ARCADIS Design & Consultancy for natural and built assets

ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT REPORT FOR 197.4 MW WIND POWER PROJECT, ANANTAPUR, ANDHRA PRADESH

SUBMITTED TO:
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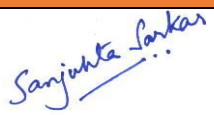
Prepared by	Sanjukta Sarkar Ecologist & Environmental Specialist	12/01/2016	
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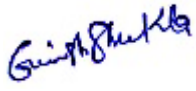
	Girish Shukla Modelling Expert		
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1 EXECUTIVE SUMMARY

COMPONENTS	DESCRIPTION
Background	OSTRO Energy is proposing to establish a 197.4 MW wind farm project in Ramagiri, Kambadur and Kanaganapalli mandal of Anantapur district of Andhra Pradesh. The proposed project will be implemented by two SPVs of OSTRO namely: OSTRO A.P Wind Private Limited of 98.7 MW and OSTRO Andhra wind Private Limited of 98.7 MW. OSTRO will sign a lump sum turnkey contract with Suzlon for development of this proposed project. Further, Suzlon will work along with M/s Ecoren Energy Pvt. Ltd, which will be one of the major contractors of Suzlon. The project would be handed over to OSTRO after completion of construction and commissioning of wind farm. Suzlon would be responsible for operation and maintenance of the project for a period of five years on behalf of OSTRO Renewables.
Project Overview	The proposed project is spread across land in eight villages in Ramagiri, Kambadur and Kanaganapalli mandal[1] of Anantapur District. All land required for this project will be private land, which will be reportedly purchased on good faith negotiations and willing buyer-willing seller basis. . The site can be easily approached from Bangalore to Anantapur by road, via National Highway-7 and from Anantapur via Dharamavram-Kalyandurg road. The project will comprises of 94 wind turbine generators (WTGs) each of Suzlon model 2100 kW capacity, access roads, transmission lines, pooling and grid substation and other equipment laying yard. The proposed 94 WTG locations will be selected out of a set of 101 WTG locations that Arcadis team has visited during the course of ESIA study for this project. As reported by OSTRO, out of 101 locations, locations which doesn't have any significant environmental and social impact will be selected for set of 94 locations. Electric power generated from this project will be evacuated through transmission line to the pooling substation near Perur town. Two numbers of 220/33 kV 63 MVA power transformers is planned to be installed at the substation.
Applicable IFC's Performance Standards	The ESIA study has been assessed for the overall impacts on Environmental and Social components due to construction and operational activities of the proposed wind power project. The applicable IFC performance standards for the project include: • **PS 1: Assessment and Management of Environmental and Social Risks and Impacts** The proposed project will have environmental and social impacts such as

[1] Mandal is another word for Tehsil, an administrative division used in the state of Andhra Pradesh.

COMPONENTS	DESCRIPTION
	generation of noise, domestic wastes from labour camp, and small quantities of hazardous wastes from the construction site. The company will contractually require the developer/operator to put in place a social and environmental organization consisting of qualified E&S personnel with appropriate responsibility allocation to implement/oversee/monitor ***Construction Phase:*** a) Performance of contractors on labour and health & safety aspects ***Operation Phase:*** a) Periodic monitoring of social and environmental performance b) Internal and third party audit c) Management review **Both Construction and Operation Phase:** a) The implementation of the ESMP b) Community engagement and grievance redressal system/mechanism c) Regular training of employees and contractors d) Emergency preparedness and response e) Periodic reporting of E&S performance to the management OSTRO needs to implement an Environmental and Social Management System to monitor and manage the risks associated with the operation of wind farm. • **PS 2: Labor and Working Conditions** During construction, which will last for around 3-4 months, 75 workers will be required. Preference would be given to local community members. The contractor workforce will comprise of both skilled and unskilled labours, which will be sourced from the nearby village settlements depending on their skills and capabilities. A labour camp would be established on site for around 45 migrant labours. During the operations phase approx. 30-40 nos. of technical personnel will be deployed on site including security guards. Guidelines of *IFC Worker's Accommodation: Process and Standards* and ILO recommendations & IFC Guidelines to be followed, while providing labour accommodation. • **PS: 3 Resource Efficiency and Pollution Prevention** Water for construction phase will be sourced from bore wells of adjacent

COMPONENTS	DESCRIPTION
	villages by tankers and drinking water supply would be through packaged drinking water. During operation phase the water requirement would be met by packaged drinking water. During construction phase, domestic waste water from the labour camp would be discharged through soak pits. Solid domestic waste from the labour camp would be segregated and disposed through local vendor. Hazardous waste like metals scrap, used oil, etc. would be disposed through authorized vendor by Ecoren. Storage of hazardous waste will be done in separate bins with proper labelling and stored with secondary containment to avoid any spillage and soil contamination. • **PS: 4 Community Health, Safety and Security** The project will involve movement of vehicles on the approach road passing close to few villages, entering the site through the Dharamavram-Kalyandurg road. This road has dense traffic plying 24 hours. Further, at the project site, the project developer will need to exercise appropriate access control. This control will include barricading of excavated areas, safety signage and other measures to mitigate the risk of accidents for general public during the construction phase. Also, the project envisages influx of labours from different nearby villages. Migrant labours will be accommodated in the labour camp. Health and Safety requirement will be taken care by the project developer, which will ensure the safety system and measures are adequately put in place both during construction and operation phase of the project to avoid accident or emergency situation. • **PS: 6 Biodiversity Conservation and Sustainable Management of Living Natural Resource** There are two Reserved Forests (RF) namely Narasampalli RF and Bhadrapuram RF located within 5 kms distance from the nearest WTG. The nearest black buck reserve (Jayamangali Black Buck Reserve) is located about 72 kms south of the project site. However, black bucks were occasionally observed within the project site. Black bucks are protected and conserved under Indian Wildlife Protect Act, 1972. The project site is dry and arid in nature. Penneru River traverses through the project site which is seasonal in nature. Upper Penneru Reservoir is major water body near the project site apart from three other small water bodies. Eight Schedule I species, two Near Threatened species and one both Schedule I and Near threatened species of avifauna as per Wildlife Protection Act (1972) and IUCN Red List were observed near the project site. No sanctuary or national park is located within 5 kms of the project site. Other performance standards viz. **PS 5: Land Acquisition and Involuntary**

COMPONENTS	DESCRIPTION
	Resettlement, PS 7: Indigenous Peoples & PS 8: Cultural Heritage are not applicable for the project
Project Impacts – Construction Phase	***The impacts due to the project are minimal, site specific, temporary and reversible owing to the construction period (which is of short phase of 6-7 months only).*** • **Ground Water**: Construction water will be sourced through authorized tankers by local vendors. The tankers will source the water from authorized village bore wells. During construction phase, the water requirement for construction activities, labour camp and construction workers, will be about 65 KLD, while water requirement of operation phase for domestic use is estimated to be about 2-3 KLD. As per Central Ground Water Board Report 2013, ground water in the three mandals (Ramagiri, Kambadur & Kanaganapalle) is partly "Semi- Critical"[2]. As OSTRO is not directly digging borewell to extract ground water no permission is required to be obtained from Central Ground Water Board. Hence, moderate to minor impact on the ground water is anticipated during construction phase of the project. During operation phase, the impact on ground water resource is not expected to be significant. • **Wildlife:** Potential impact on wildlife (Antelopes, bears and livestock) of the area is anticipated due to man animal conflict during construction and excavation activities. As per WPA, 1972, Section 51, killing of wildlife (including blackbucks and bears) will lead to a penalty which is imprisonment for a term which may extend to three years or with fine which may extend to twenty five thousand rupees or with both. • **Laborers:** About 75 workers are expected during the peak construction phase. Few migrant labour will be accommodated in the labour camps. Social impacts such as conflict among the labour due to mixing of migrant labour and local laboureres is possible due to sharing of common resources and cultural differences. There is possibility of spread out of diseases associated with migrant labour with local population. The impact can be managed by adopting

[2] As per Central Ground Water Board, India, Semi-critical' areas where cautious groundwater development is recommended. Permission is required from CGWB for digging of bore wells for extracting ground water.

COMPONENTS	DESCRIPTION
	suitable mitigation measures as suggested in the ESIA report.
Project Impacts – Operation Phase	• **Noise:** During operation phase noise would be generated from operation of WTGs. The nearest settlement is Chennampalli which is 0.32 km away from WTG P69 and Shivapuram village which is 0.46 km away from P60. Hence impact on community due to noise generation during operation phase is anticipated (moderate) as few settlements are within 500 m from the nearest turbine location. • **Shadow Flicker:** Shadow flicker impact on nearby settlement is anticipated to be minor. Worst case shadow flicker modelling revealed that 16 set of receptors will receive shadow for more than 30 hours per year from 12 WTGs. Set of receptors includes sensitive receptors like primary schools and households. However, when the model is run for these 12 turbines considering region specific sunshine data and wind data the no. of turbines generating shadow flicker impact reduces to two (P76 & P77) which would impact only one set of receptors in one village (Edugurallapalle). The set of receptors comprises of sparsely populated group of households. • **Assessment of ecology and biodiversity including Bird and Bat :** This was conducted in two parts covering total 11 days of extensive study was carried out during the last week of October and last week of November 2015. (dates 20 October till 24th October and 27 November till 3 December 2015). The vantage point study undertaken for bird collision risk assessment (only for two months) revealed that there is total nine schedule I species and three Near Threatened species (as per IUCN Classification of species) observed to be present in the study area. 11 species of birds are observed to under high collision risk assessed on the basis of conservation status, abundance, general flight height and migratory status. 12% of observed bird species are categorized as Schedules I species, 4% comprises of Near Threatened species and 21 % comprises of migratory birds. About 18% of the species of birds observed in the area has a high risk of collision with the wind turbine out of which 8.8% comprises of Schedule I species and 9.26% comprises of other high risk species. However, in terms of abundance only 5.36% of the total bird population in the area has high risk of collision out of which 2.6% of birds belong to Schedule I category. As per the assessment 19 turbines near to VP 1(Upper Penneru Reservoir) are having high risk of avifuana collision. Out of 19 WTG P 76 & P77

COMPONENTS	DESCRIPTION
	are also having impact due to shadow flicker on nearby receptors. However, detailed and WTG specific vantage point assessment is required to ascertain which WTGs out of 19 are at the highest risk for avifauna collision and needs relocation. • Based on above discussion, the impact on birds during operation phase of the project is envisaged to be moderate.
Mitigation Measures	Appropriate mitigation measures has been planned and recommended in the ESIA report. These measures will minimise the impacts on air, water, soil, noise quality, solid and liquid effluent waste, ecology and socio-economic conditions. The activities of the project during both construction and operation phase will help in improving the socioeconomic condition of the surrounding area. ***Construction Phase*** • Alternative source of water for construction should be explored like sourcing water from nearby water bodies (like Upper Penneru Reservoir) for construction activities. • A detailed wildlife management plan (Black Buck and Bear) giving DO's and DONT,s (Annexure XXVI) which should be implemented during construction phase. The management plan will focus to raise awareness about presence of black buck in the project area and bear in reserved forests close to project area, and about its protected status so that the workers employed at site and the local people do not harm or hunt black bucks or get injured due to attack by bears. • Signage prohibiting the hunting or killing of the antelope should also be placed in and around the project site. • It should be ensured that the labour camp (onsite) should have basic amenities such as electricity, drinking water, health & sanitation facility, kitchen and rest room. • Proper personal protective equipment like, safety helmet, safety shoes, safety harness ear plug, etc should be provided to workers as required. • Workers to be trained for working at height and safety measures with proper work permit should be implemented for avoiding any incidents or accidents.

COMPONENTS	DESCRIPTION
	• Need based sprinkling of water should be carried out near the construction site to suppress dust. • Vehicles speed to be restricted to 20-25 km/hr on unpaved road • Suzlon will need to exercise appropriate access control, barricading of excavated areas; safety signage; illumination and other measures to mitigate the risk of accidents for general public during the implementation of the project. ***Operation Phase*** • Restrict movement of vehicles within project site during operation phase. • WTG models with inbuilt noise reducing technologies conforming to international acoustic design standards should be installed. • There will be close monitoring through engagement with villagers where the impacts are predicted due to shadow flicker. • Use of curtains, higher fencing and planting trees can be explored at problem locations. • Signage prohibiting the hunting or killing of the antelope should also be placed near the WTG location and substation area. • Visibility enhancement objects such as marker balls, bird deterrents, or diverters shall also be installed along the transmission line to avoid bird collision of birds. • The tip of blades should be painted to increase visibility and avoid collision. • A detailed bird and bat study and monitoring for all season shall be done post operation of the project. • Collision risk modelling should be undertaken to understand the extent of impact on bird and bat due to collision with operating WTGs. • Top of the 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.

COMPONENTS	DESCRIPTION
Conclusion	The overall conclusion of the ESIA study is based on following outcomes: • As all project components are located more than 500 m away from the nearest village settlements, potential impact due to noise generated during construction phase is considered to be low. • The proposed wind power project is having moderate but temporary impact due to ground water utilization during construction period. • The results of the noise modeling in worst case scenario reveals the impact of noise on the receptors located in villages Chinampally and Shivapuram are in the range of 46.8-47.5 dB(A) which is marginally exceeding the night time limit of 45 dB(A) and are within the day time limits of 55 dB(A). Further, two (2) WTGs i.e P60 and P69, which were observed to have potential noise impacts will not be selected by OSTRO. Hence, potential of impact due to noise from operation phase is considered low. • Shadow flicker impact on nearby settlement is anticipated to be minor. Real case shadow flicker modelling revealed that one set of receptors will receive shadow for more than 30 hours per year. WTG P-76 & P -77 results in shadow flicker on the receptors. The impacts can be minimized by adopting suitable mitigation measures as suggested in the environment management plan. • Impact on avifauna during operation phase is assessed to be moderate in nature. However this is based on only two months of observations during ESIA. • Based on community and land owner consultation conducted for this project, it is understood that land negotiations are being conducted in good faith negotiations and willing buyer- willing seller basis. Consultations with the land procurement team of Ecoren reveals that the prospective land sellers are being offered at least thrice the circle rates applicable in the project area which leads to an overall positive economic impact for the land sellers. • There will be no impact on cultural resources as well as indigenous people due to their absence in the study area. • Overall the project is having positive impact in terms of employment generation and creation of infrastructural facilities through access road creations that can be used by the villagers

COMPONENTS	DESCRIPTION
	• There are three other renewable energy projects located near the proposed project site. Two of them are wind power projects in Rayala (Greenko) and Nimbagulla (OSTRO) located at a distance of about 22 kms and 50 kms respectively from the project site. The other is solar power project in Borampalli located at a distance of approximately 26 kms from the proposed project site. As the proposed wind power project do not involve forceful acquisition of land and the settlements are located far away (Approx. 2-3 kms) as such no resettlement issues are there. Also, the other nearest wind power project is located about 22 kms from the proposed project site as such visual impacts are not anticipated in the area and no obstruction to common property resources are anticipated. Hence, no cumulative impact is anticipated due to the proposed project. 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.
This Executive Summary should be read in conjunction with the full report and reflects an assessment of the Site based on information received by Arcadis at the time of reporting.	

2 INTRODUCTION

OSTRO has planned to build 800MW of wind projects till 2018. ACTIS[3] is an equity partner with OSTRO's business plan with a funding commitment of US$230 million thereby ensuring availability of equity for all its projects. OSTRO will construct green field projects but at the same time will be open to acquiring operating projects that meet its performance standards. OSTRO has signed up 100 MW of wind projects so far continues to build up its pipeline to achieve its business plan target.

OSTRO Energy is proposing to establish a 197.4 MW wind energy project in Ramagiri, Kambadur and Kanaganapalli mandal of Anantapur district of Andhra Pradesh. The proposed project will be implemented by two SPVs of OSTRO namely OSTRO A.P Wind Private Limited of 98.7 MW and OSTRO Andhra wind Private Limited of 98.7 MW. OSTRO will sign a lump sum turnkey contract with Suzlon for development of this proposed project. Further, Suzlon will work along with with M/s Ecoren Energy Pvt. Ltd, which will be one of the major contractors of Suzlon.

Proposed project is located near Ralla Anantapuram village in Anantapura District of Andhra Pradesh State. The project would be handed over to OSTRO after completion of construction and commissioning of WTGs. Suzlon would be responsible for operation and maintenance of the project for a period of five years on behalf of OSTRO. Ecoren will be working as subcontractor for Suzlon. Ecoren has completed various key activities with respect to the project viz. application to APTRANSCO for power evacuation, wind monitoring and C-WET certification, wind resource assessment, micro-siting, land survey etc. The proposed project involves construction and operation of 94 Wind Electric Generators (WEGs) of capacity 2100 KW each.

OSTRO has a 'zero-tolerance' approach when it comes to dealing with any violations of its standards and policies. OSTRO has a strong focus on Environment Social Safety and Governance aspects (ESSG) in its business and is committed to follow the highest standards across its operations. ARCADIS has been appointed as an independent environmental consultant to conduct an Environmental and Social Impact Assessment (ESIA) in accordance with IFC's Performance Standards & EHS guidelines.

ARCADIS has conducted environmental and social impact assessment (ESIA) study to assesspotential environmental and social associated with the project. As a part of ESIA, an Environmental and Social Management Plan has been developed for OSTRO which will help in mitigating the potential impacts associated with this project.

2.1 OVERVIEW OF THE PROJECT

[3] ACTIS is a pan emerging market equity firm. It invests in various sectors including energy where it invest in distribution, power generation and transmission both for renewable and non-renewable sources.

The proposed wind power project is located near Ralla Anantapuram village in Anantapura district of Andhra Pradesh state. The project will comprise of following:

- 94 WTGs, each of 2100 kW capacity each of Suzlon model. These 94 locations will be among the set of 101 locations which were visited during the course of this ESIA study. All internal overhead lines will be of 33 kV level with panther/ dog.
- A pooling substation (PSS) with an approximate area of 20-25 acres is located in Perur village. Two numbers of 220/33 kV 63 MVA power transformers is planned to be installed at the wind farm pooling substation.
- A government substation located in village Borampalli. Electric power generated from the project will be transferred from PSS to government substation in Borampalli with approximately 37 km transmission line. Power will be evacuated from wind farm pooling substation to APTRANSCO's (Andhra Pradesh Power Transmission Corporation Limited) 220/132 kV Borampalli substation
- Area for storage yard to keep WTG components, will be leased during construction phase.

