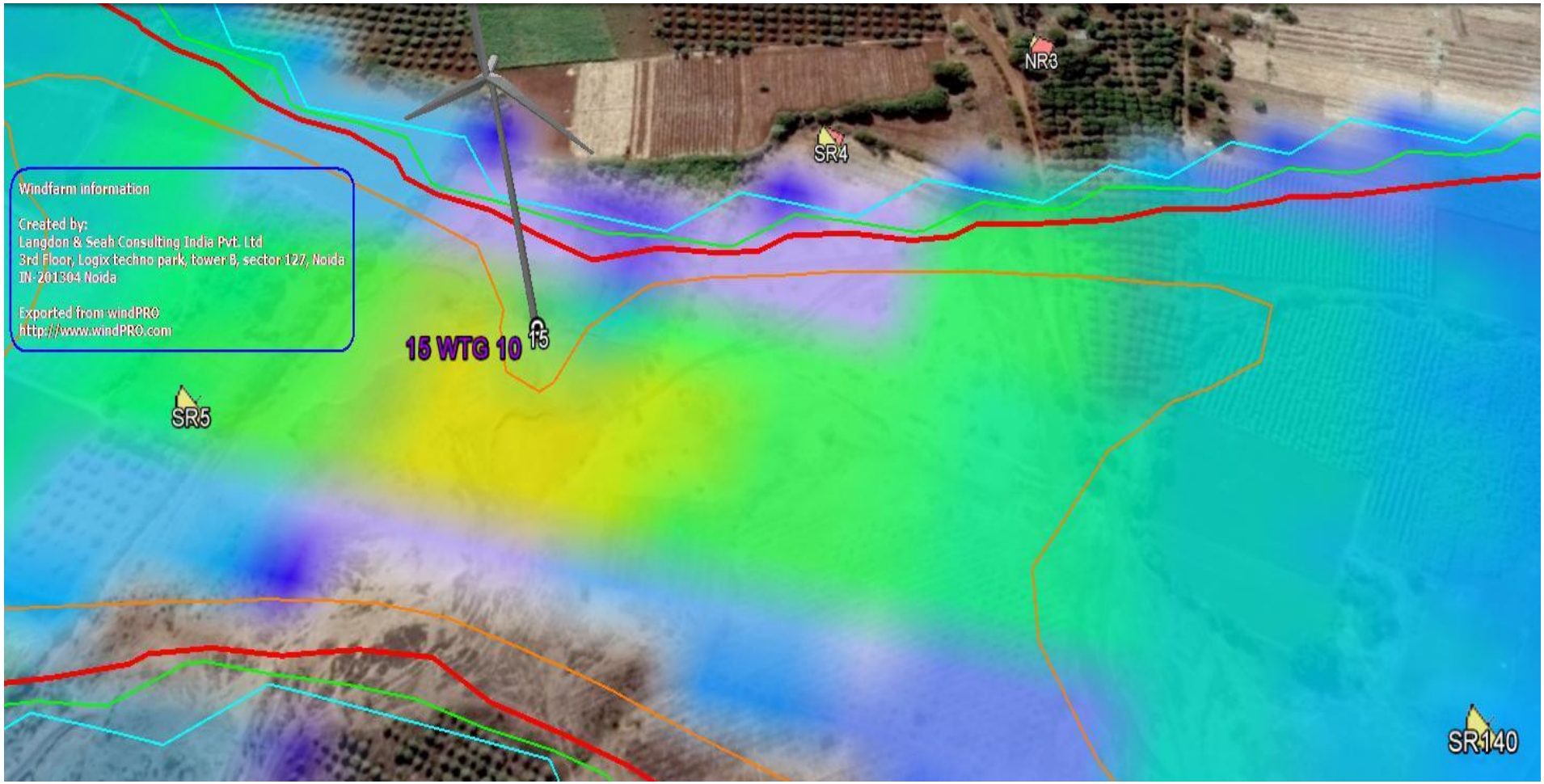
Shadow Flicker Results (SR 11)



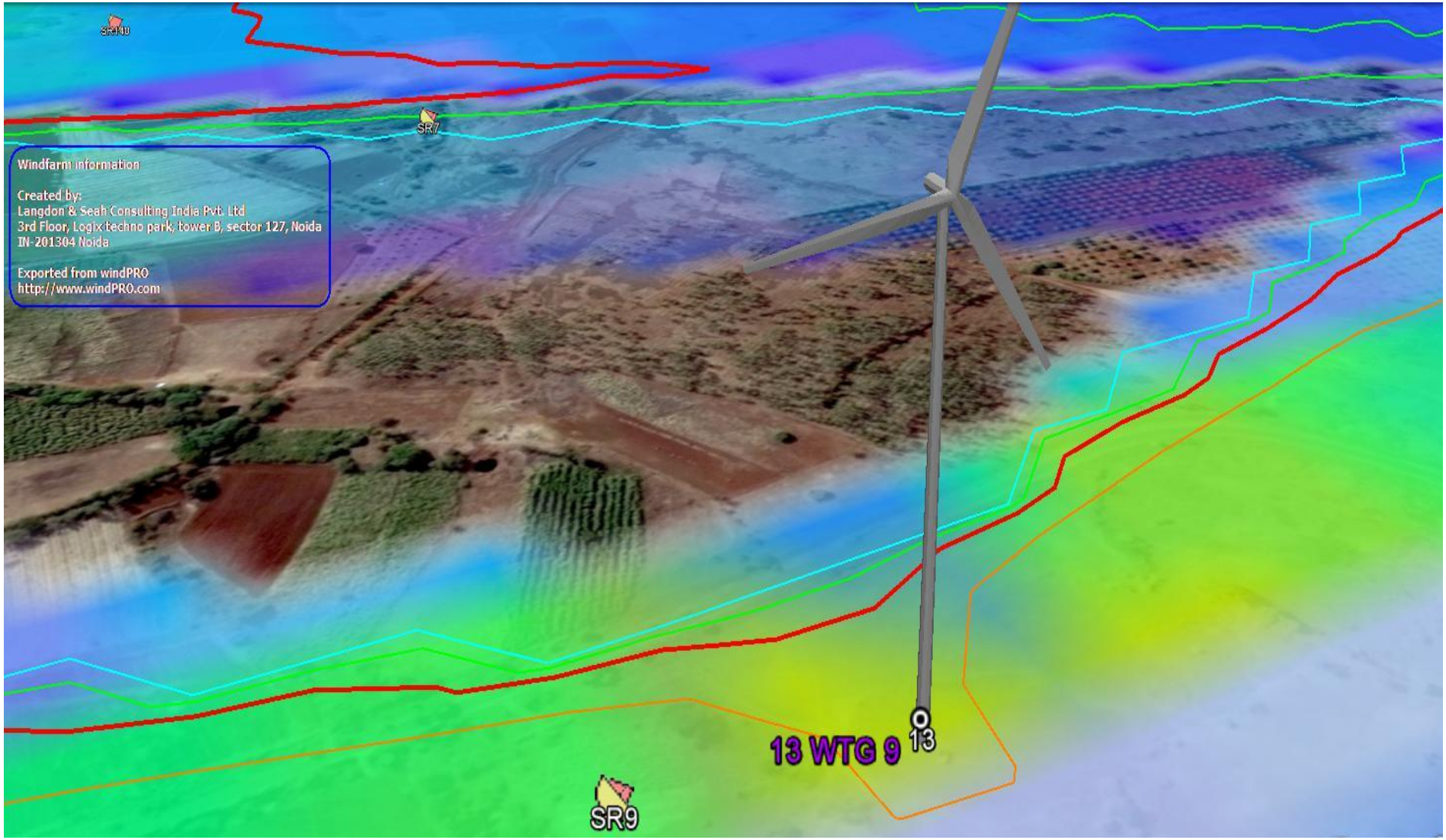