Project location map is provided in **Fig 2.1.** Location of the WTGs on toposheet published by Survey of India is presented **in Fig 2.2.**

TABLE 2-1: PROJECT SNAPSHOT IN BRIEF

S. No	Particulars	Description
1	Project Site	Ralla Anantapuram & Rallapalle in Anantapur District
2	Tehsil	Kambadur, Ramagiri and Kanaganapalle
3	District Name	Anantapur
4	Name of the State	Andhra Pradesh
5	Site Elevation	548 m AMSL
6	Latitude	14°16'50.96"N to 14°28'11.27"N
7	Longitude	77°19'36.19"E to 77°23'25.17"E
8	Road Accessibility	From Bangalore to Anantapur via NH-7 and from Anantapur to site via Dharamavaram-Kalyandurg Road
9	Nearest Airport	Bangalore (around 200 Kms)
10	Nearest Railway Station	Anantapur (around 42 Kms)
11	Type of Terrain	Generally flat terrain with some undulations
12	Ownership of land	Private Land
13	Present land use	Mostly open scrubland, agricultural or non-cultivated land
14	Proposed arrangement of land	Point basis (3 acres per WTG)
15	Project Status at the time of ESIA	Micrositing completed, land owner identification and land uptake was under process. Construction

S. No	Particulars	Description
	study	of grid substation construction was in progress during the ESIA study.
16	Number of WTGs	101
17	Capacity of each turbine proposed	2100 KW
18	Model of wind turbine	S97 &S111
19	Hub height of turbines	120 m of S97 & 90 m of S111
20	Rotor diameter of turbines	97 m of S97 & 111.80 m of S111
21	Rotational speed, rpm	11.8 to 17.7 for S97; 9.4 to 13.0 for S111

FIGURE 2-1: PROJECT LOCATION MAP

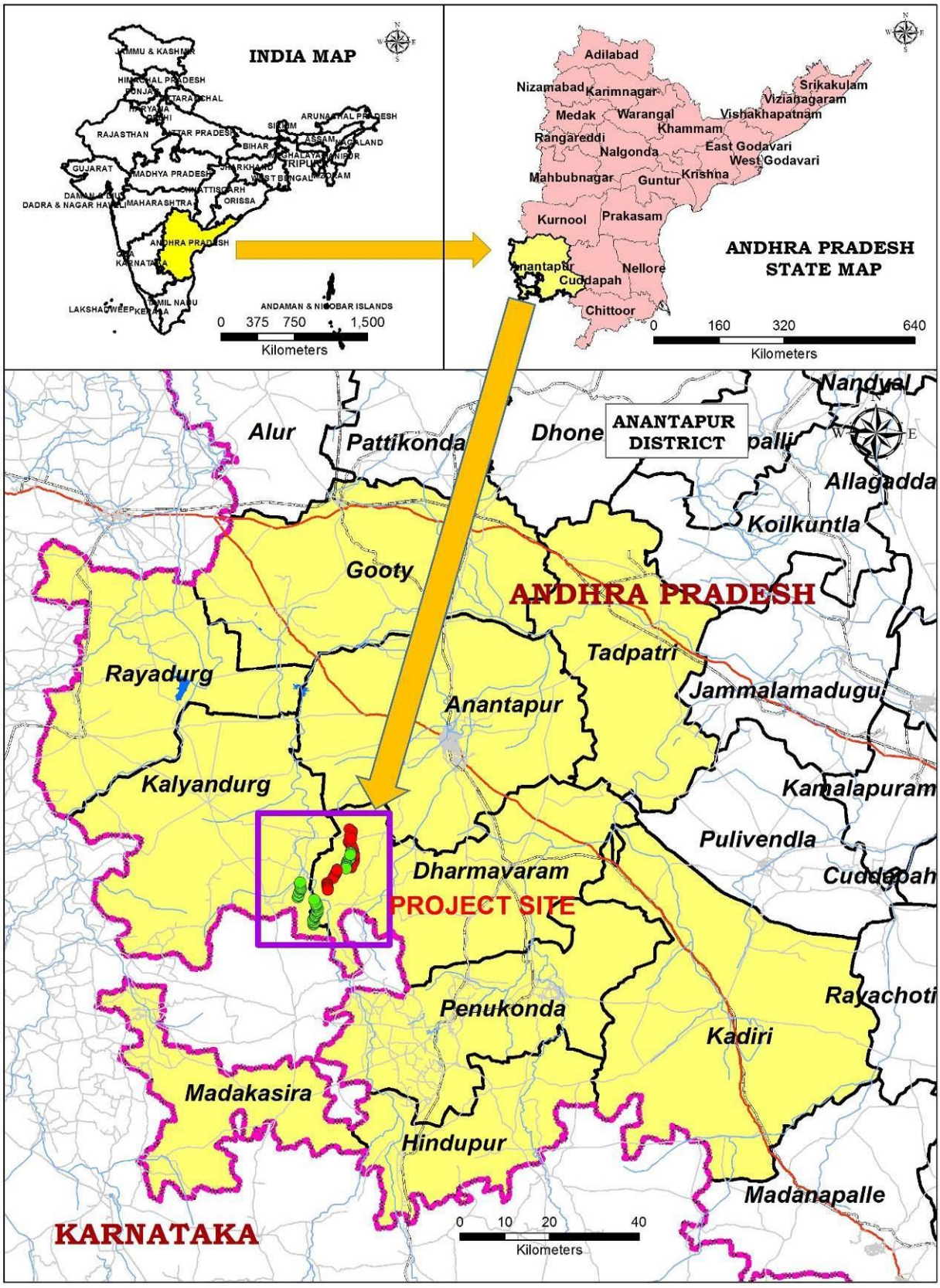
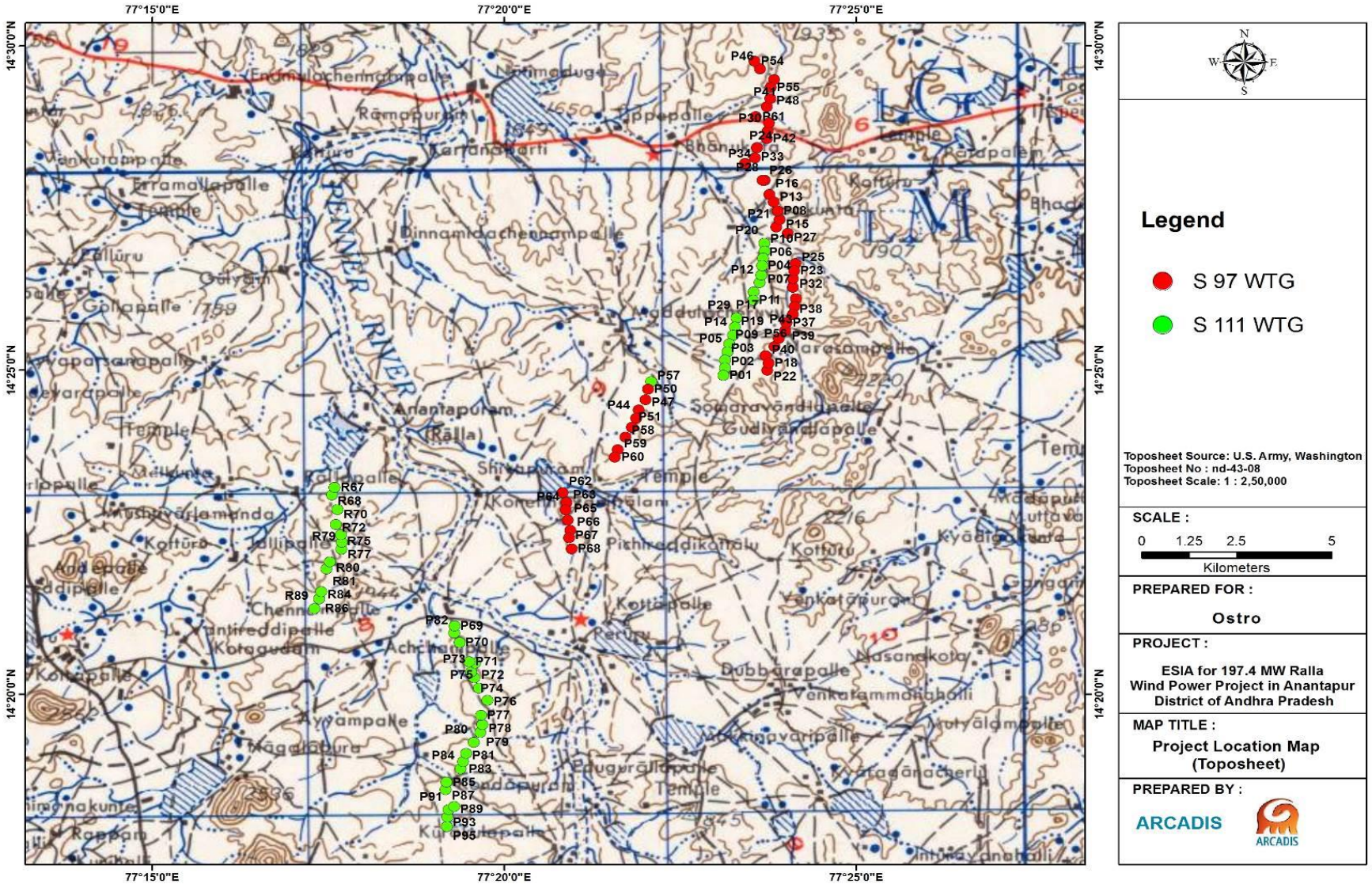


FIGURE 2-2: LOCATION OF WTG ON TOPOSHEET



2.1 WIND POTENTIAL IN ANDHRA PRADESH

Based on the wind studies by Centre for Wind Energy Technology (CWET), southern part of Andhra Pradesh has good potential for setting up of wind farms. The areas in Anantapur, Cuddapah, Kurnool and parts of Nellore and Chittoor district have relatively better potential sites to set up wind power projects. As per the assessment of Ministry of New and Renewable Energy (MNRE), the estimated gross potential is 8,968 MW in A.P. NREDCAP is the single window clearance agency to sanction projects up to 20 MW capacity in the State and so far 233.72 MW capacity of projects by various private developers has been established. In view of above, decision for establishment of wind power project by OSTRO in Andhra Pradesh is a timely and right step to avail advantage of growing wind power industry in India.

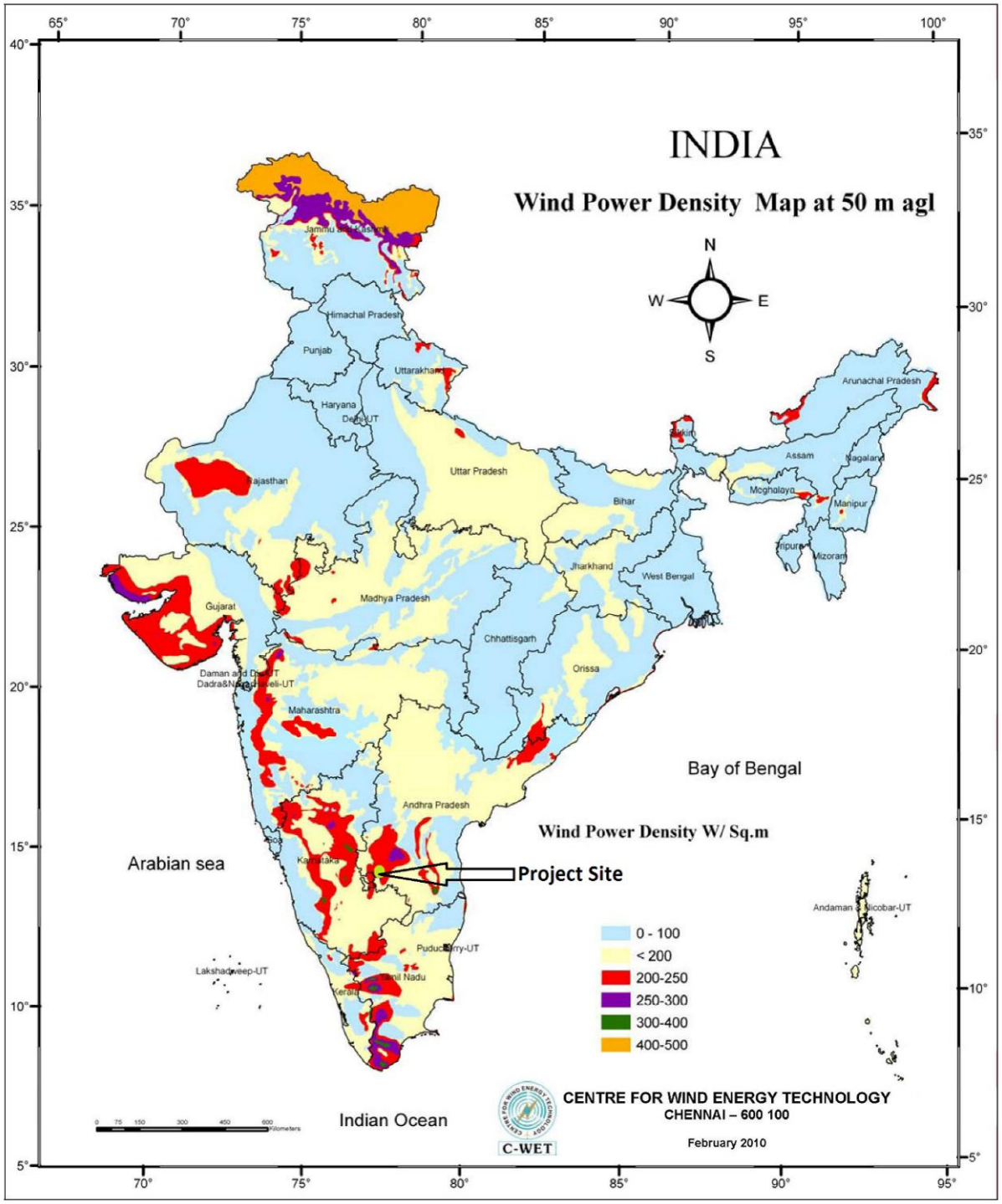
2.2 WIND POTENTIAL AT PROJECT SITE

The Ministry of New and Renewable Energy (MNRE), had issued a guideline to consider Wind Power Density (WPD) of 200 watt/m2 at 50 meter hub height as the minimum requirement for suitability of wind power project development in its circular dated 27.06.2002. With change in wind turbine technology and better efficiency, even the lower wind regimes have become exploitable. Considering the same, the MNRE, vide its circular dated 01.08.2011, had issued a new guideline wherein it has been decided that hereafter, no restriction will exist for Wind Power Density (WPD) criteria as far as the development of wind power projects are concerned.

Ramagiri is a state designated wind farm area, where over 55 MW of wind projects are already operational. The project location is a designated wind farm area, categorized as Wind Zone –III having very good wind potential by C-WET. Ecoren Energy has also installed their wind monitoring mast in Maddalacheruvu near the proposed site.

As per the Wind Power Density (WPD) Map of India prepared by C-WET (February 2010) reveals the WPD of the proposed site generally vary between 200 – 250 W/m^2 (**Refer Figure 2.3**).

FIGURE 2-3: WIND POWER DENSITY MAP OF INDIA



Source: Centre for Wind Energy Technology

2.3 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.

2.4 APPROACH & METHODOLOGY OF ESIA

2.4.1 Approach

The site visit was conducted in two visits, one during mid-October 2015 and other during end-November 2015 for the WTG locations. . During site visit, potential environmental and social risks associated with the project were assessed with respect to applicable national regulations and IFC performance standards. Approach to conduct an ESIA for the project project is as described below.

1. **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.. 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.
2. **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).
3. **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.

4. **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.
5. 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).

    a. **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.
    b. **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.

    c. **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.

d. 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 habiatats 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.

e. 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.

f. 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.

g. 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.

h. 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.

i. Development of Project Specific Environmental and Social Management Plan: 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. The site setting and sensitivities (if any) was surveyed in two visits, one during mid-October 2015 and other during end-November 2015 for the WTG locations. 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 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 and action plan (with timelines & responsibilities) to address these gaps. ARCADIS has followed following steps to achieve the above mentioned approach:

2.4.2 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 OSTRO 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 OSTRO.

The study and report is based on the project specific information and documents provided by project proponent, site survey observations and community consultation. Presented information and fact has been analyzed and inferences has been drawn through professional judgment.

2.5 LIMITATIONS

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 reconnaissance survey. Any major changes in the proposed activities may result in significant deviations of outcomes or impacts. Major limitations

for the ESIA study includes:

- Land purchase process was in progress and entire land details for the proposed project was not in hand till the ESIA report is prepared.
- Consultation has been carried out with 17 landowners out of the total 26 ATS (Agreement to Sale) which has been completed till the time of the study. Total eight villages have been considered as a socio-economic profile.
- Project schedule was non-available till the ESIA study was undertaken.
- Biodiversity assessments has been carried out on the basis of two months survey for the ESIA.

2.6 ESIA TEAM

ARCADIS has mobilized a diverse team of multidisciplinary experts for conducting the ESIA study. A number of these experts has accredited professionals by Quality Council of India to conduct regulatory EIA. These experts have provided consultancy services to over 75 wind power projects across India with over 1000 MW in installed capacity. The experts have been continuously working with funding agency, who understand the modalities and procedures of evaluating and addressing environment and social risk associated with large scale investment.

3 PROJECT DESCRIPTION

3.1 PROJECT SITE SETTINGS

The project area is mostly agricultural area, mixed with open scrubland & uncultivated land. The terrain of the site is flat with some undulations. The soil is sandy in nature comprising of red and black soil. There are other established wind power projects in the region which are located within radius of 50 Km from the proposed site.

The district of Anantapur has a fairly good elevation which provides the district with pleasant climate throughout the year. As mentioned in district profile of Anantapur, there is a gradual rise in elevation in Hindupur, Parigi, Lepakshi, Chilamathur, Agali, Rolla and Madakasira Mandals 2 in the South to join the Karnataka Plateau where the average elevation is about 2000 feet above the mean sea level (approximately 610 AMSL). The elevation of project site is about 548 AMSL. Topography of the proposed project site is shown in the photograph below. Contour map and Digital Elevation Map (DEM) map has been shown in **Figure 3.2** and **Figure 3.3.**

The location and geographical position of the Anantapur district in the Deccan Peninsula render it to be the driest part of the state. It does not receive full benefits of north east monsoon due to its far location from east coast and high Western Ghats also cut it off from the south west monsoon showers. Due to this the agricultural conditions are not suitable throughout the year. The district is drought prone. The only river in the district is the Penna River, which traverses through the proposed project site. The river is seasonal in nature. Its origin is in the Nandi Hills of Karnataka, enters the Anantapur district from the extreme south of Hindupur mandal and flows through 12 mandals including Kambadur and Ramagiri. The Penna River traverses through the project site.

nearest WTG is 900 m away from the river bank. There is a proposed firing range[4] near to the project site as reported by Ecoren Team. One cluster comprising of 9 WTGs are located close to the boundary of firing range (P-57, P50, P47, P36, P44, P57, P58, P59 & P60). The nearest WTG to the boundary is P-47 (0.03 km) followed by, P-50& 57 (0.09 km). If the proposed firing range is established then required preventive measures should be taken by OSTRO to safeguard the safety and security of its personnel both during the construction and operation phase of the project.

[4] A **shooting range** or **firing range** is a specialized facility designed for firearms practice

Photo-Proposed Firing Range

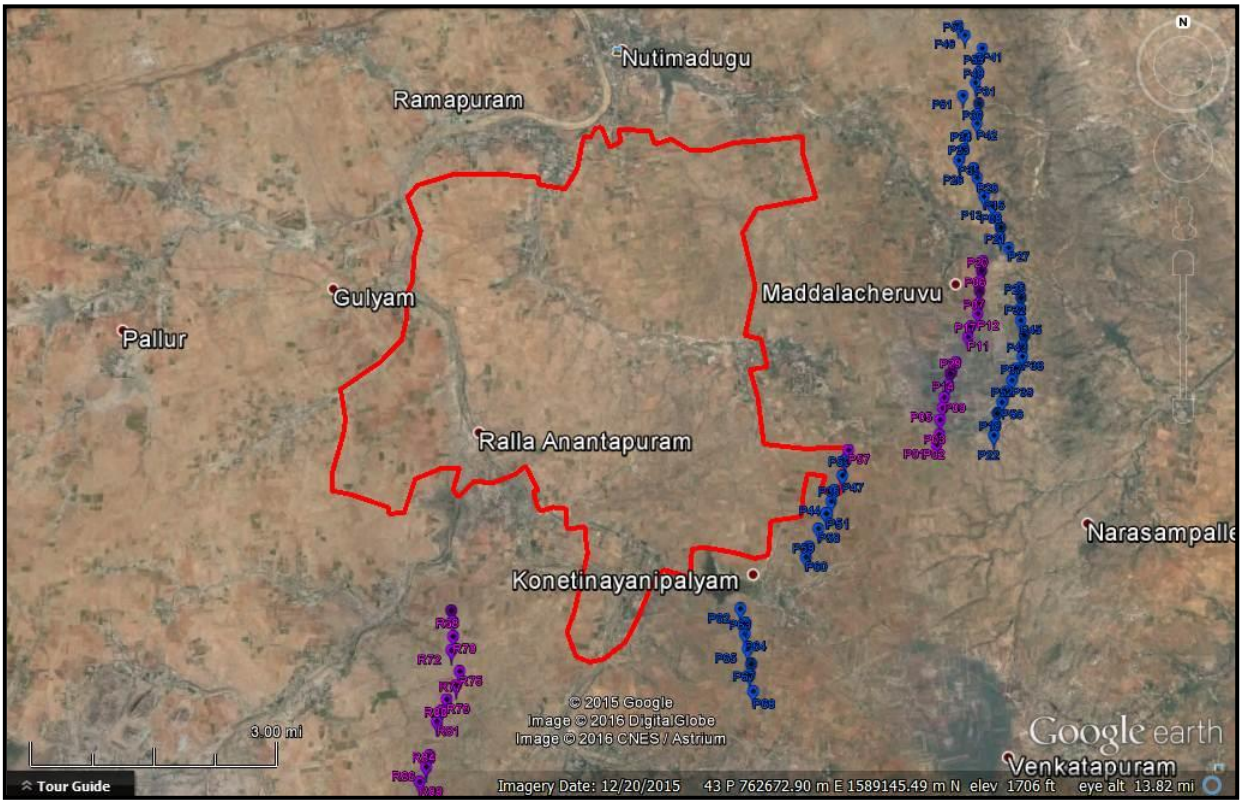


Photo-Topography of proposed project site




3.2 SITE ACCESSIBILITY

The site be easily approached from Bangalore to Anantapur by road via NH-7 and from Anantapur to the site via Dharamavram-Kalyandurg road. Bangalore is the nearest airport situated approximately 200 Kms from site and Anantapur Railway station is situated approximately 42 kms from site. Access to the site is presented in the **Fig 3.1** below.

FIGURE 3-1: ACCESSIBILITY MAP OF PROJECT SITE

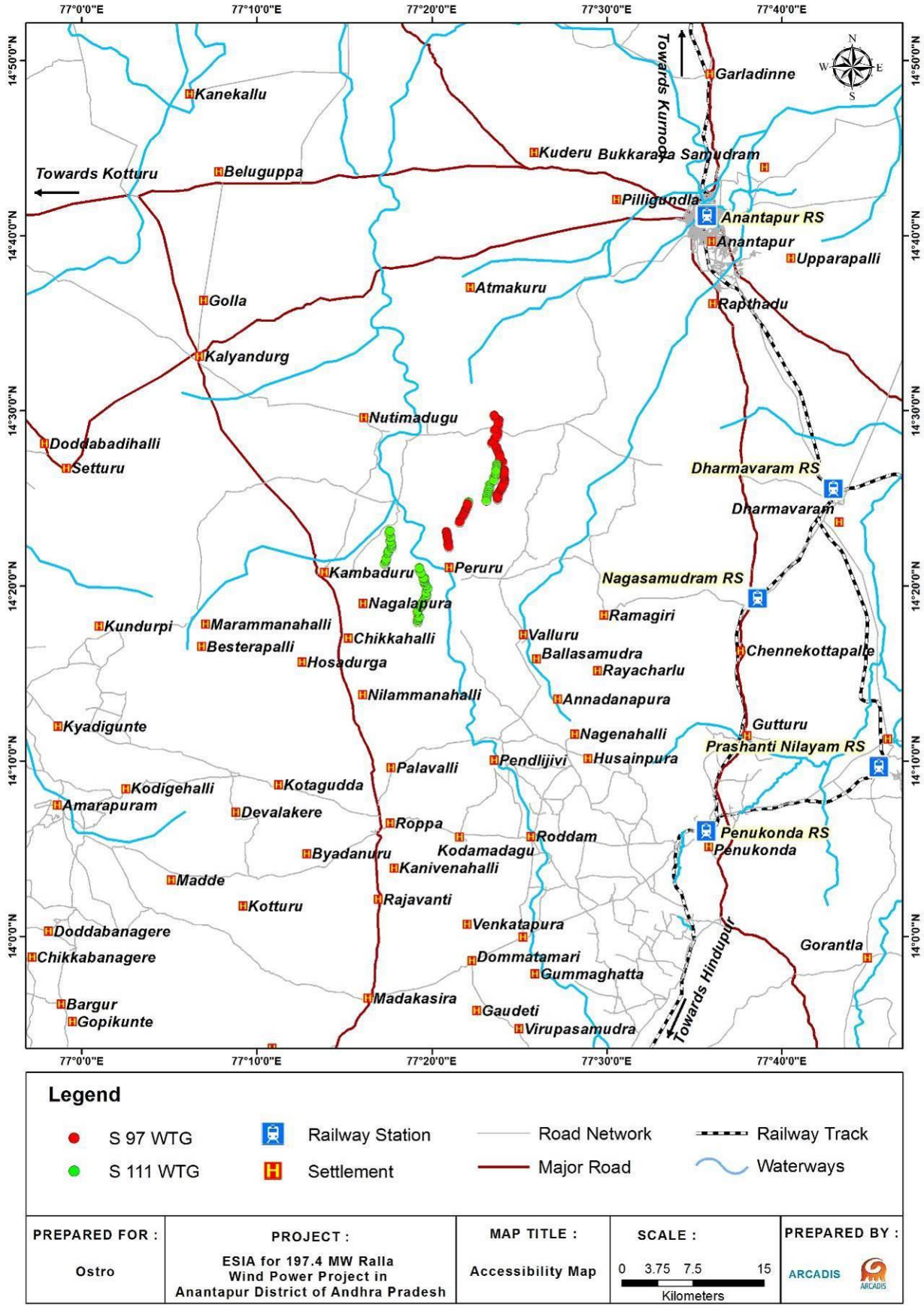


FIGURE 3-2: CONTOUR MAP OF PROJECT SITE

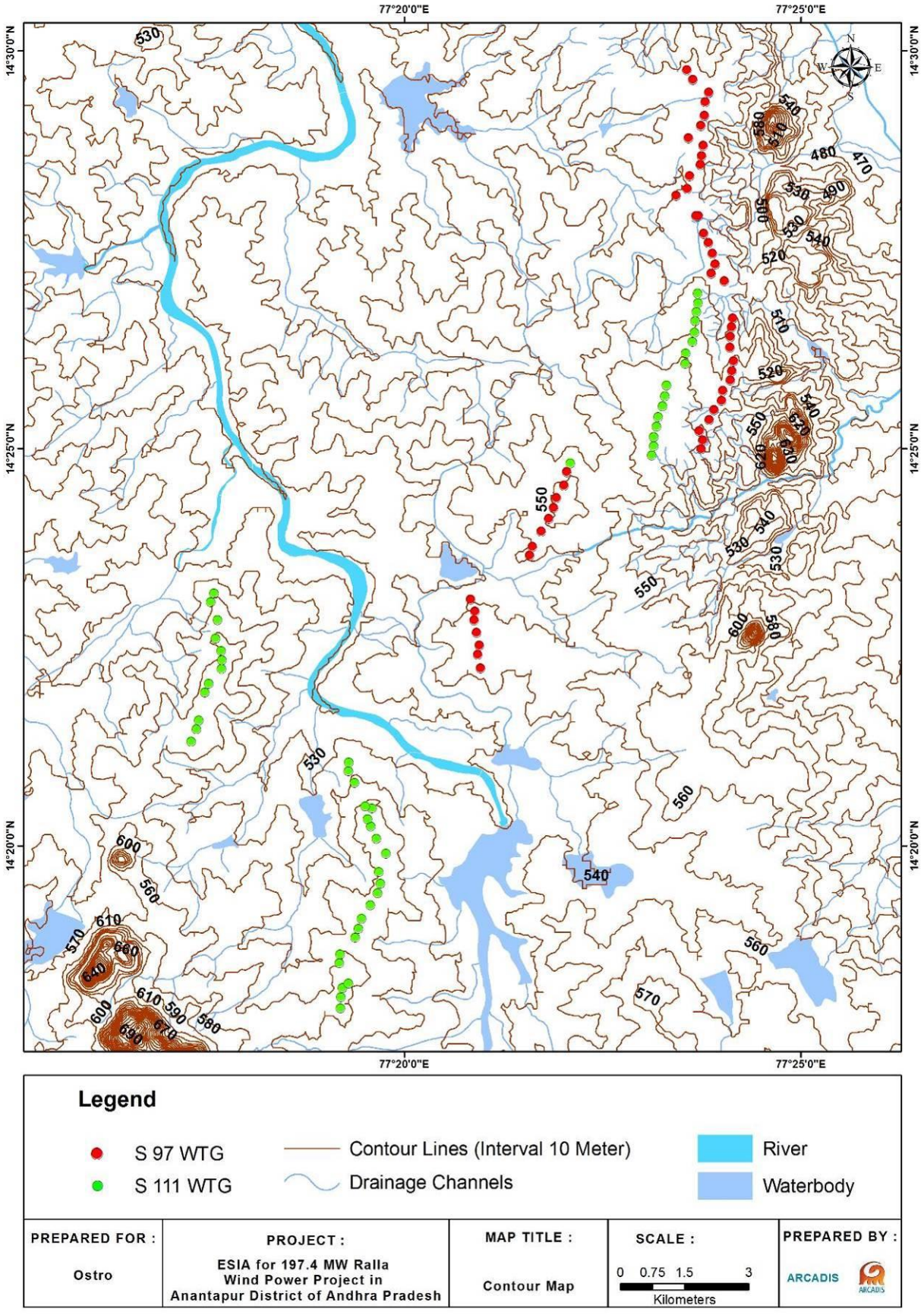
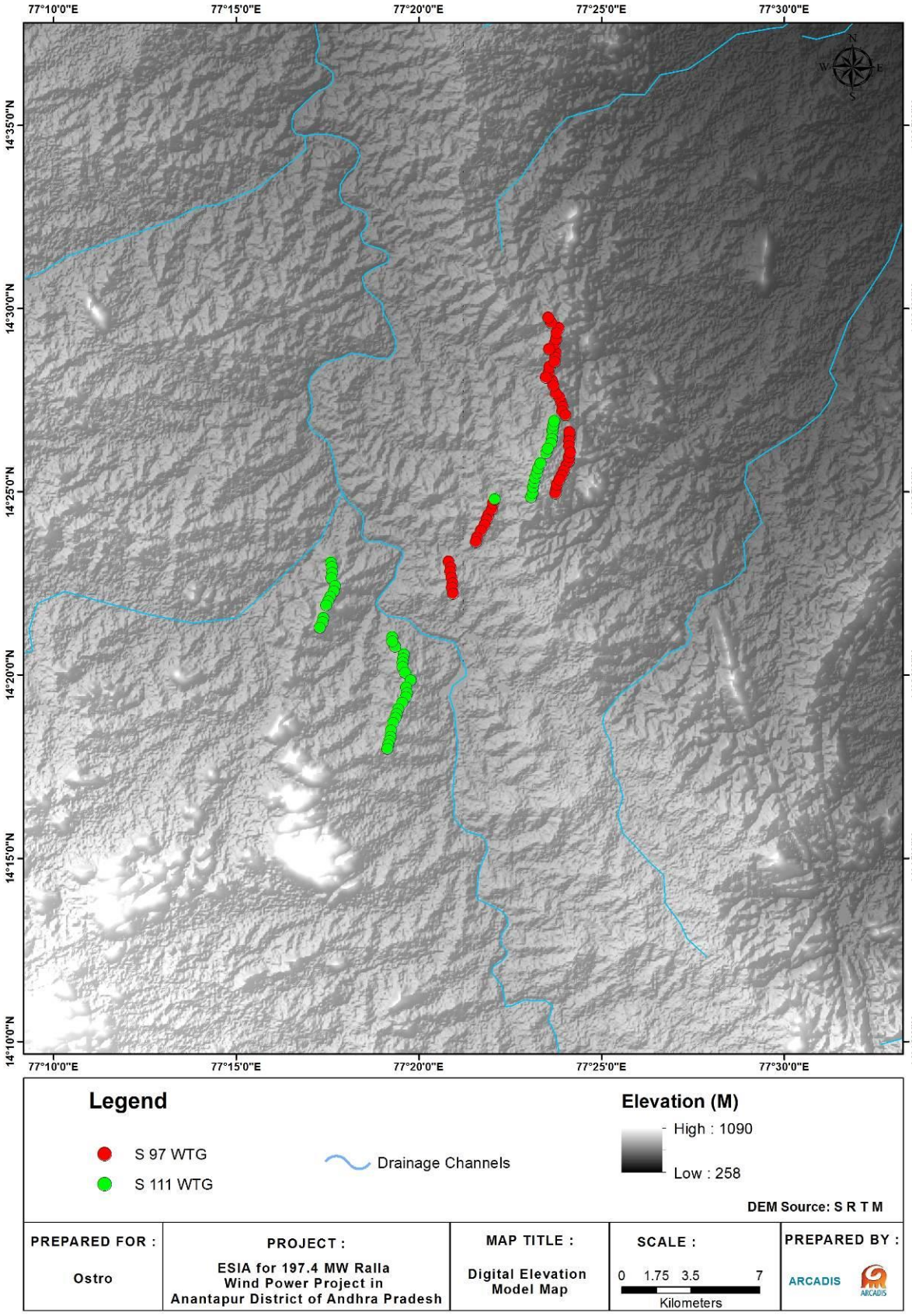


FIGURE 3-3: DEM MAP OF PROJECT SITE



3.3 WTG PROFILING & TECHNOLOGY

The project includes 101 WTGs spread across three mandals namely, Kambadur, Ramagiri and Kanaganapalle. The WTG locations were visited and profiling of surrounding area of 500 m around each WTG was carried out and sensitive receptors were identified. The project include one pooling substation (PSS) and one grid substation (GSS). Both the substation locations were visited and sensitive receptors (if any) were noted. Also, the process for identification of land for transmission line was under process while the angle points of EHV line was surveyed during the site visit. The length of transmission line from PSS to GSS is approximately 37 kms. Profiling of the WTGs and other component of the projects has been carried out using scientific equipment such as GPS, camera and satellite maps of the area was referred for during the site visit. Maps showing the distance of one WTGs cluster to adjacent WTG cluster is provided in **Annexure V (A)**.

3.3.1 Wind Turbine - Technical Details & Design

The project will comprise of two models of wind turbines namely S97 and S111, which will be supplied by Suzlon. The diameter of a rotor from the wind turbine S97 is 97 meters and S111 is 111.80 meters. The rotor sweep of S97 is 7386 square meters and S111 is more than 9500 square meters. The rated power output is 2.1 MW. The rotor consists of 3 rotor blades made of high quality E-glass reinforced Epoxy, vaccum-injected material. Manufacturer of the rotor blades is Suzlon. The type for S97 is SB47 of length 47.5 m and S111 is SB54 of length 54.6 m respectively. The rated actual power output of S97 is at a wind speed of 11 M/s and S111 is at a wind speed of 10 M/s. The nacelle is equipped with a 3 stage helical/planetary gearbox with a ratio of 1:98.8 for S97 and 1:90 for S111. The generator of the Suzlon S97 is a Slip ring Asyn type. The Suzlon S97 has a hybrid tower with tower height of 116.3 meters and S111 has a 4 section Steel tube tower with a height of 87.12 meters.

The Suzlon S97 model is covered in the list of wind turbine models possessing valid type approval/certificates as published by National Institute of Wind Energy (NIWE) under "Main List" of "Models & Manufacturers of Wind Turbines" dated 15.05.2015. The type approval certificate is valid till 12th April 2018[5]. As reported by OSTRO Type certificate for Other Suzlon S111 model has also been obtained. The technical concept and specification of the S97 & S111, WTG model has been presented in **Table 3.1** below.

TABLE 3-1: MEAN ANNUAL WIND SPEED & WPD AT PROJECT SITE

PROPERTIES OF THE MODEL		
	S97	S111
ROTOR		

[5] List of valid type approval/certificates as published by National Institute of Wind Energy (NIWE) under "Main List" of "Models & Manufacturers of Wind Turbines" dated 15.05.2015.

PROPERTIES OF THE MODEL		
Diameter	97 m	111.80 m
Swept area	7,390 m²	>9500 m²
Rotational speed	11.8 - 17.7 rpm	9.4 – 13.0 rpm
BLADES		
Number of blades	3	3
Type	SB47	SB54
Length	47.5 m	54.6 m
Airfoils	Suzlon	Suzlon
Material	E-glass reinforced Epoxy, Vaccum-injected	E-glass reinforced Epoxy, Vaccum-injected
TOWER		
Type	Hybrid tower (lattice tower, adapter, tubular tower)	4 section tubular steel tower
Height	116.3 m	87.12 m
GEAR BOX		
Type	1 planetary stage, 2 helical stages	1 planetary stage, 2 helical stages
Ratio	1:98.8	1:90
GENERATOR 2.0 MW		
Type	Slip ring asynchronous generator	Asynchronous 3- phase induction generator with slip rings
Rated power	2.1 MW	2.17 MW
Frequency	50 Hz	50 Hz
Protection class	IP 54 (slip ring IP 23)	IP 54 (slip ring IP 23)
Power factor	Variable; 0.94 cap.; from 1 to 0.94 ind.	0.90 cap. To 0.90 ind.

3.4 POWER EVACUATION

Power evacuation arrangement is required to feed electricity generated by wind power project to the State grid system of the Utility. APTRANSCO will be providing connectivity to this project for evacuating power for the proposed wind farm. Laying of 220 KV moose DC line up to upcoming 400/200 KV Borampalli substation from the proposed pooling substation will be carried out. Ecoren to construct the 200 KVA pooling substation on site that will directly connect to 400/200KV substation. M/s Ecoren Energy Pvt. Ltd should enter an agreement with New & Renewable Energy Development Corporation of Andhra Pradesh Limited

whereby NREDCAP should sanction the allotment of the wind power project with designated capacity to Ecoren in Anantapur district following which Ecoren should enter an agreement for power purchase with discoms.

Photo-Grid Substation under construction

3.5 RESOURCE REQUIREMENT

3.5.1 Land

Proposed wind power project is currently in preliminary stage and micro siting has been completed for the WTG locations. Village wise land requirement have been identified during the ESIA study. Total 26 ATS (Agreement to Sale) were completed till the time of the study.Land will be purchased through the by project land team of Ecoren. One ATS has been attached in **Annexure I (C)** as a sample**.**

The land to be purchased is private & is a mix of non-cultivated, dry open scrub and agricultural land which is cultivated only once during monsoon as the area is very dry and devoid of rain during rest of the year. The village wise land distribution as shared by Ecoren land team is provided in following **Table 3.2**.