Shadow Flicker Results (SR 12 & SR 13)



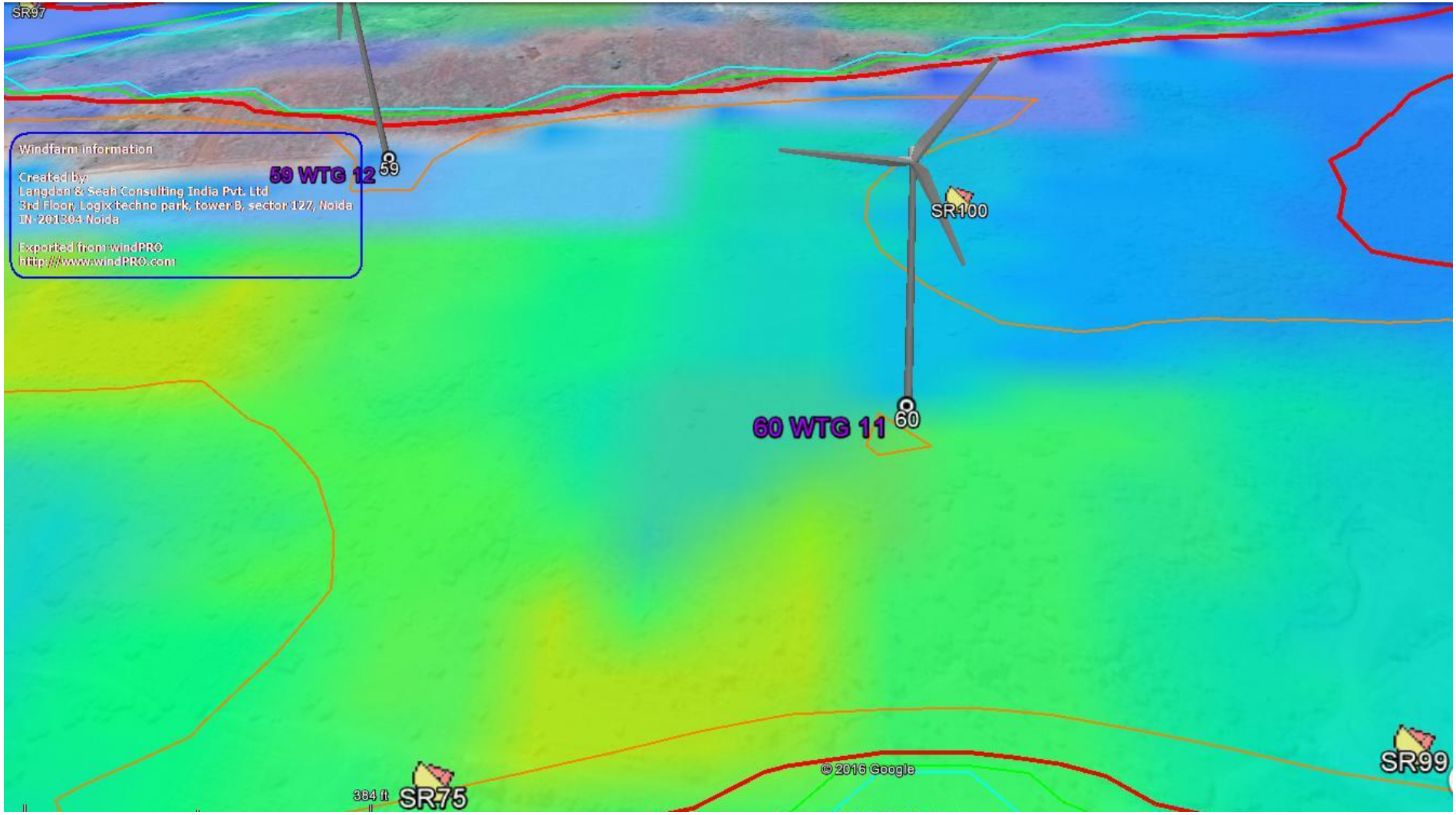