TABLE 3-2: VILLAGE WISE LAND DISTRIBUTION

Sl. No.	*Village*	*Land in Acre*	*Land type*	*Total WTG No.*
1	Maddulacheruvu	126.80	Private	*42*
2	Konetinayanipalem	3.30	Private	*1*
3	Perur	59.20	Private	*19*
4	Kurakulapalli	*62.80*	Private	*22*
5	Chennampalli	*36.30*	Private	*11*
6	Rallanantapuram	*13.20*	Private	*4*
7	Rallapalli	*6.60*	Private	*2*

Total	***307.40***	***101***

Source: land detail shared by land developer (M/S Ecoren)

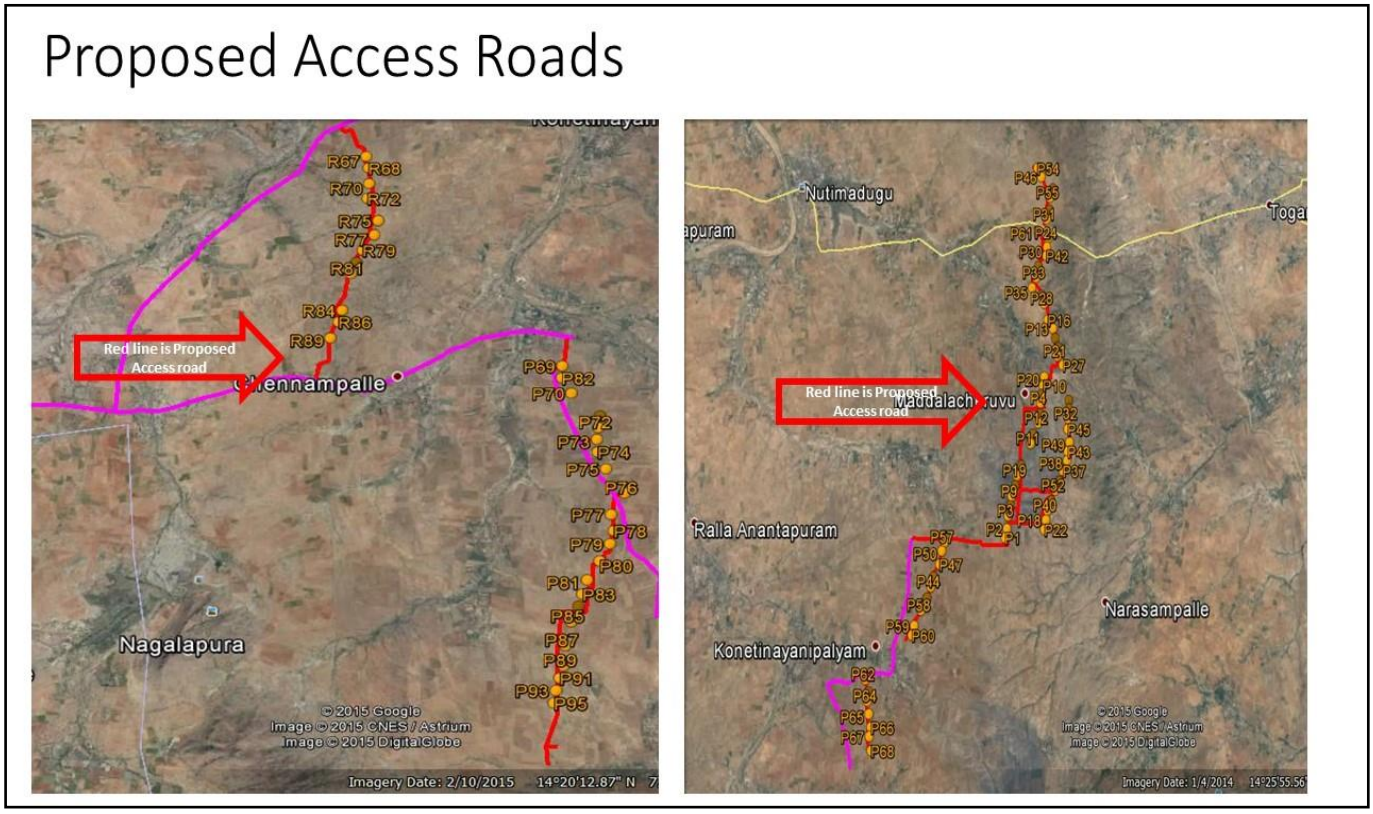
TABLE 3-3: LAND BREAKUP FOR PROPOSED PROJECT

Sl. No.	***Project Components***	***Approximate Land Requiremnet in Acre***	***Remarks***
1	WTG	307.4	Total 101 WTG
2	Access Roads	60	Permanently will be acquired for site access to each WTG location for both phase construction and operational.
3	Transmission line	2.34	Around 148 transmission line tower falls under37 km lenth of T. line. Land requirement for one tower is 8 m X 8 m and distance between two tower is about 250 m.
4	Pooling Sub Station (PSS)	20	As reported by Ecoren
	Total	**389.74**	

ST land for WTG location: ST (schedule tribe) land may be involved for the 3-4 WTG location as reported by land developer team till the time site visit was undertaken. Land purchase procedure for ST land is similar to private land acquisition process in A.P. as reported by land developer team (M/s Ecoren). As per opinion from Ecoren's Local Civil Advocates and Mandal Revenue Officers there is no Government order pertaining to prohibition for purchase of private land belonging to SC/ST people, if all related documents stated that they have the rights for sale. However, there is prohibition in purchase of SC/ST assigned lands which are allotted from Government of Andhra Pradesh to them.

Based on the interview the concerned official from the local land revenue office, Government of Andhra Pradesh has notified ST/SC land identified in government records. Such land, which is notified in records as ST/SC land cannot be purchased by any private company. If any applications for registration of such notified SC/ST land comes by any private company then such registration requests are not accepted. It should be noted that if a person from SC/ST community purchases/owns a private land, which is not present in the notified SC/ST lands then that SC/ST person has rights to sell such land to a private company or a non SC/ST person. As reported by the land team of Ecoren, the SC/ST land which were identified for some WTG locations were non-notified SC/ST land.

Land for access road: The planned access road will be approximately 8-10 m in width. As per the information provided by OSTRO, approximately 60 acres of land will be acquired. An exclusive access to the construction site is usually required prior to the mobilization of manpower and machinery. The construction of access road will be linked with village main road and district major road. The access road will be developed on procured private land. All WTG location will be connected about 35 km of access roads



Land for transmission line & PSS: As per the information provided by OSTRO, approximately 20 acres of land will procured for PSS. Transmission line of 220 KV will cross 9 villages (Konetinayanipalyam, Chennampalli, Ralla Anantapur, Rallapalli, Gulyam, Pallur, Ramapuram, Muddinayana palli and Golla) for a distance of about 37 km. M/sEcoren 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 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 in the study area

During site visit and dialogue with Ecoren (project developer) land team and sub-registrar office it was also confirmed that, only private land will be purchased. No revenue land will be procured for the proposed project. Private land will be purchased through good faith negotiations based on willing seller and willing buyer basis, which was confirmed on the basis of following evidences:

- Agreement to Sale (ATS),
- Absence of corrosive methods verified through primary consultation with landowners (consulted with 17 landowners),
- Consultation with land developer (Ecoren),
- Analysis of market value of land that the land sold by landowners are at a higher price than the circle rate.
- Farmers has the right to say no to sell the land if it is through forceful means and this has been verified through primary consultation
- Grievance redressal mechanism should be in place during the land uptake process

Ecoren land purchase procedure for land uptake and detail land purchase procedure provided in flowchart as Annexure I (A) It is recommended that documentation related to land purchase should be maintained as per the format attached in Annexure I (B). Scan copy of ATS as a sample attached as Annexure I (C).

Brief general procedure of land purchase is as follows:

- 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 initiated
- Land registrations in the name of the company
- Mutation to be done in favor of company's name in revenue records
- Computerization of land records in the name of the company.
- Payment of 10% on Basic land value (as per Sub Registar Office data) through challan for conversion of the land.
- The circle rate details of the proposed project area is provided in **Table 3.3.**

TABLE 3-4: VILLAGE WISE GOVT. CIRCLE RATE OF LAND

Sl. No.	Mandal/Village Name	Circle rate/Acre (INR)

Sl. No.	Mandal/Village Name	Circle rate/Acre (INR)
1	Chennampalle	1,00,000
2	Ralla Anantapuram	1,00,000
3	Rallapalle	1,00,000
4	Kurakulapalle	1,00,000
5	Maddalacheruvu	1,00,000
6	Konetinayanipalyam	1,00,000
7	Vepakunta	1,00,000
8	Perur	1,00,000

Source: Sub-Registrar Office, Kalyandurga, Anantapur/primary consultation

OSTRO also has its own land procurement procedure and land due diligence process as mentioned below.

OSTRO land purchase process

- Land team of the developers/OEMs approaches owners of land, which is identified for project components i.e WTG locations, land for pooling substation, land for batching plant and labour camps based on the wind potential
- OSTRO conducts an environmental and social impact assessment study on the offered locations to identify locations that may have environmental or social concerns.
- Developers land team assesses whether the land identified is government/revenue/assigned land or a private land.
- All approvals as per applicable law are obtained, prior to procurement of either government land or private land (for e.g. Gram Panchayat approval, DC approval, etc. as applicable)
- In case of government land, application is made to the concerned revenue department for allotment of land for the project purpose.
- In case of private land, developer's land team approaches the land owner and proposes him to sell his land for project purpose at negotiated price, which is generally in line with the local circle and market rates. The land owner is given sufficient time to decide whether he is agreeable to sell his land or not.
- If the land owner agrees to sell his land then an Agreement to Sell (ATS) is signed between the land-owner and developer/OEM, which is followed by a detailed diligence and sale transaction. These ATS and sale deeds are shared with OSTRO only after a legal contract gets signed between OSTRO and the developer/OEM.
- Before the developer transfers any private land to OSTRO, OSTRO publishes a notice in the most circulated local newspaper both is vernacular and English language where OSTRO's authorized local point of contact/address is given to receive any grievances

within a standard time frame , if any, associated with the private land. OSTRO also conducts detailed diligence on the land parcel being procured, and ensures that consent of all land-owners for the given land parcel is obtained as per law.

- OSTRO also initiates local community outreach programmes at the time of project construction, for both immediate and long term benefits to the local community, in the regions where land is acquired on behalf of OSTRO.

Land Due Diligence by OSTRO

1. OSTRO appoints a third party consultants such as Trilegal for conducting land diligence.
2. The third party appoints a local counsel, where land procurement has to happen to conduct land diligence. The local counsel is completely managed by Trilegal. Reports prepared by the Local counsel are under the guidance and supervision of Trilegal and then submitted to OSTRO.
3. OSTRO provides land related information available with the OEM to Trilegal.
4. In addition to reviewing the information made available by the OEM, Trilegal/Local Counsel also conducts independent review of the revenue records / land ownership records, and seeks clarification from relevant local departments as required.
5. Subsequently, Trilegal shares the due diligence report with OSTRO.
6. If the report does not raise any issue, then OSTRO ask Trilegal to finalise the report. If the report raises issues (mortgaged land, land in defence area, etc) then OSTRO seeks further clarification from the OEM and provide OEM's responses to Trilegal to finalise the report.
7. Subject to the nature of issues raised in the final report, if the issues are curable – OSTRO requires the OEM to cure the issue before transferring the land to OSTRO. If the issues are not curable – then OSTRO does not acquire the relevant land parcel.

Andhra Pradesh Wind Power Policy, 2015

As per Andhra Pradesh Wind Power Policy, 2015 orders issued regarding provision of land to wind project developers in the state A.P. is as follows-

As stated in the aforementioned policy, *"As per Category I, projects set up in government / revenue lands or forest areas or assigned lands and also in private lands, selling power within the State Power generated from the wind power projects installed entirely or partly on government/ revenue land or forest areas, shall be for sale within the State only".*

The Govt. of A.P. may consider proposals for allotment of revenue land if available at the wind power potential areas on first come first serve basis- based on recommendation of NREDCAP, as per the provisions of New Land Allotment Policy announced by the Government vide G.O. Ms. No: 571, dated: 14-09-2012 of Revenue (Assignment-I) Department.

To facilitate faster execution of projects, the district collector shall handover advance possession of land including pathways to NREDCAP and the land shall be allotted in the joint name of NREDCAP and the Developer. The concerned district collector after taking into account all the necessary undertakings of land proposal shall permit the developer to start the construction. NREDCAP shall withdraw its rights from the land once the project gets commissioned.

In case of forest areas, the developers shall submit the application through the Nodal Agency to the forest department, to consider for allotment as per the guidelines/regulations laid down by the forest department from time to time. If the wind farm is set up in private land then the Eligible Developer shall procure the land from the land holder on their own.

3.5.2 Water

Water will be required for civil works, would be sourced from authorized 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 3-5 KLD for domestic water use considering 75 workers during peak hours. Labour camp would be put up within project area, however, no detailed information pertaining to number of migrant labours was available during ite visit. In operational phase, water would be used for the domestic use of project staff at the site, which is estimated to be around 2-3 KLD considering 35-40 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 3-5: WATER REQUIRED DURING CONSTRUCTION PHASE

S.No.	Area		Approximate Quantity	Source
1	During Construction	Various WTG foundation and construction activities	65 KLD per WTG	Authorised Local bore wells/lakes supplied by tankers
2		Domestic water requirement	3-5 KLD (considering regular and peak labour requirement)	Authorised Local bore wells/lakes supplied by tankers
3	During operation	Domestic water requirement	2-3 KLD	Authorised Local bore wells/lakes supplied by

S.No.	Area	Approximate Quantity	Source
			tankers

3.5.3 Workforce

Approximate 75 nos. of workers to be deployed by the contractor on temporary basis including 30 security personnel (mostly local) during construction phase. The contractor workforce will be comprised of both skilled and unskilled labours, which will be sourced from the nearby villages depending on their skills and capabilities. However during the operations phase approx. 30-40 nos. of personnel will be deployed on site which will include technical personnel and security guards.

3.6 PROJECT IMPLEMENTATION STATUS

During the ESIA ,project was in its initial phase, where the land for the proposed project has been identified and yet to be purchased. The locations of the WTGs has been finalized through micro siting. Also the grid substation was under construction and the route for the transmission line has been identified. Tentative project schedule is presented in the table below. The timeline set for the completion of each activity may vary as the project is in its initial phase during the ESIA study.

Sr No.	Project Activity	Project Schedule
1	Land Procurement lead time + Production Plan	Under progress- likely to be completed by Feb end 2016
2	Logistics	May-2016
3	Civil Works & other Construction (EPC)	Start during March-2016 till –Nov-2016
5	Electrical	GSS started, at PSS from April-December-2016
6	Project Commissioning	Feb-2017.

3.7 OTHER PROJECTS

There are three other renewable energy projects located near the proposed project site. Two of them are wind power projects in Rayala (Greenko) and Nimbagulla (OSTRO) located at a distance of about 22 kms and 50 kms respectively north east from the proposed project site. The other is solar power project in Borampalli located at a distance of approximately 26 kms from the proposed project site.

4 SOCIAL & ENVIRONMENTAL COMPLIANCE REQUIREMENTS

This section describes the regulations, statutory guidelines and obligatory standards that are applicable to the social and environmental performance of the proposed project.

4.1 NATIONAL REGULATIONS AND SOCIAL & ENVIRONMENTAL PERFORMANCE STANDARDS OF IFC

The environmental and safety related national regulations and IFC performance standards that are applicable for the wind power plants are discussed below.

TABLE 4-1: APPLICABLE EHS REGULATIONS – SUMMARY TABLE

S. No	Act/Guidelines/Policy/Govt. Orders	Applicability
1	The Water (Prevention and Control of Pollution) Act 1974	Not Applicable as insignificant pollution would be generated by the project. As per Andhra Pradesh Wind Power Policy, dated 13.02.2015, Section 8, Item J (Pollution Clearance) - Wind power projects will be exempted from obtaining any NOC/Consent for establishment for pollution control laws from AP Pollution Control Board.
2	Air (Prevention and Control of Pollution) Act 1981	
3	The Water Cess Act 1977 and Rules	
4	Environment (Protection) Act, 1986 as amended	Applicable This is an Act to provide the protection and improvement of the environment. The EPA Act 1986 relate to the implementation of protection and improvement of environment and prevention of hazards to human beings, other living creatures, plants and property.
5	Wildlife Protection Act 1972 & National Wildlife Action Plan (NWAP)(2012-2016)	The Wildlife Protection Act 1972 aims at protecting the plants and wildlife of India. This act will be applicable as the area is rich in avifauna and some mammal species falling under schedule I of NWAP-1972. As per NWAP (2012-2016) the action plan indicates that all identified areas around the protected area and wild life corridors to be declared as ecologically fragile under EPA 1986. The proposed project do no fall under any notified Eco Sensitive Zone (ESZ). The proposed project site is not close to any

S. No	Act/Guidelines/Policy/Govt. Orders	Applicability
		protected area, wild life sanctuaries or national parks. The nearest wildlife sanctuary is Jayamangala wild life sanctuary located about 72 kms from the project site. So the project area does not fall under ecologically sensitive zone.
6	Indian Forest Act 1927 & Forest (Protection) Act 1980 as amended.	Since forest land is not involved for the proposed project, therefore this Act is not applicable for the proposed project.
7	Hazardous Waste (Management, Handling & Transboundary Movement) Rules 2008 as amended	Applicable. Although nominal quantities of waste oil is likely to be generated during operation and maintenance of DG set, which need to be managed in accordance to the HWMH Rules. The generated waste managed to be disposed through authorized recyclers appointed by SPCB.
8	Contract Labour (Regulation & Abolition) Act 1970 and Rules	Applicable. It is the responsibility of EPC contractor to have valid license and ensure provision of appropriate welfare measures viz. arrangement for sanitation facilities, drinking water, first aid etc for the onsite contractual workers & labourers. In addition Ecoren Energy as principal employer needs to obtain registration certificate from EPC contractor for undertaking project work.
9	The Building and Other Construction Workers' (Regulation of Employment and Conditions of Service) Act 1996	Applicable. This Act provides for the safety, health and welfare measures of building and construction workers in every establishment which employs or employed during the preceding year ten or more such workers. These measures include fixing hours for normal working day, weekly paid rest day, wages for overtime, provision of basic welfare amenities

S. No	Act/Guidelines/Policy/Govt. Orders	Applicability
		like drinking water, latrines, urinals, crèches, first aid, canteens etc. and provision of temporary living accommodation within or near work site. As discussed for the Contract Labour Act the provision for this Act also need to be complied by the EPC contractor & its subcontractorsfor the project.
10	The Minimum Wages Act 1948	Applicable. Applicable to the project.as Ecoren Energy is going to employ laborers both for construction and operation phase of the project.
11	The Payment of Wages Act 1948	Applicable for the project.
12	Workmen Compensation Act 1923 and Rules	Applicable. The objective of this Act is that in the case of an employment injury compensation be provided to the injured workman and in case of his death to his dependents. Hence any injury or death of workmen that may arise under any accidental circumstance during the proposed project development need to be compensated under the provision of the is Act
13	Micro-siting Guidelines for Wind Power Projects	*Distance between WEGs* As per micro siting guidelines from National Institute of Wind Energy (formely known as CWET), minimum distance of 3D (D is rotor diameter) is recommended between the turbines, facing perpendicular to wind direction. For the proposed project, the minimum distance maintained between WTGs is 3D, although it is not mandatory as per CWET guidelines. There is no specific guidelines pertaining to spacing between wind turbines by IFC.

S. No	Act/Guidelines/Policy/Govt. Orders	Applicability
14	Electricity Act 2003, relevant para-electricity Laws, section 67, 68 & 69	*Applicable* Para 67 & 68 give provision for granting license to project proponent to break-up any utility area like roads, railway line, sewage lines, drain or tunnel to lay the transmission lines. This is required to install poles and lattice structures and laying of transmission lines. The Act says that '…the consent in writing of the appropriate government, local authority, owner or occupier as the case may be shall be required for carrying out the work.' This applies to agricultural land as well.
15	The Right To Fair Compensation And Transparency In Land Acquisition, Rehabilitation And Resettlement Act, 2013 And Andhra Pradesh Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Rules, 2014-	*Not Applicable as the proposed project does not involve and forceful land acquisition and no resettlement.* As per section 3 and 46 (1) of The Right To Fair Compensation And Transparency In Land Acquisition, Rehabilitation And Resettlement (R&R) Act, 2013, R & R will be applicable only when any person and company purchased land through private negotiation for an area equal to or more than limits as notified by the state Govt. as per Andhra Pradesh Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Rules, 2014. Specified limit of purchasing land by a company is 5000 acre. In this proposed project is total purchased land is less than specified limit at is 5000 acre.

TABLE 4-2 PERMITTING & COMPLIANCE FOR THE PROPOSED PROJECT

S.No	PERMIT	AUTHORITY	REMARKS
1	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
2	Forest Clearance from MoEFCC/ State Government	Forest Department	Some WTG location is close to Narasampalli Reserve Forest area. Nearest WTG from forest boundary are P30, P24, P42, P48 and P31 (0.02 km to 0.05km). Refer Annexure V.
3	Power evacuation approval	Transmission Corporation of Andhra Pradesh Limited (APTRANSCO)	Required for the project. Approval will be obtained by Ecoren Energy from APTRANSCO for evacuation of power, for the project.
4	Consent to Establish (CTE)	Andhra Pradesh Pollution Control Board (APPCB)	Not required for the project. As per Andhra Pradesh Wind Power Policy, dated 13.02.2015, Section 8, Item J (Pollution Clearance) - Wind power projects will be exempted from obtaining any NOC/Consent for establishment for pollution control laws from AP Pollution Control Board. Reference Andhra Pradesh Wind Power Policy, dated 13.02.2015, Section 8, Item J (Pollution Clearance) –is attached as Annexure XXIII

S.No	PERMIT	AUTHORITY	REMARKS
5	Consent to Operate (CTO)	APPCB	Not required for the project. As per Andhra Pradesh Wind Power Policy, dated 13.02.2015, Section 8, Item J (Pollution Clearance) - Wind power projects will be exempted from obtaining any NOC/Consent for establishment for pollution control laws from AP Pollution Control Board. Reference Andhra Pradesh Wind Power Policy, dated 13.02.2015, Section 8, Item J (Pollution Clearance) –is attached as Annexure XXIII
6	NOC state nodal agency	Industry Commissioner/R.O.	Required for the project as change in land use from agriculture to industry is required for establishing the project.
7	NOC State Electricity Board	State Electricity Commission	Required for the project prior to grid connection.
8	Contractor permits	Project Developer	The contractor will need to abide by the following laws and Ecoren Energy will have to ensure that it is being done as they are the principal employer: 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,

S.No	PERMIT	AUTHORITY	REMARKS
			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.
9	Land procurement	Project Developer	Is under process
10	No Objection Certificate from the Gram Panchayat	Gram Panchayats	Need to be taken from the Gram Panchayats of the villages from whom land will be purchased for the development of the project.

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 4-3: 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. OSTRO also needs to develop and implement an 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	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 labours would be temporarily employed by contractors of Ecoren. Labor camp would be setup for the proposed project. Ecoren should follow the requirements of IFC guidelines and ILO guidelines for worker accommodation. OSTRO Renewables had developed accommodation guidelines for labours residing in labour camp which meets the recommendations of IFC and ILO. Ecoren is recommended to implement the

Title of Performance Standard	Objective	Applicability
	To avoid use of forced labor	requirements while establishing labour camp. The ILO worker accommodation requirements are attached as **Annexure II** of this report.
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 land, water and power. Private land will be purchased on point basis for erection of the WTGs. Water will be sourced locally via tankers from village bore wells. Access road will be constructed for the movement of the vehicles like trailor 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.
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 To ensure that the safeguarding of personnel and property is carried out in accordance with relevant human rights principles and in a manner that avoids or minimizes risks to the Affected Communities.	The 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 also envisages influx of labors from different nearby villages and migrant labours during construction phase. Conflict among labours 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

Title of Performance Standard	Objective	Applicability
		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 is based on willing to sell and willing to buy basis. It was confirmed through following evidences viz primary consultation with landowners, ATS, discussed with land aggregator and analysis of market value. The process do not involve any forceful land. The land purchased for the project isF private land.
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	This PS is applicable for the project. There are two Reserved Forests namely Narasampalli RF and Bhadrapuram RF located within 5 kms from the nearest WTG (P30, P24, P42, P48 and P31 are located at a distance of 0.02 km to 0.05km from the Narasampalli RF boundary). Black bucks are reported to be present around the project site as per consultation with the

Title of Performance Standard	Objective	Applicability
	activities.	forest officials and villagers and was confirmed through direct sighting. Black bucks are protected and conserved under Indian Wildlife Protect Act (1972). The nearest sanctuary is located about 72 kms south of the project site. Upper Penneru Reservoir is major water body in the project site apart from few small water bodies. During reconnaissance survey eight Schedule I species, two Near Threatened species and 1 both Schedule I and Near Threatened species of birds as per WPA (1972) and IUCN Red List were spotted within the proposed project site. About 15 migratory birds were observed from the project site.
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	PS is not applicable as there are no indigenous people present within the study area.

Title of Performance Standard	Objective	Applicability
	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 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 XXIV**

5 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 NETEL Laboratory (a NABL certified laboratory). Primary monitoring was conducted in November, 2015 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.

5.1 STUDY AREA

The project site is falling in three mandals i.e. Kambadur, Ramagiri and Kanaganapalli. 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).

5.2 PHYSICAL ENVIRONMENT

5.2.1 Climate & Meteorology

The climate of Anantapur 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 monitoring station is Anantapur.

Temperature

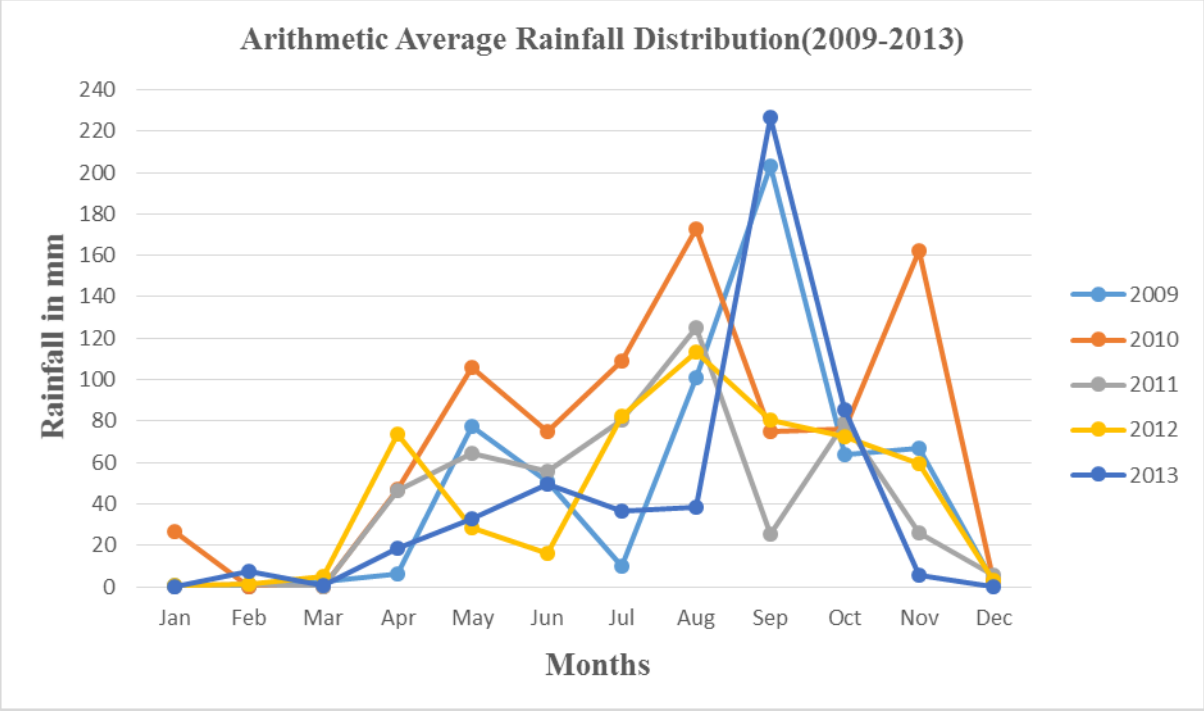
Summers start in late February and peak in May with average high temperatures around the 37 °C (99 °F) range. A dry and mild winter starts in late November and lasts until early February with little humidity and average temperatures in the 22–23 °C (72–73 °F) range.

Rainfall

The average annual rainfall of the district is 535 mm, which ranges from no rainfall in the month of February and March to 129 mm in September. September and October are the wettest months of the year. The mean seasonal rainfall distribution is about 316 mm during southwest monsoon (June-September) & 146 mm during northeast monsoon (Oct-Dec), 1 mm rainfall during winter (Jan-Feb) and 72 mm during summer (March-May). As per official district profile of Anantapur, the percentage distribution of rainfall season wise is 58.7% in southwest monsoon, 27.6% in northeast monsoon, 0.21 percentages in winter and 13.5% in summer. The rainfall analysis for the period of 30 years (1961-1990) reveals that the monthly rainfall in the study area varies from 0.3 mm – 135.1 mm. According to 30 years of IMD data, annual rainfall in the study area has been recorded as 551.3 mm.

Review of rainfall data of 5 years (2009-2013) Anantapur district available from Hydromet Division, India Meteorological Department (IMD) reveals June to September as the high rainfall months with maximum arithmetic average rainfall value generally recorded in the range of 226.8 mm. The rainfall distribution of Anantapur district for the five year period (2009-2013) has been presented in **Figure 5.1** below.

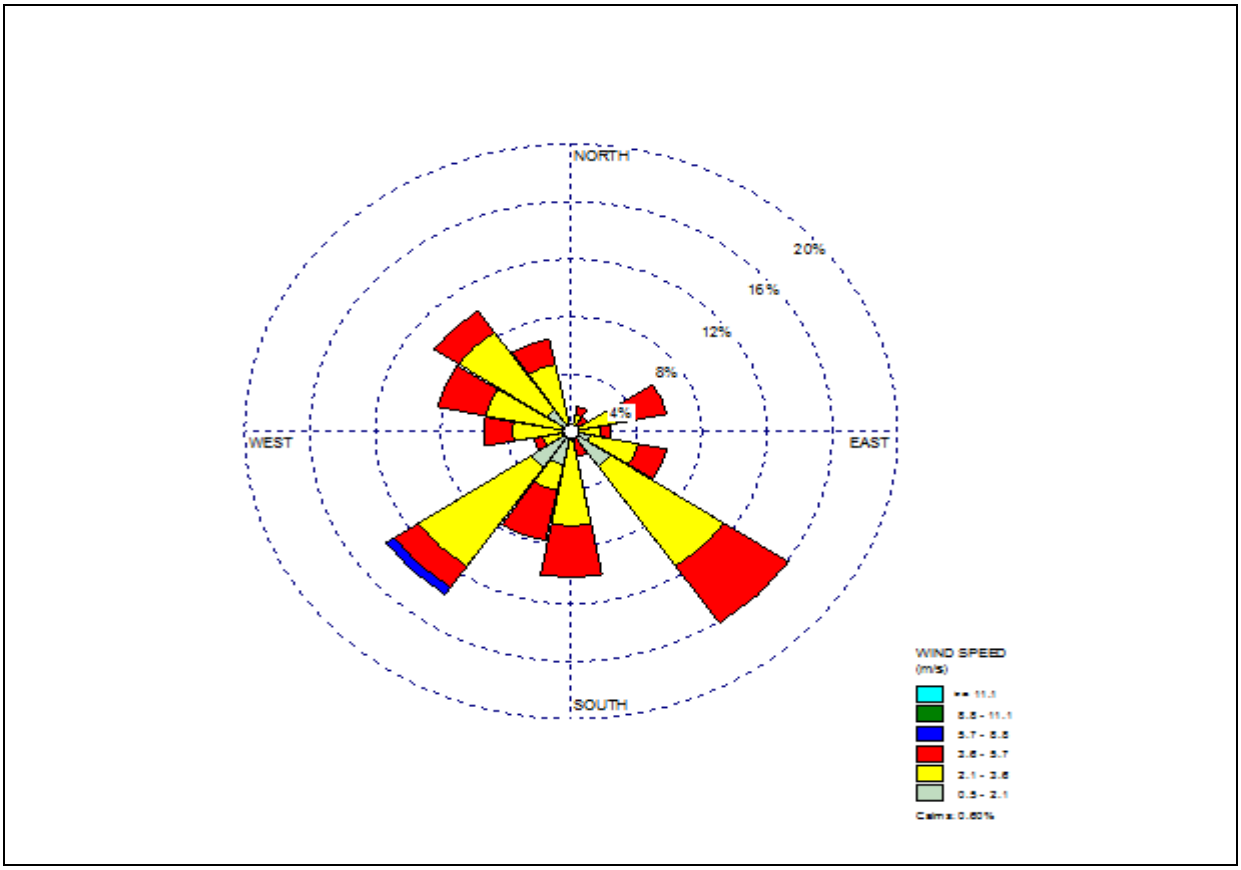
FIGURE 5-1: RAINFALL DISTRIBUTION OF THE DISTRICT (2009-13)



Wind Speed & Direction

Regional wind speed and direction in the study area has been established based on analysis of the micro-meteorological data available[6] for Anantapur IMD station located in Anantapur district. The wind speed of the district for the period (1961-90) generally varies in the range of 7.4-16.4M/sec with average wind speed recorded at 11.0 M/sec. High wind speed values were generally observed for the monsoon months i.e. June (16.4 M/sec) and July (16.5 M/sec). Micrometeorological data for 30 year period of the district indicates the predominant wind direction is west (W) followed by South West (SW). The wind rose showing the predominant wind direction at project site is presented in **Figure 5.2** below.

FIGURE 5-2: WINDROSE SHOWING PREDOMINANT WIND DIRECTION AT PROJECT SITE



5.2.2 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.

[6] IMD Climatological Table (1961-90)

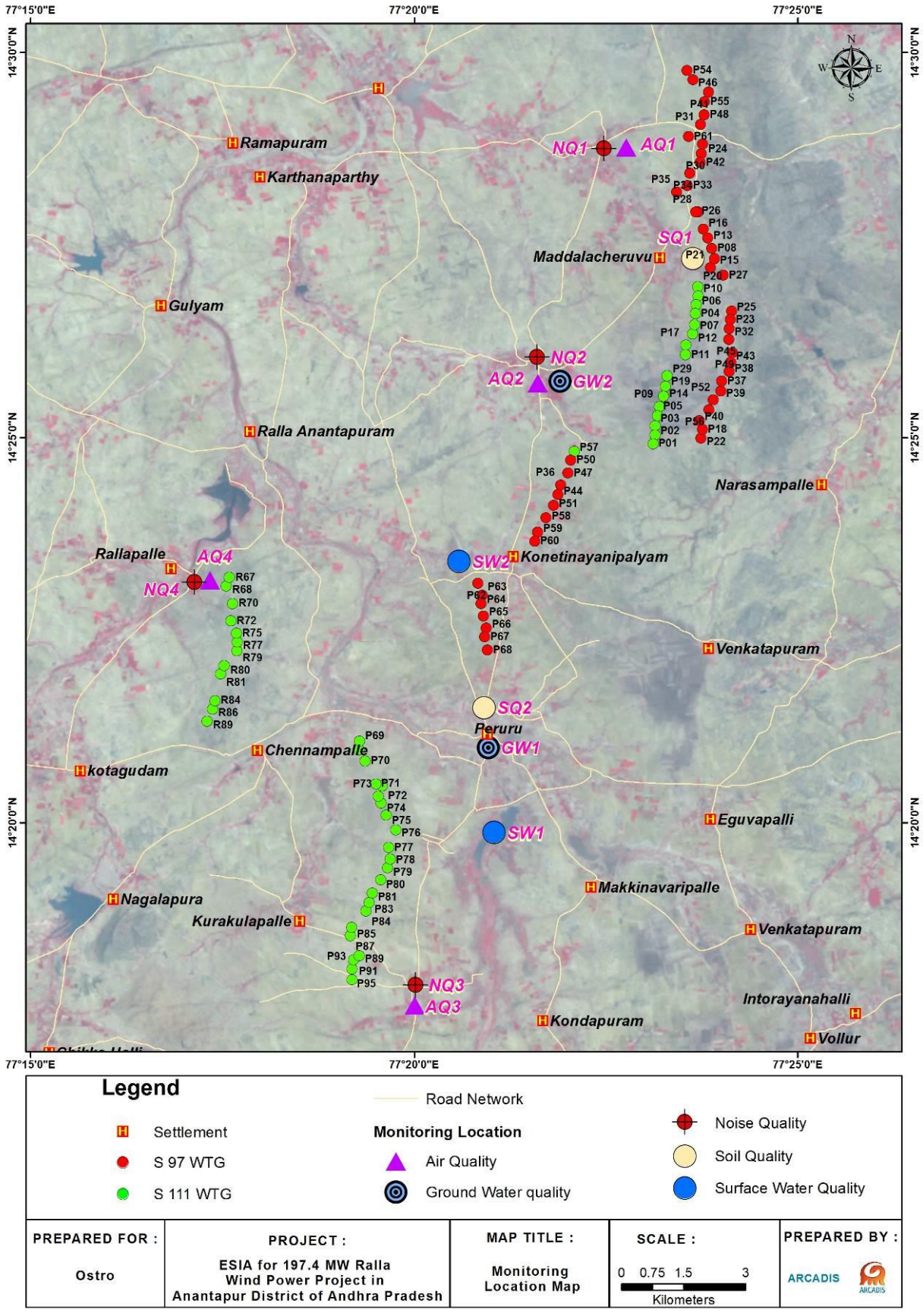
The ambient air quality monitoring was conducted at 4 representative locations during the period of November, 2015. The baseline air quality status of the study area was primarily assessed by monitoring for particulates and gaseous pollutants at these stations (**Refer Figure 5.3**). The monitoring network 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). Monitoring location map is provided in **Figure 5.3** for all the monitoring parameters.

FIGURE 5-3: MONITORING LOCATION MAP OF THE STUDY AREA



Interpretation of Air Quality Results

Particulate Matter (PM_{10}): The arithmetic mean of 24 hourly PM_{10} at all the monitoring locations ranged between 40.7 to 49.7 μg/m^3. The average PM_{10} concentrations at all stations were found to be in compliance to the stipulated PM_{10} standards specified for residential area i.e. 100 μg/m^3. Low PM_{10} concentrations could be attributed to the rural setting of the sites. The PM_{10} level in the monitoring stations is represented in **Figure 5.4.**

Particulate Matter ($PM_{2.5}$): The arithmetic mean of 24 hourly $PM_{2.5}$ at all the monitoring locations ranged between 13.2 to 15.6 μg/m^3. The average $PM_{2.5}$ concentrations were found to conform stipulated $PM_{2.5}$ standards specified by CPCB for residential areas (60 μg/m^3) at all the air quality monitoring locations. The statistical results of $PM_{2.5}$ levels in the monitoring stations are represented in **Figure 5.5**

Sulfur dioxides (SO_2): Mean Sulfur dioxide concentration at all locations was found to be ranging between 5.2 to 7.75 μg/m^3 and in compliance with NAAQS for sulfur dioxide (80 μg/m^3). Low values of SO_x can be attributed to the rural setting of the area. SO_X values recorded as a part of primary monitoring is shown in **Fig 5.6**.