Shadow Flicker Results (SR 5 & SR 140)



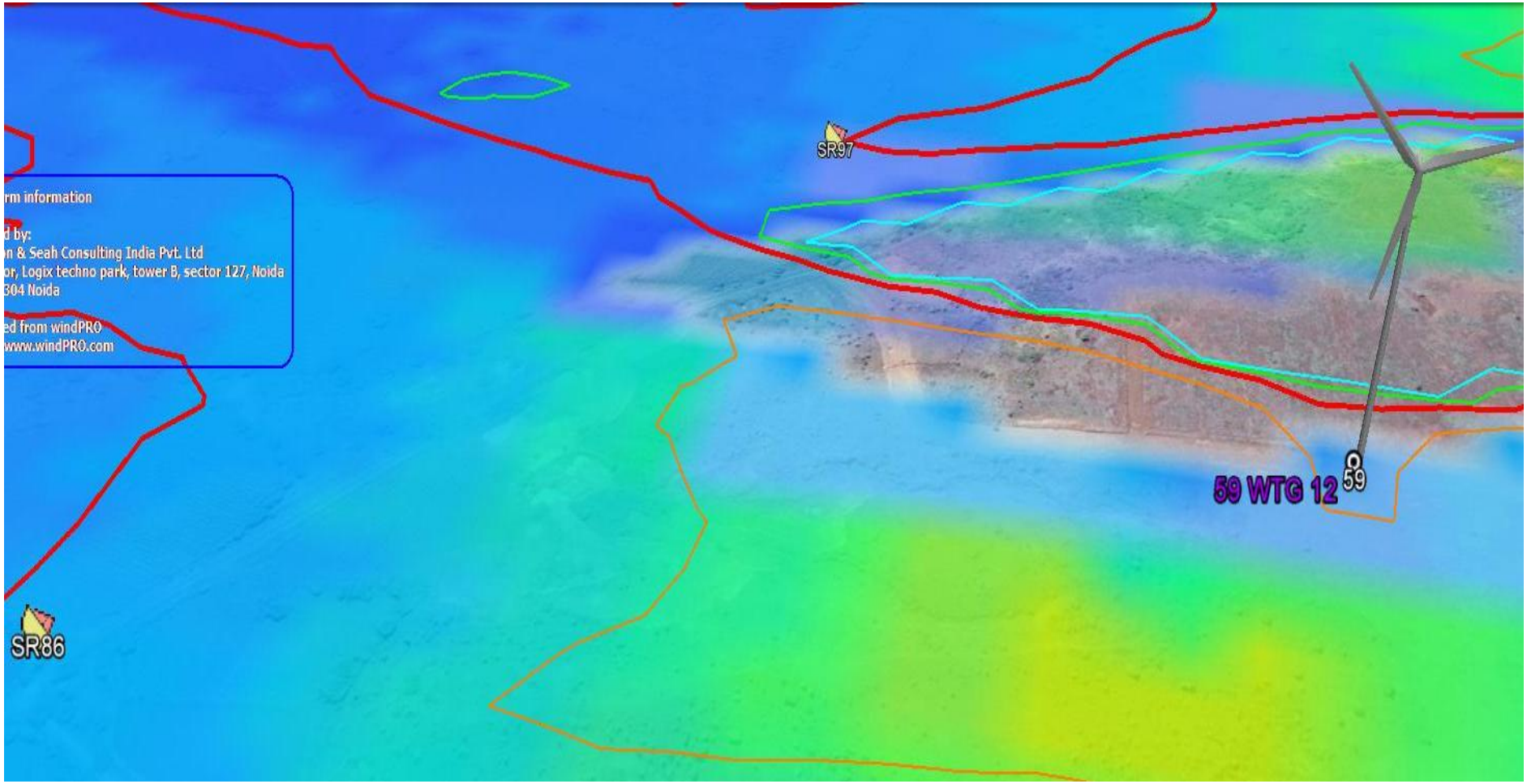
Shadow Flicker Results (SR 9)