Oxides of Nitrogen (NO_x): The average NO_x values at all locations were observed in the range of 8.2 to 11.6 μg/m^3 which are in compliance to the NAAQS specified for Oxides of Nitrogen (80 μg/m^3). The concentration values of nitrogen oxide representative of each sampling station have been provided in **Fig 5.7**.

Carbon Monoxide: CO levels were detected lowest at Kukarlapalle location i.e 0.18mg/ m^3. The values obtained for CO is found within the NAAQS standard of (CO-2mg/m^3) and is presented in **Fig 5.8.**

Analysis result of air quality monitoring within the block reveals that all the parameters at all monitoring locations are well within the limit (as shown graphically from **Figure 5.4 to 5.8**) which can be primarily attributed to the rural setting of the study area.

FIGURE 5-4: PM_{10} LEVELS RECORDED AT AAQ STATIONS

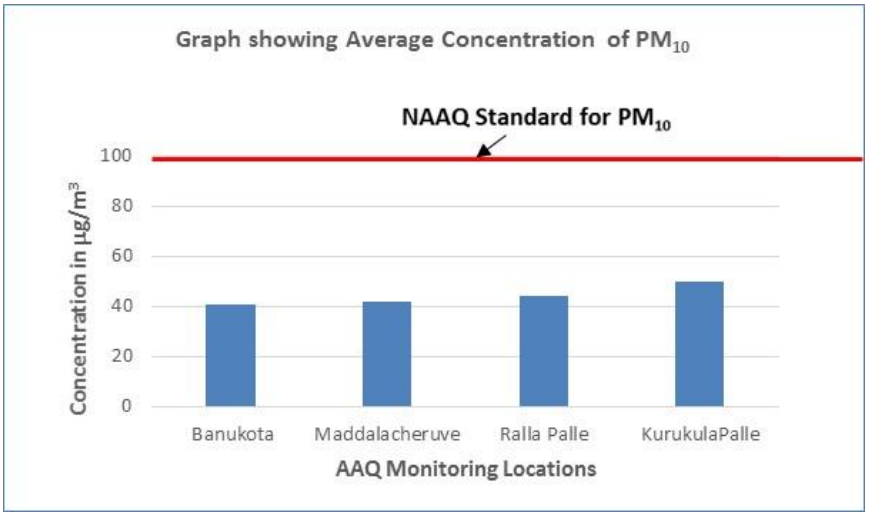


FIGURE 5-5: $PM_{2.5}$ LEVELS RECORDED AT AAQ STATIONS

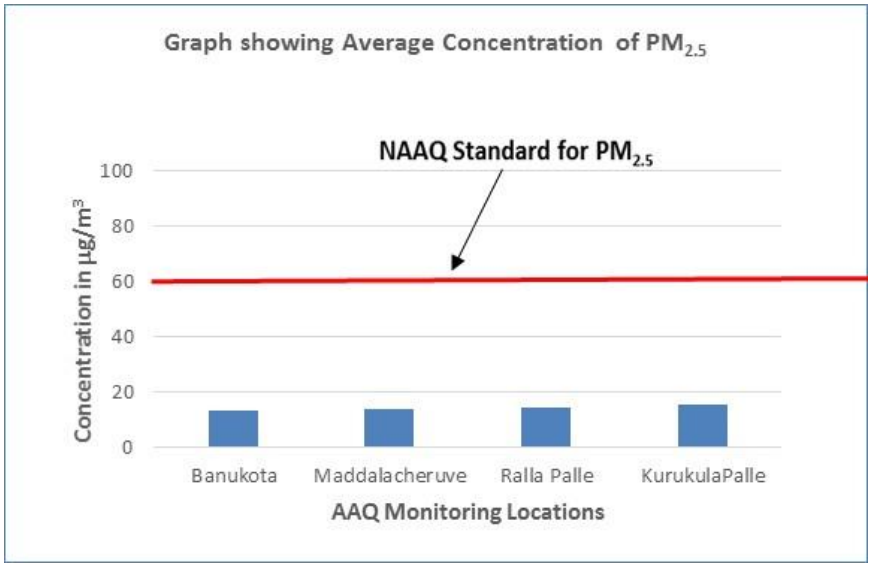


FIGURE 5-6: SO2 LEVELS RECORDED AT AAQ STATIONS

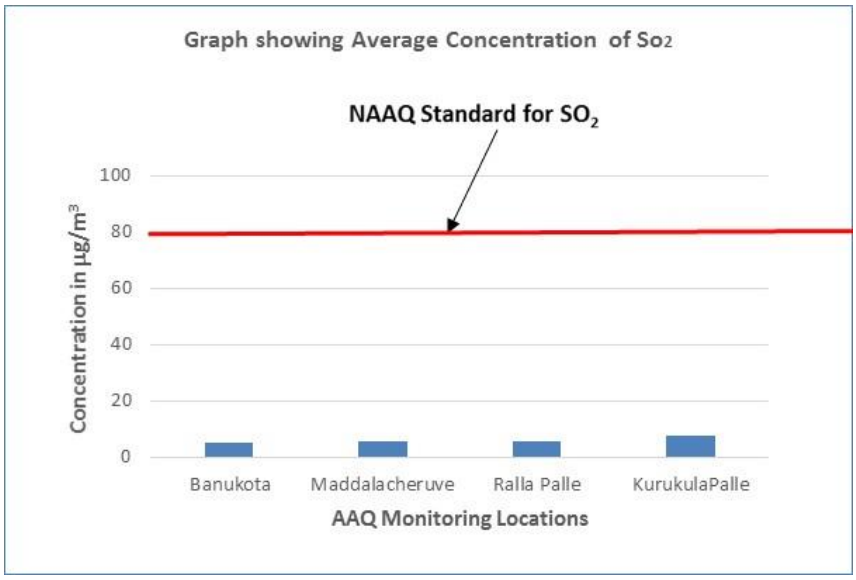


FIGURE 5-7: NOX LEVELS RECORDED AT AAQ STATIONS

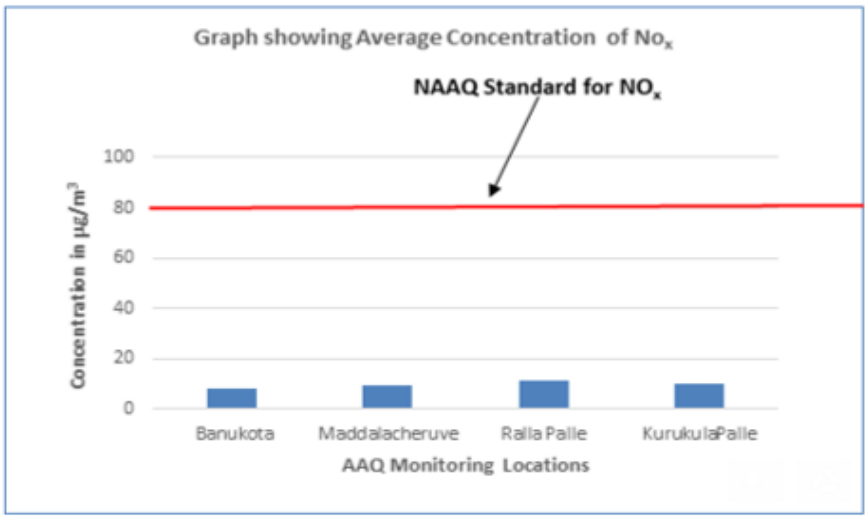
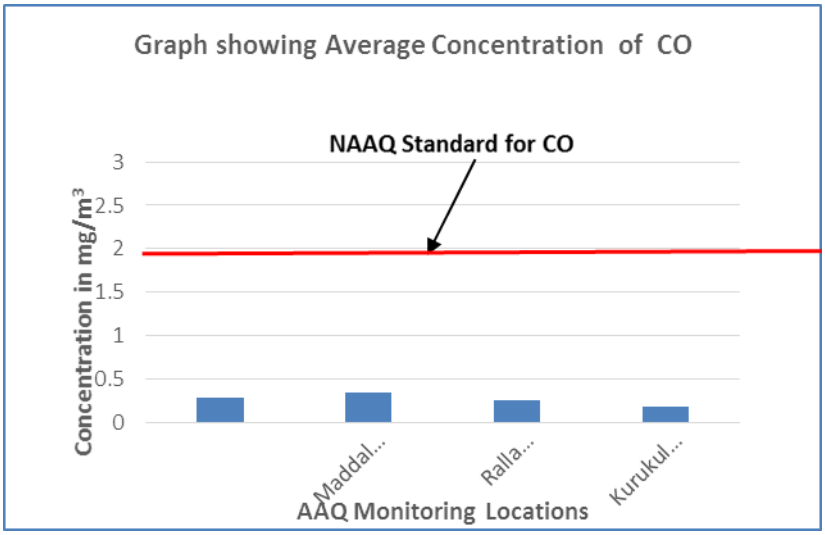


FIGURE 5-8: CO LEVELS RECORDED AT AAQ STATIONS



5.2.3 Ambient Noise Quality

The ambient noise monitoring was conducted during the month of June at 4 locations within the study area. The noise monitoring network was established based on the understanding of the proposed project activities and professional judgment. The location of the ambient noise quality stations have been represented in the **Figure 5.3** for reference.

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 5-1: AMBIENT NOISE MONITORING RESULTS (IN DECIBELS)

S. No.	Location		Leq(dBA)
NQ1	Kurakula Palli	day	56.1
		night	48.5
NQ 2	Rallapalle	day	58.2
		night	42.3
NQ 3	Maddadhera	day	56.6
		night	41.3
NQ 4	**Banukote**	day	54.6
		night	41.2

Interpretation of Noise Quality Results

The equivalent noise levels at three of the monitoring stations during day were found to be little higher than the range of 55 dB (A) and at one location the value exceeds the night time limit of 45dB (A) (CPCB noise standards for residential area). At Kurakulapalli the noise

levels are higher during both day and night time. This village is directly connected to Perur which is the largest settlement area within the project site. At Rallapalle & Maddalacheruvu the values exceeds during the day time limits and are within night time limits for residential areas. At Banukote the values are within limits for both day and night time. The noise levels recorded therefore reveals the rural setting of the study region characterized by little higher vehicular movement which are generally identified as potential noise sources during the day time.

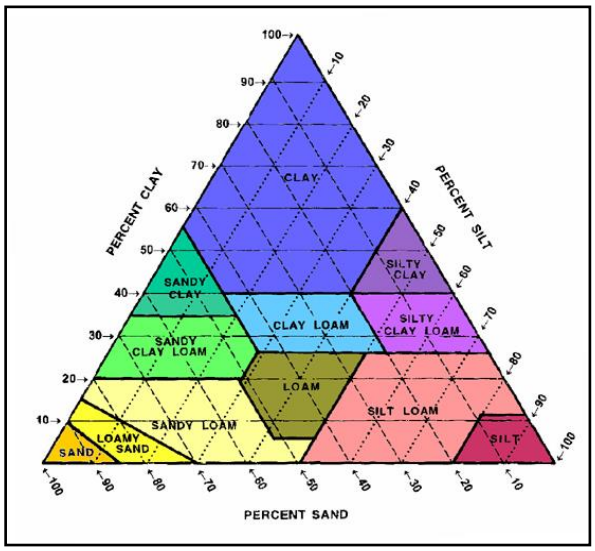
5.2.4 Soil Quality

The soils of Anantapur originated from both the granite and granite-gneisss land forms, as wells as the Dharwar landforms. Both these land forms are characterized by hills and ridges having undulating and gently-sloping lands. As per the study of Anantapur district, carried out by M s Swaminathan Research Foundation, Chennai for the Government of India, there are about thirty four soil families in the district of Anantapur, and among these, the Anantapur and Penukonda soil families are the most predominant. The monitoring results presented below reflects the texture quality and type of soil present within the project site.

TABLE 5-2: SOIL MONITORING RESULTS

Sr. No.	Parameter	Unit	MaddlaCheru	Peruru
	Sample Reference No.	–	NIL/SO/11/15/001	NIL/SO/11/15/002
1	Particle size distribution			
	i. Sand	%	68.86	72.29
	ii. Slit	%	10.39	4.5
	iii. Clay	%	20.75	23.21
2	Texture	--	Sandy Clay Loam	Sandy Clay Loam
3	pH	--	7.47	8.27
4	Colour	--	Reddish Brown	Dark Brown
5	Conductivity	mmhos/cm	0.067	0.146
6	Total Nitrogen	mg/kg	88.46	117.92
7	Phosphate	mg/kg	<1	112.00
8	Potassium	mg/kg	9910.4	10058.5
9	Calcium	mg/kg	1248.3	2187.3
10	Magnesium	mg/kg	374.48	609.33
11	Sodium Adsorption Ratio	--	3.83	2.22
12	Water holding capacity	%	35.70	32.93

Interpretation of Primary Soil Monitoring Results



Based on the particle size distribution obtained from the soil analysis, the texture of soil of the study area is sandy clay loam type of soil. Soil sample also contain high concentration of other minerals like calcium, magnesium and nitrogen. As per the Soil Textural Triangle (USDA), a sandy clay loam has on an average about 50% sand, 30% clay and 20% silt. Water holding capacity and nutrient holding capacity are higher for clayey textured soil than sandy textured soil while drainage is better in case of sandy soil. As the sand content in the soil is high at both the locations hence the drainage capacity of the soil is good and the soil is loose and dry. Sandy clay loam has a gritty feel. Phosphate level is very low at Maddalacheruvu.

5.2.5 Surface Water Quality

Among the various rivers running in the district, the most important is the river Penna. It has its origins in the Nandi Hills of the state of Karnataka and enters the Anantapur district from the extreme south of Hindupur mandal and flows through 12 mandals. Penna River traverses the project site and is seasonal in nature. The river drains into a big reservoir (Upper Penneru Reservoir) and adjacent small reservoirs. Apart from water coming from the river the reservoirs are fed by annual rainfall. The proposed project area is criss-crossed by a number of drainage channels draining into the reservoir.

Three surface water sampling was carried out near the project site (Refer **Figure 5.3**). Water sampling and analysis was done following CPCB[7] standard guidelines for physical, chemical and bacteriological parameters and the details of the monitoring results are presented in ***Annexure III.***

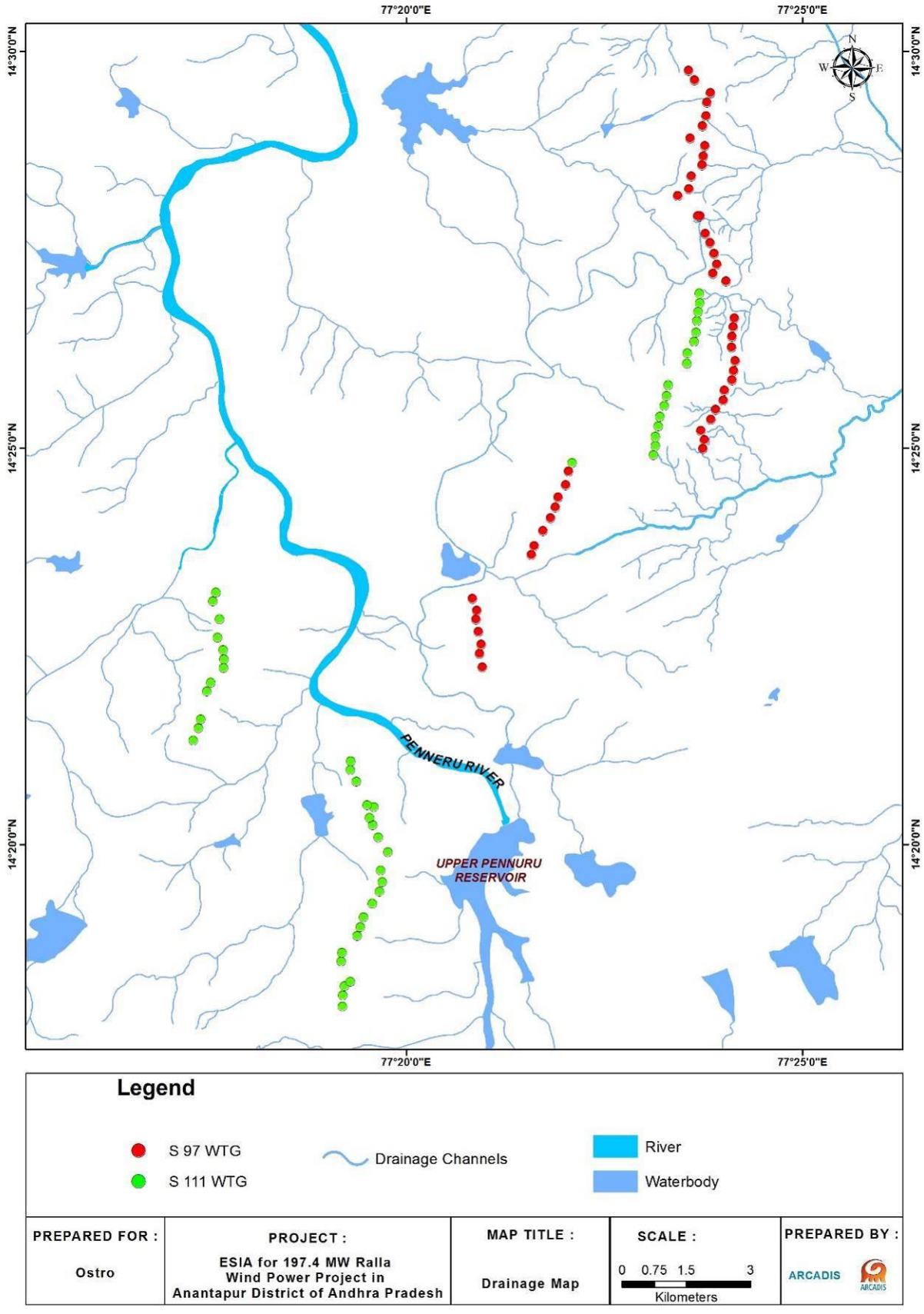
Interpretation of Surface Water Quality Results

Surface water characteristics were assessed against water quality criteria as per CPCB guidelines for water resources. The surface water samples were collected from two different

[7] CPCB Guidelines for Water Quality Monitoring - **MINARS/27/2007-08**

sources (Water sample collected from Perur Dam & K.N Paliam). The results of the surface water sample collected from natural drainage channel near the project site have been discussed below. The dissolved oxygen (DO) levels value observed between 11.3 and 13.9 mg/l indicating favorable conditions for the growth and reproduction of normal population of fish and other aquatic organisms in the water bodies. BOD levels were below 4 mg/l and Total coliforms detected as 8MPN/100 ml at Perur Dam and 7MPN/100 at K.N Paliam. The surface water sample is analyzed to be slightly alkaline in nature having pH value of 7.8 and above. Hence, the best use class of the surface water bodies according to the CPCB Water Use Classification conforms to Class B (Outdoor bathing (Organised)) inland surface water quality.

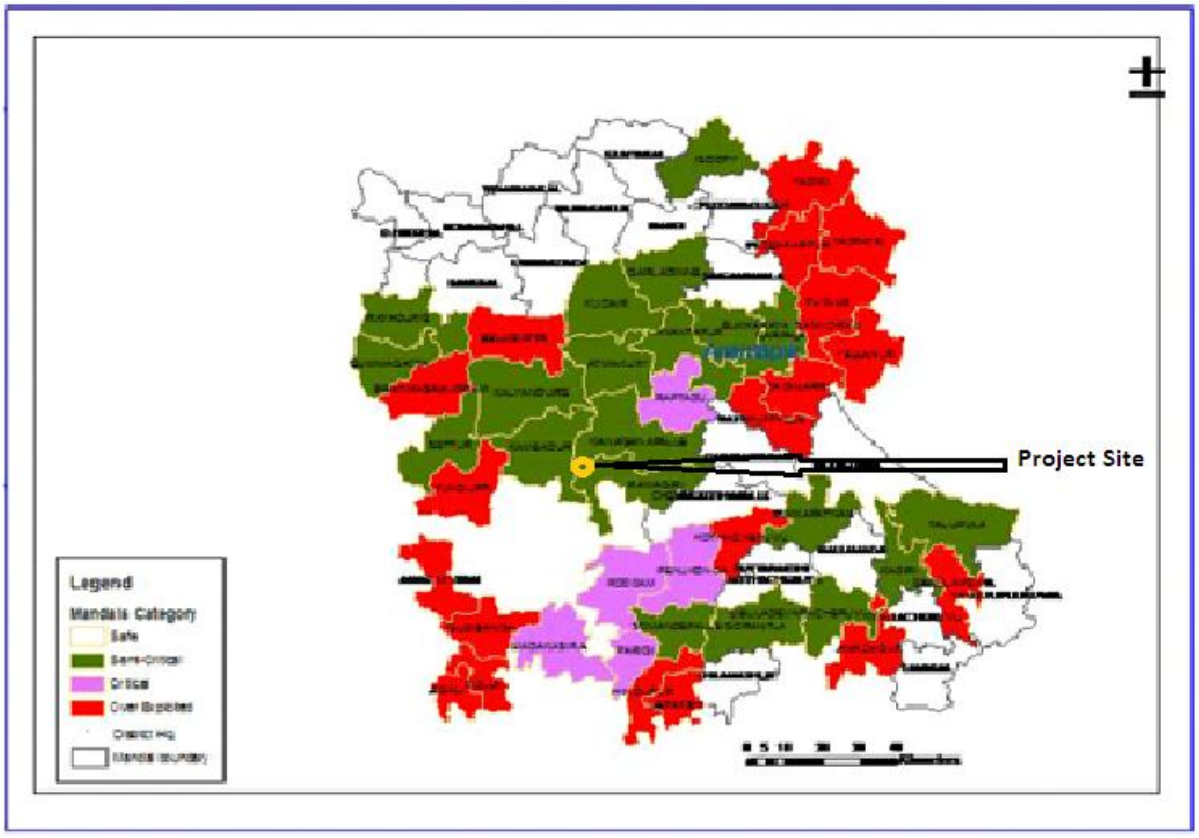
FIGURE 5-9: DRAINAGE MAP OF PROJECT SITE



5.2.6 Ground Water Quality

Andhra Pradesh is characterized by various geological formations ranging in age from Archaean to Recent. Nearly 67 percent of the State is underlain by hard rock formations consisting of granites, gneisses, metamorphics and intrusives (Archaeans), Precambrian quartzites, shales and limestones (Cuddapahs & Kurnools), Mesozoic Deccan Trap basalts etc., while the remaining area is underlain by Gondwana, Tertiary sedimentaries and Sub Recent-Recent alluvium. The occurrence and movement of ground water in hard rocks is chiefly controlled by thickness of weathering and structural features like fractures and solution cavities. In general, the depth of weathering varies from 5 to 20 m and occasionally upto 40 m. Ground water in the proposed project site is found at a depth of about 15-20 m and is high in salt content. As per CGWB Anantapur district published in September 2013 the three mandals namely Kambadur, Ramadiri and Kanaganapalli falls in "**Semi Critical Zone**". The **Figure 5.10** shows the mandal wise categorization of ground water of Anantapur district.

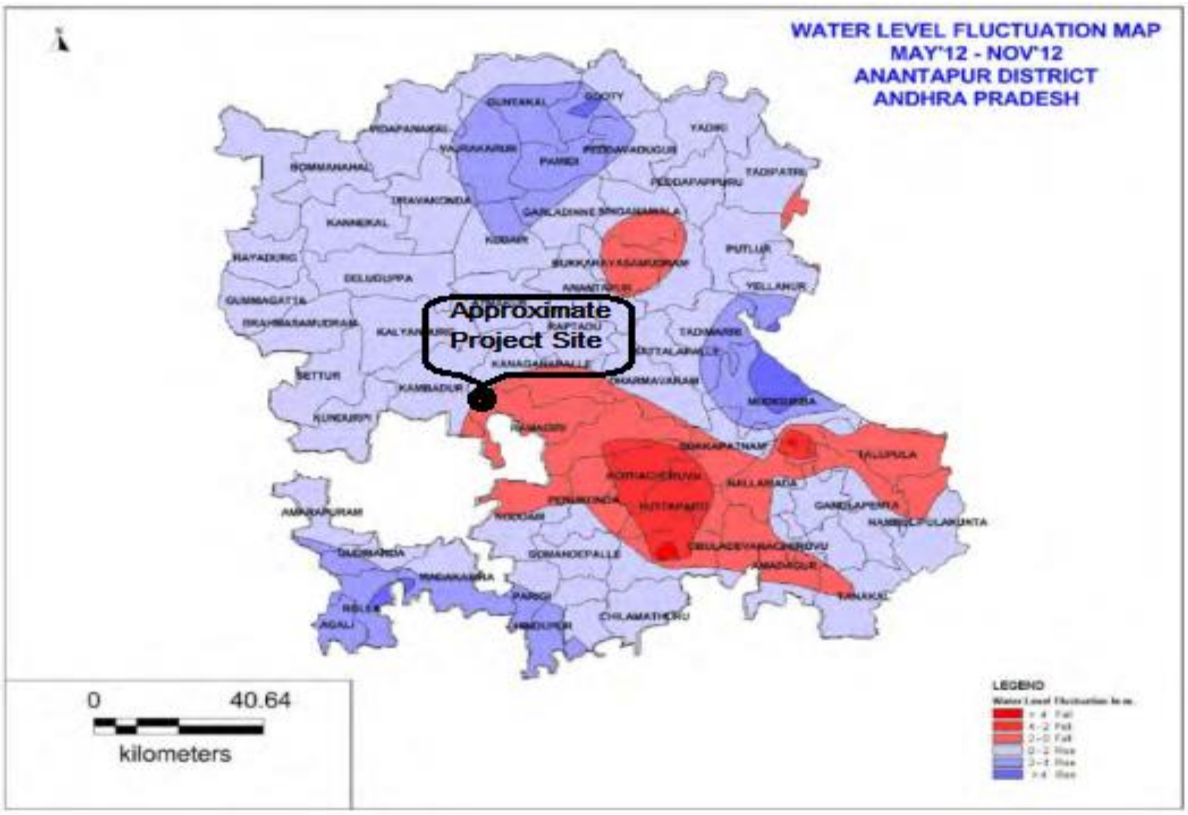
FIGURE 5-10: WATER LEVEL FLUCTUATION MAP OF ANANTAPUR DISTRICT



Source: Central Ground Water Board

As per Central Ground Water Report, majority of the district shows 0-2m rise in water level between pre and post monsoon period of 2012. Rise of water level of 2-4 m is observed in North Eastern and northern part of the district as isolated pockets. Fall of Water levels have been observed in southeastern part of the district. Less fluctuation is observed in the areas where the water levels were comparatively shallow during pre-monsoon.

FIGURE 5-11: WATER LEVEL FLUCTUATION MAP OF ANANTAPUR DISTRICT



Source: Central Ground Water Board

Interpretation of Ground Water Quality Results

A total of 2 no. ground water samples were collected from Perur and Maddelacheruvu 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. The results for relevant drinking water quality parameters have been discussed below.

pH and Turbidity

The pH and turbidity values of water sample collected were within the desirable limit of IS: 10500 drinking water standard thereby establishing its potable use. The pH varied in the range of 7.79 to 7.85.

Total Dissolved Solids

The concentration of total dissolved solids (TDS) in ground water is a measure of its suitability for domestic use. In general, TDS values at 500 mg/l or below is considered to be most desirable for such purpose being specified under IS: 10500 drinking water standard. The TDS values for the ground water samples analyzed were found to be Perur (2516 mg/l) and Maddelacheruvu (1362mg/l) thereby conforming to the permissible limit but not the desirable

limit as per ground water standard (IS: 10500). This is probably due to no or limited recharge of ground water as the area is devoid of good rainfall.

Chlorides

With respect to IS: 10500 standards, the desirable limit of chloride is 250 mg/l while the permissible limit of the said parameter (in absence of an alternate source) is 1000 mg/l. At concentration above 250 mg/l chlorides renders a salty taste to water which may be considered to be objectionable in terms of human consumption. The chloride concentration in the ground water samples were found to be Perur (318.59mg/l) and Maddelacheruvu (138.9mg/l) which is well within the desirable limit specified for domestic consumption except for Perur where the TDS value is higher than the specified desirable limit.

Total Hardness

Hardness of water is considered to be an important parameter in determining the suitability of water for domestic uses particularly washing. Hardness of water is correlated to the presence of bivalent metallic ions viz. calcium and magnesium. Total hardness values for the ground water sample analyzed and were found as (Perur- 813.4 mg/l), and (Maddelacheruvu -715.4 mg/l) which is not within the stipulated standard of 200 mg/l specified under IS: 10500 but higher than the standard at Perur & Maddelacheruvu .

Iron and Fluoride

Iron is considered to be an important ground water parameter since at higher concentration it interferes with laundering operations and imparts objectionable stains. The concentration of iron in ground water sample was observed to be below detection limits of 0.3mg/l for Perur locations & 1.37mg/l for Maddelacheruvu. Fluoride content in the ground water samples was found to lie within the desirable limit of the potable drinking water standard of 1.0 mg/l at Perur & Maddelacheruvu

Heavy Metals

The presence of heavy metals like mercury, arsenic and copper in the ground water samples is below detectable level.

Coliforms and E. coli

Coliforms, as an indicator of contamination from sewage and fecal matter were reported to be present in the ground water samples analyzed for two locations. Total coliform analyzed to be 4 MPN per 100 ml of ground water samples at Perur while Total coliform is found absent in ground water sample of Maddelacheruvu. Faecal coliform is absent in Perur and Maddelacheruvu. The detail monitoring results are presented in ***Annexure III.***

5.2.7 Geology

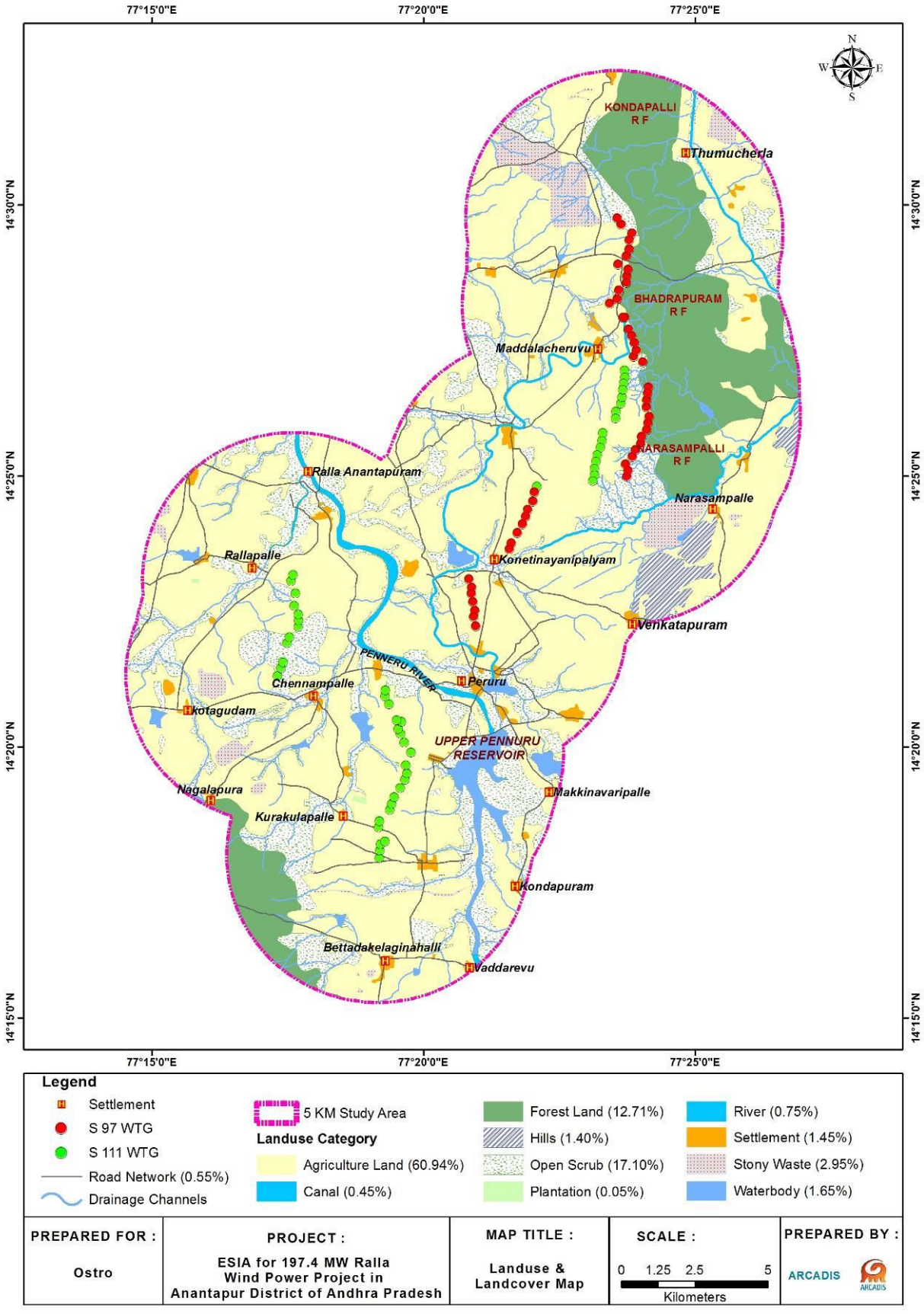
As per CGWB report, the geological formations in Anantapur district can broadly be categorized into two distinct groups (i) an older group of archaean rocks and (ii) an younger one of sedimentary rocks equivalent in age relation to Kadapa and Kurnool Systems of

Kadapa Basin. Rocks belonging to the later formations are pre-cambrian in age and covers the area of Yadiki, Peddapappapuru, Tadipatri, Putlur, Yellanur mandals and the eastern parts of Peddavadugur, Gooty, Pamidi, Guntakal, Vajrakarur, Vidapanakal, Narpala, Singanamala, Garladinne, and Kuderu mandals. The remaining parts of the district comprise the older arch can group of rocks which include schists, gneisses and granites.

5.2.8 Land Use

Land use of the proposed project site is mainly a mix of scrub land and agricultural land cultivated once a year only during the monsoon season. A 5 km land use map surrounding all WTGs is provided in **Fig 5.12** showing the land use pattern of the proposed project site**.** The land use at the project site comprises mostly of agricultural land (60.94%). Other land use in the project study area is characterized by i) open scrub (17.10%) ii) Forest land (12.71%) iii) Hills (1.40%) iv) Stony waste (2.95%) v) Water body (1.65%) vi) Settlement (1.45 %) vii) River (0.75%) viii) Road network (0.55%) ix) Canal (0.45%) and x) Plantation (0.05%).

FIGURE 5-12: LAND USE MAP OF THE STUDY AREA



5.3 BIOLOGICAL ENVIRONMENT

Assessment of Bilogical environment was conducted in two parts covering total 11 days of extensive study was carried out during the last week of October and last week of November 2015. (dates 20 October till 24th October and 27 November till 3 December 2015). A total of three ecologists visited the site for complete and detailed assessment of ecological diversity in the area. The main objective of the survey was to collect ground data on flora and fauna of the area. Detailed bird assessment was carried out during both visits and survey was carried out at eight vantage points (VP) to cover all WTG locations as well as the proposed transmission line route. Published / unpublished secondary information was also collected on the same from government records, journals and reliable sources.

These information will further enable to gauge potential ecological impacts that can be generated from the project activities. Understanding of the significant risks and impacts is important to implement mitigation measures or suggest changes if the associated risks are huge. Such mitigation measures will help reduce the impacts and also develop ecological monitoring parameters.

The project site is climatologically located in dry and arid region and normally exhibits dry and thorny open scrublands. According to Champion and Seth (1968), the area is classified as Southern Thorn Scrub forest (6A/DSI). The site area is categorized as semi-critical zone as per CGWB and falls in the Deccan plateau region. Anantapur district is reported to be an important habitat for nearly 80 families of black bucks as per the forest official's records.

There are two reserved forests (RF) namely Narasampalli RF (located ~ 0.02 km from WTG No- P30) and Bhadrapuram RF close to the project area. Please Refer **Annexure IV** for details of location of WTGs near Reserved Forests. Maps showing the distance of the WTGs to the forests are provided in **Annexure V (B)**.

The project site covers a major reservoir named Upper Penneru Reservoir build on Penna River. It is located near Perur village. Apart from this, a few small reservoirs (Chennampalle Lake, Konetinayanipalyam reservoir) are also present in the Project area. The other small water bodies are seasonal and gets filled up after monsoon showers. Maps showing the distance of the WTGs to water bodies is provided in **Annexure V (C)**.

Main objectives for Ecological surveys:

On Floral profile-

- Identification of floral species, endangered as well as endemic species (if any), important habitats, forests area within the study area;

- Surveys to identify local, widespread floral species, any endangered or endemic species and protected species in the study area;
- Identification of aquatic flora near the water bodies found in the study area;
- Identification of any notified area under international conventions, national or local legislation for their ecological, landscape, cultural or other related values within the study site.

On Faunal profile-

- Identification of fauna (terrestrial, aerial and aquatic) by direct sighting and through secondary means like, nests, roosts, pug marks, droppings, etc.
- Identification and classification of species recognized as critically endangered, endangered, threatened etc. as per IUCN Red list and scheduled species as per WPA (1972).
- Identification of areas important for breeding, foraging, nesting, resting or over wintering areas include migratory corridors/ avian migratory routes.
- Identification and assessment of aquatic fauna near the study area.

Methodologies for Ecological Surveys:

Desktop Review:

Desktop study was undertaken prior to site visit for biodiversity impact assessment for the proposed project. The desktop study was done to understand the background of the project area for biodiversity through collection of secondary information from relevant and authentic sources, type of habitats involved in the project area, presence of rare and endangered species if any of flora and fauna and other relevant details required to undertake the site visit for primary data collection and assessment.

Flora
Survey

The primary floral survey was conducted to record site specific floral species and its diversity. A walk through of the project area was carried out covering each WTG location and transmission route. Nearby area around the WTG, proposed access roads and surrounding area was also covered to understand the floral diversity. At the time of the survey, woody/small trees and ephemeral layer of ground flora consisting of seasonal or annuals were recorded. Further seasonal species data were gathered from secondary sources like governmental department records, forest officials and local residents. None of the species recorded falls in the IUCN red list category.

Faunal

Survey

To assess the presence of fauna in the project site, a walk through survey area was carried out. Each WTG locations were visited to find out the presence of faunal species near the project site. The faunal survey focused mainly on three groups viz. mammals, avifauna and herpeto fauna of the study area.

Vantage point (VP) surveys was conducted at eight locations covering the entire site including the transmission routes in the early morning , afternoon and evening to keep a record on all the target species. The VP survey locations were selected upon the flight pattern of different birds, rich representation of bird species, conducive habitat of bird species and most importantly the potential to suffer significant impact from collision etc. The VP location map is shown in **Figure 5-14**. Data related to the other faunal species were also noted, based on the direct sightings and from authentic secondary sources. Secondary sources like published books and reports, government departmental records, interviews with forest department and information from local residents were further used to gather information and support primary observations.