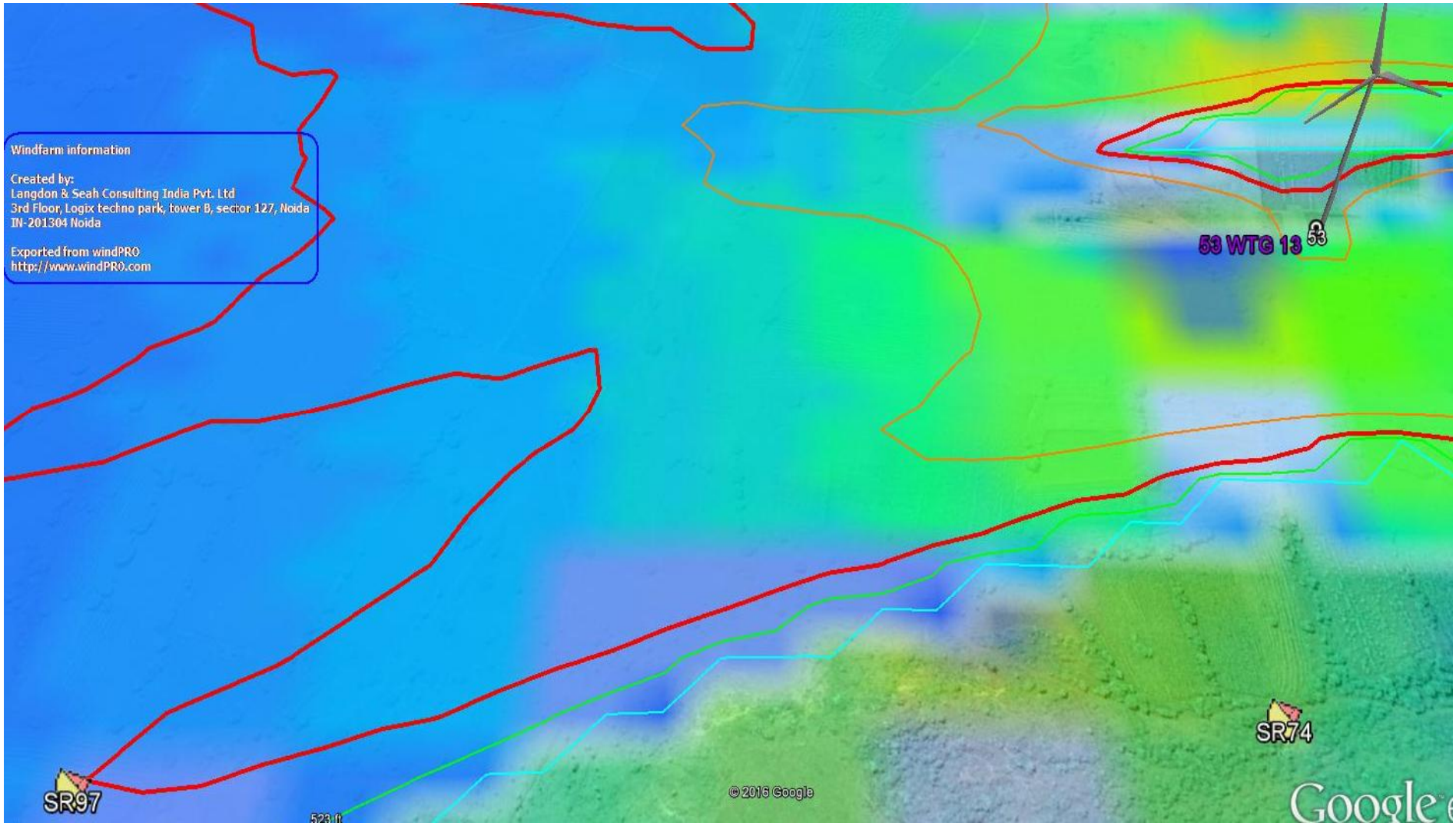
Shadow Flicker Results (SR 99, SR 75 & SR 100)



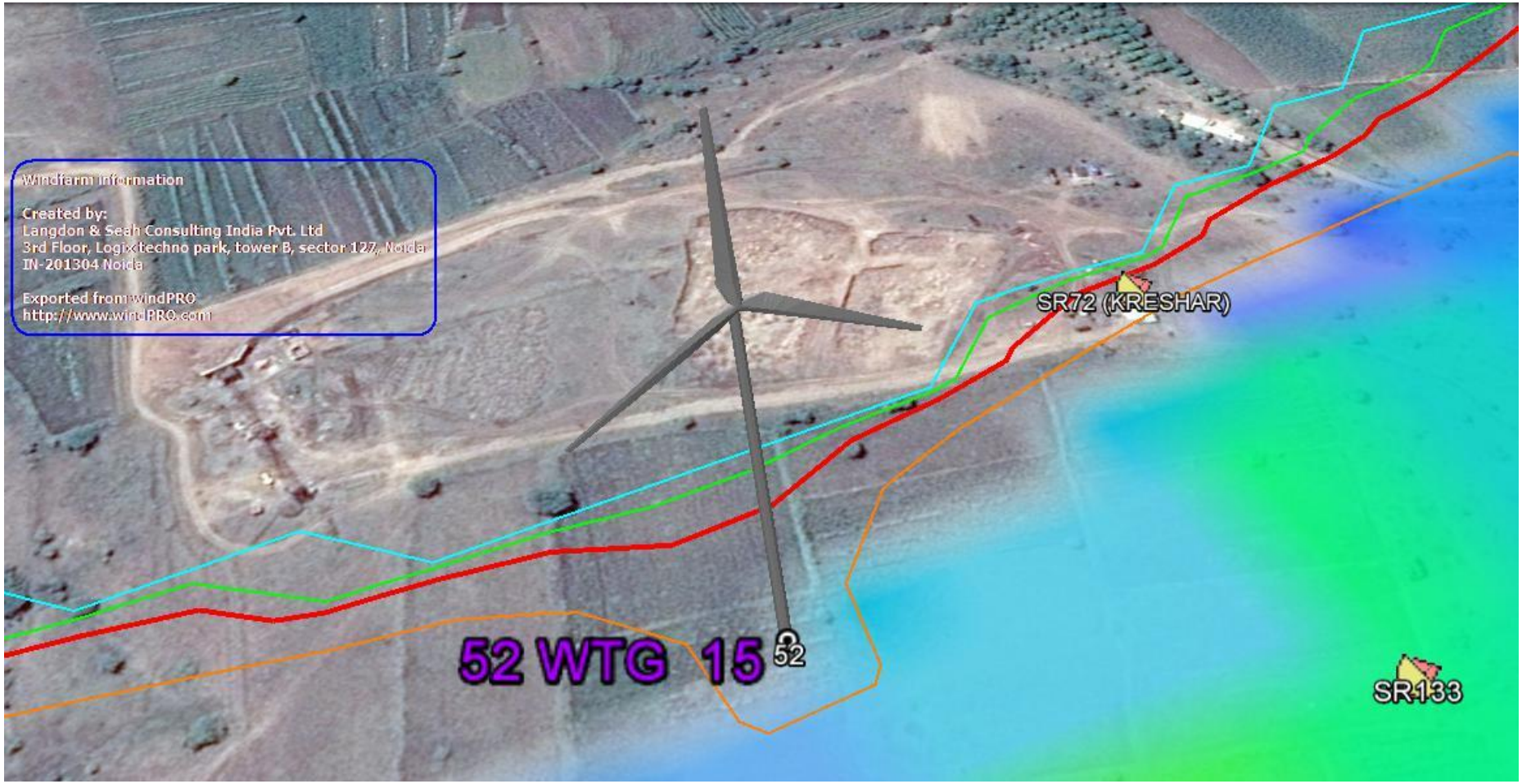
Shadow Flicker Results (SR 86)



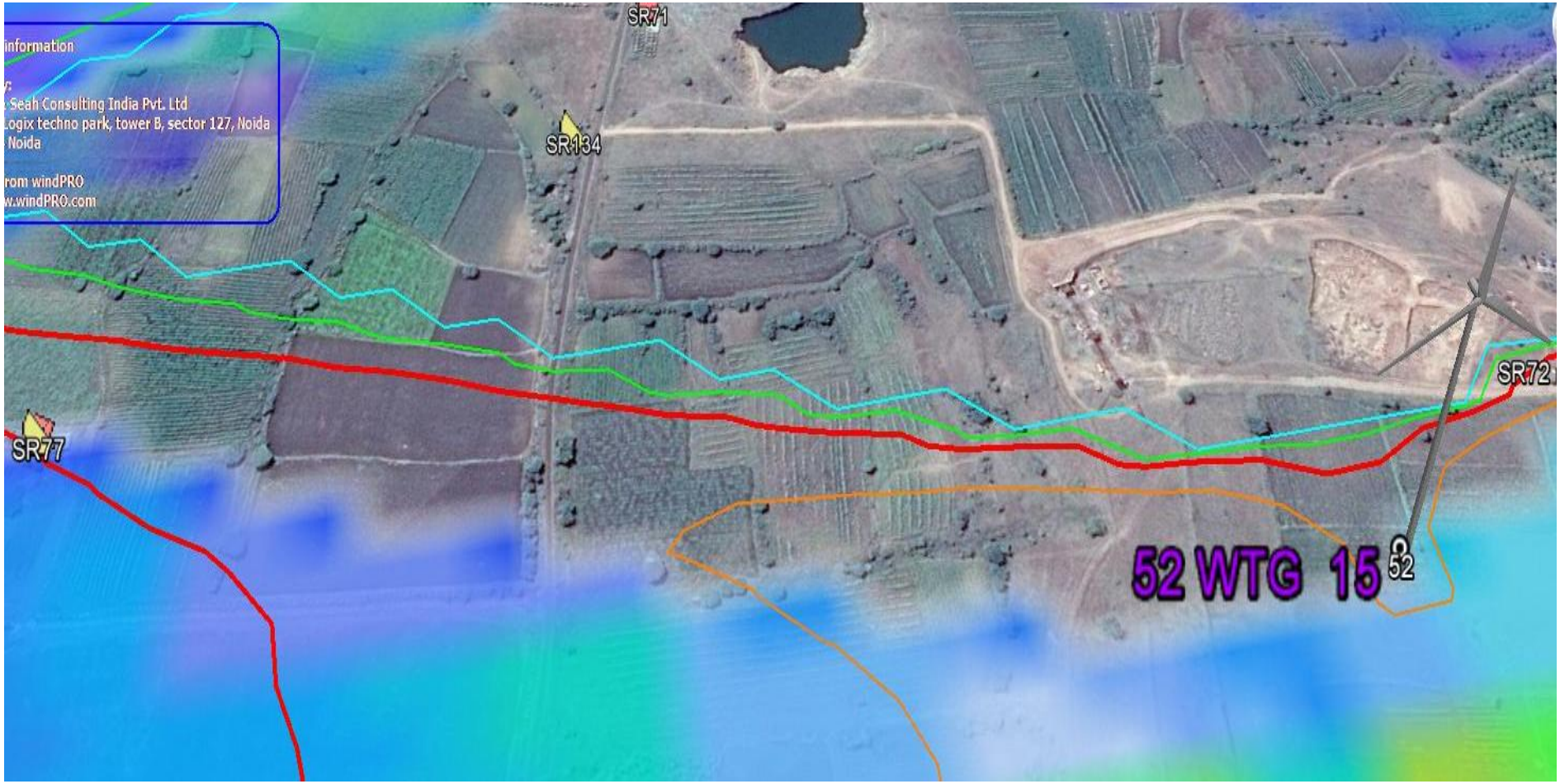
Shadow Flicker Results (SR 97)



Shadow Flicker Results (SR 133)



Shadow Flicker Results (SR 77)



Shadow Flicker Results (SR 72)

Shadow Flicker Results (SR 88)

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