5.3.1 Habitat

Survey

According to the Biogeographic provinces of India published by Wildlife Institute of India (Rodgers, Panwar and Mathur, 2002), the project site falls under the Biogeographic Province – 6E-Deccan Peninsula-Deccan South. The Biogeographic zones of India is shown in **Figure 5-13.**

The site survey also included understanding of important habitats in the area. A "Habitat" according to IFC is defined as a terrestrial, freshwater or marine geographical unit or airway that supports assemblage of living organisms and their interactions with the non-living environment. As per IFC, habitats are divided into - **Natural**, **Modified** or **Critical**[8] the purpose of implementation of IFC Performance

[8] Natural Habitats- These are the areas composed of viable assemblages of plant and/or animal species of largely native origin, and/or where human activity has not essentially modified an area's primary ecological functions and species composition.

Modified Habitats- These are the areas that may contain large proportion of plant and/or animal species of non-native origin and/or where human activity has substantially modified an area's primary ecological functions and species composition. It may include areas omanaged for agriculture,, forest plantations, reclaimed coastal zones and reclaimed wetlands.

Critical Habitats- These are the areas with high biodiversity value, including (i) habitat of significant importance to critically endangered and/or endangered species; (ii) habitat of significant importance to endemic and/or restricted range species; (iii) habitat supporting globally significant concentra tions of migratory species and/or congregatory species; (iv) highly threatened and/or unique ecosystems; and/or (v) areas associated with key evolutionary processes.

Standard-6 (Biodiversity Conservation and Sustainable Management of Living Natural Resources). Critical habitats are subsets of Natural habitats.

During survey at the project site and its immediate surroundings, it was found that the habitat was primarily "**Modified**". The project site and nearby land was either agricultural land or abandoned (culturable wasteland). Cash crops such as horse gram, Red gram, Ground nut, Cow pea, Sorghum are being cultivated by the farmers in this part of A.P. The barren lands and culturable wastes were found invaded by weeds and grasses. A few tree species such as *Acacia nilotica, Acacia catechu, Salvodara persica, Zyzyphus nummularia, Balanites agyptica, Tamarindus indica,* and *Prosopis juliflora* were recoded from the primary survey. Common grasses like *Digitaria ciliaris, Aristida adscensionis, Aristida purpurea, Chrysopogon aciculata , Cynodon dactylon,* etc. were also found in large quantities in the culturable wastes/abandoned fields. It was also observed that grazing was rampant in the area. Herds of goats and sheep were observed grazing at the abandoned farm lands.

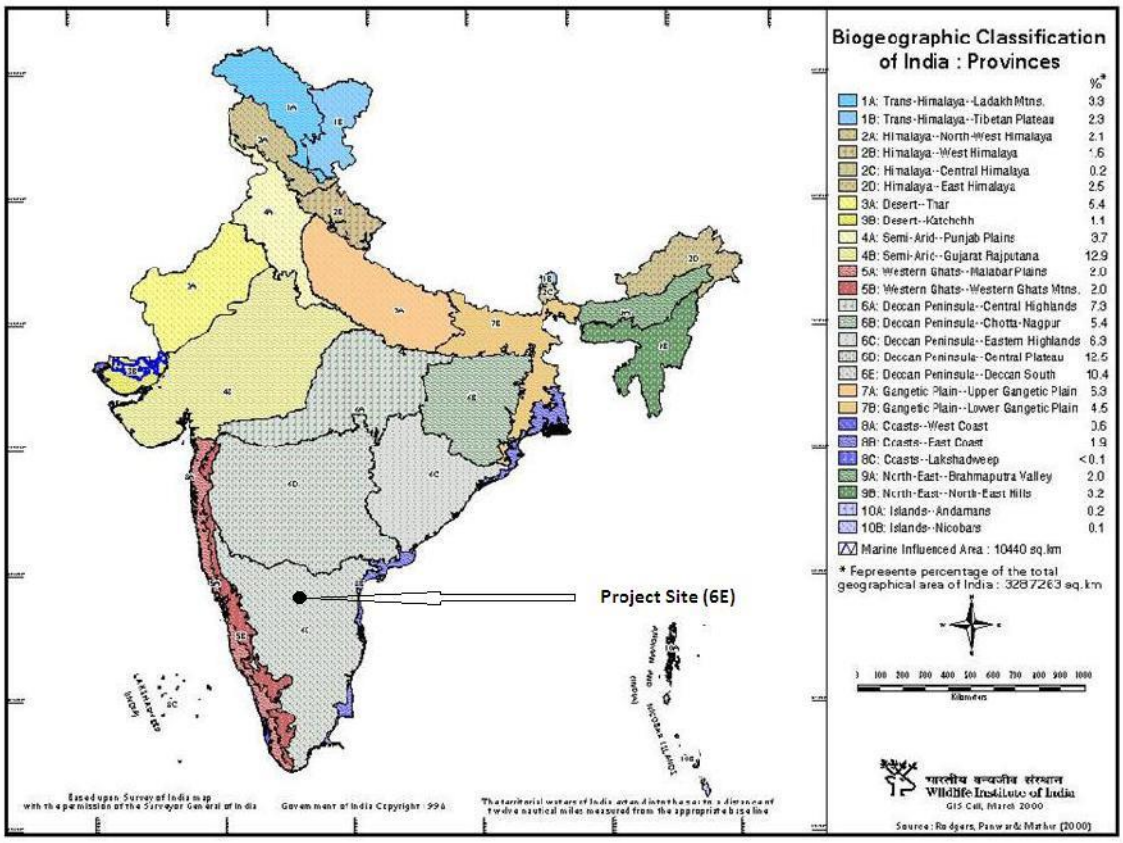
Further to strengthen the observations, and gather authentic secondary information a meeting with the forest officer was conducted in Anantapur. It confirmed that few WTG locations were falling on the verge of notified Narasampalli Reserved forest. Nearest WTG from forest boundary are P30, P24, P42, P48 and P31 (0.02 km to 0.05km) (Refer Annexure V). ***Though there is no regulations pertaining to establishment of WTGs close to reserve forests the relocation of the following WTGs may be considered on the basis of closeness to the reserved forests boundary.***

TABLE 5-3: DISTANCES OF WTG LOCATIONS FROM RESERVED FOREST

Sr No.	WTG No.	Reserved Forests	Distance in Km/ Direction
1.	P41	Narasampalli RF	0.45/ East
2.	P55	Narasampalli RF	0.30/ East
3.	P48	Narasampalli RF	0.02/ East
4.	P31	Narasampalli RF	0.03/ East
5.	P61	Narasampalli RF	0.34/ East
6.	P24	Narasampalli RF	0.05/ East
7.	P30	Narasampalli RF	0.02/ East

Sr No.	WTG No.	Reserved Forests	Distance in Km/ Direction
8.	P42	Narasampalli RF	0.03/ East
9.	P34	Narasampalli RF	0.12/ East
10.	P33	Narasampalli RF	0.11/ East
11.	P35	Narasampalli RF	0.29/ East
12.	P26	Narasampalli RF	0.09/ East
13.	P28	Narasampalli RF	0.09/ East
14.	P16	Narasampalli RF	0.12/ East
15.	P13	Narasampalli RF	0.11/ East
16.	P08	Narasampalli RF	0.13/ East
17.	P15	Narasampalli RF	0.15/ East
18.	P21	Narasampalli RF	0.45/ East
19.	P27	Narasampalli RF	0.16/ East
20.	P85	Kamandurga RF	3.30/ South west
21.	P87	Kamandurga RF	3.26/ South west
22.	P91	Kamandurga RF	3.13/ South west
23.	P93	Kamandurga RF	2.92/ South west
24.	P95	Kamandurga RF	2.97/ South west
25.	R89	Kamandurga RF	4.40/ South west

FIGURE 5-13: BIOGEOGRAPHIC ZONES OF INDIA



Source: Wildlife Institute of India

5.3.2 Terrestrial Ecology

(A) Floral Profile

The proposed project site is dry and arid in nature comprising dry, thorny scrubs mixed with pockets of private agriculture land. The rainfall in the area is scanty. The primary floral survey was limited to record site specific floral species (both woody trees/ small tree species as well as ephemeral ground vegetation). Assessing the existing floral profile was necessary to understand the baseline conditions of the area as the project activities might lead to loss of significant ecological resources, if present. The information will add on to the knowledge of ecological resources and help in further evaluating the possible risks due to project activities and feasibility of the proposed mitigation measures. Photographs of some of the flora recorded during primary survey are provided below:

Photo-Flora of the proposed project site

Ricinus communis (Castor plant)

*Aerva javanica (*Kapuri jadi)

Cassia auriculata (Tanner's Cassia)

Chrysopogon zizanioides (Vetiver grass)

Cactus Spp.

Acacia nilotica (Babool)

Prosopis juliflora (Mesquite)

Balanites aegyptiaca

Eremochloa ophiuroides (Centipede grass)

Parthenium hysterophorus (Carrot Grass)

Azardirachta indica (Neem)

Capparis sepiaria (Kanthari)

Aristida adscensionis

Prosopis cineraria (Khejri)

Ficus religiosa (Peepal)

Eucalyptus spp.

Parkinsonea aculeata (Jelly bean tree)

Typha elephantina (Elephant grass)

(A) Faunal Profile

Mammal

During the site visit Indian Hare and black bucks were sighted. As per the IUCN status, black bucks fall under "Near Threatened" category and according to Indian Wildlife Protection Act it is considered as Schedule I species. While the Indian hare (*Lepus nigricollis)* is classified as "Least Concerned" under IUCN red list. The Jayamangali Black Buck reserve is approximately 72 Km from the project site and is located in Tumkur district in Karnataka, neighboring Karnataka- Andhra Pradesh border. During primary survey in the outskirt of Chennampalli village, preparatory work by local tribal to hunt wild boar was also noticed. Wild boar hunting is being practiced by the tribal here and the meat is sold at Rs 100 per kg in local market. Indian wild boar falls under "Least Concerned" category in IUCN red data list.

Photo- Mammals within the project site

Trap laid for hunting Wild Boar

Black buck sighted in the study area

Avifauna

From the Vantage Point Study and walkthrough survey, a total of 73 species of birds were sighted and recorded in the study area. Out of which, 9 species of birds (please refer the table below) are listed in Schedule I category according to Indian Wildlife Protection Act (1972) and three species viz. black headed ibis (*Threskiornis melanocephalusis*), pallid harrier (*Circus macrourus*) and river tern (*Sterna aurantia*) are listed as "Near Threatened" in the IUCN red list category. Bird species such as egrets, black drongo, red vented bulbul, green bee eater, barn swallow, ashy crowned sparrow, hoopoe, common myna, paddy field pipit, laughing dove were found in large numbers from the survey. Stilts, egrets, parakeets, little swift etc. were also sighted in large numbers near the Upper Penneru Reservoir. Regarding presence of bat in the project area, consultation with village seniors (more than 65-70 years old) and local forest officials were made. Further, suitable bat habitats such as old abandoned structure or cave, abandoned well, old and huge canopy tree especially banyan tree/peepal tree,

near waterbody etc were searched to find out any such bat roosting sites, however, there were no observation indicating bat presence in the area during 11 days survey.. The species of birds recorded in the project area during site visit is listed in the **Table 5.3** below and photo documentation of the same is annexed as **Annexure VI** of this report**.**

FIGURE 5-13: VANTAGE POINT LOCATION MAP

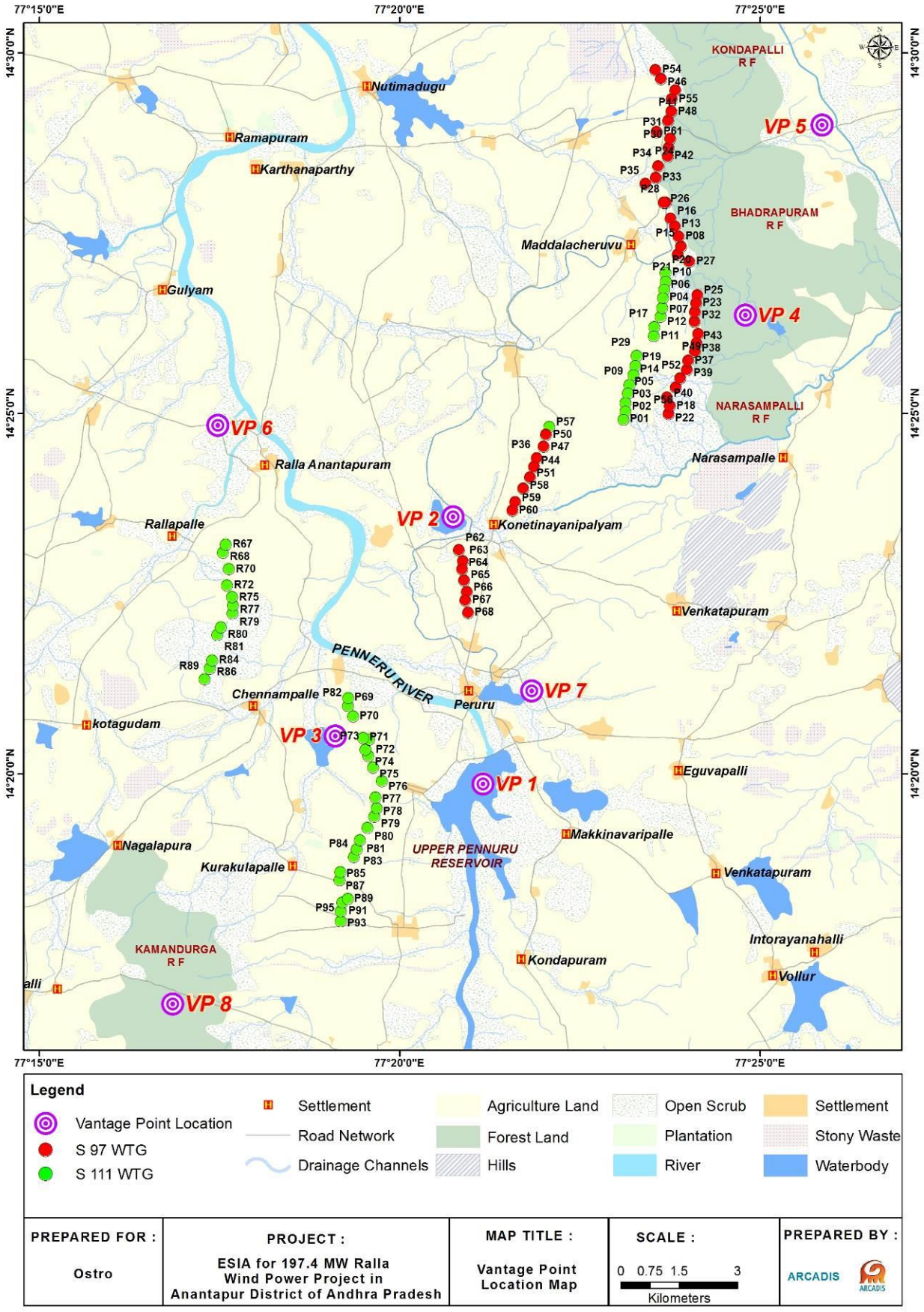


TABLE 5-4: LIST OF AVIFAUNA SIGHTED DURING VISIT

S. No.	Common Name	Scientific Name	IUCN Status	WPA Schedule	Migratory Status	Sighting frequency
1	Ashy crowned Sparrow Lark	*Eremopterix griseus*	LC	Schedule IV	Resident	frequent
2	Asian Koel	*Eudynamys scolopaceus*	LC	Schedule IV	Resident	rare
3	Barn Swallow	*Hirundo rustica*	LC		WV (from Central Asia)	frequent
4	Bay Backed Shrike	*Lanius vittatus*	LC		Resident	frequent
5	Black Drongo	*Dicrurus macrocercus*	LC	Schedule IV	Resident	frequent
6	Black Headed Ibis	*Threskiornis melanocephalus*	NT	Schedule IV	Resident	frequent
7	Black Winged Stilt	*Himantopus himantopus*	LC	Schedule IV	Resident/ Local migratory	frequent
8	Black winged Kite	*Elanus caeruleus*	LC	Schedule I	Resident	frequent
9	Blue Tailed Bee-eater	*Merops philippinus*	LC		Passage migrant	frequent
10	Brahminy Starling	*Sturnia pagodarum*	LC	Schedule IV	Resident	rare
11	Cattle Egret	*Bubulcus ibis*	LC	Schedule IV	Resident	frequent
12	Common Coot	*Fulica atra*	LC	Schedule IV	Resident	frequent
13	Common Hoopoe	*Upupa epops*	LC		Resident	rare
14	Common Moorhen	*Gallinula chloropus*	LC	Schedule IV	Resident	frequent
15	Common Myna	*Acridotheres tristis*	LC	Schedule	Not	frequent

S. No.	Common Name	Scientific Name	IUCN Status	WPA Schedule	Migratory Status	Sighting frequency
				IV	migratory	
16	Cotton Pygmy Goose	*Nettapus coromandelianus*	LC	Schedule IV	Resident	rare
17	Eurasian Collared Dove	*Streptopelia decaocto*	LC	Schedule IV	Resident	frequent
18	Eurasian Wigeon	*Anas Penelope*	LC	Schedule IV	widespread winter visitor	rare
19	Great Egret	*Ardea alba*	LC	Schedule IV	Resident	rare
20	Green Bee-eater	*Merops orientalis*	LC	Schedule IV	Not migratory	frequent
21	Grey Francolin	*Francolinus pondicerianus*	LC	Schedule IV	Resident	rare
22	Grey Heron	*Ardea cinerea*	LC	Schedule IV	Resident	frequent
23	Grey Necked Bunting	*Emberiza buchanani*	LC	Schedule IV	WV (from Caspian Sea & Altai mountain)	rare
24	House crow	*Corvus splendens*	LC	Schedule IV	Resident	frequent
25	House sparrow	*Passer domesticus*	LC	Schedule IV	Resident	frequent
26	Indian Robin	*Saxicoloides fulicatus*	LC	Schedule IV	Resident	frequent
27	Indian Silverbill	*Euodice malabarica*	LC	Schedule IV	Resident	frequent
28	Indian Roller	*Coracias benghalensis*	LC	Schedule IV	Resident	frequent

S. No.	Common Name	Scientific Name	IUCN Status	WPA Schedule	Migratory Status	Sighting frequency
29	Intermediate Egret	*Ardea intermedia*	LC	Schedule IV	Resident	rare
30	Jerdon`s bushlark	*Mirafra affinis*	LC	Schedule IV	Not migratory	rare
31	Indian Jungle Crow	*Corvus macrorhynchos*	LC	Schedule IV	Resident	frequent
32	Large Grey Babbler	*Turdoides malcolmi*	LC	Schedule IV	Resident	frequent
33	Laughing Dove	*Streptopelia senegalensis*	LC	Schedule IV	Resident	frequent
34	Little Cormorant	*Microcarbo niger*	LC	Schedule IV	Resident	frequent
35	Little Grebe	*Tachybaptus ruficollis*	LC	Schedule IV	Resident	rare
36	Eurasian Marsh Harrier	*Circus aeruginosus*	LC	Schedule I	WV	frequent
37	Montagu`s Harrier	*Circus pygargus*	LC	Schedule I	WV (From Central Asia, Europe)	frequent
38	Paddyfield Pipit	*Anthus rufulus*	LC	Schedule IV	Resident	frequent
39	Pallid Harrier	*Circus macrourus*	NT	Schedule I (part III)	WV (from Central Asia)	frequent
40	Pied Bushchat	*Saxicola caprata*	LC	Schedule IV	Resident	rare
41	Pond Heron	*Ardeola grayii*	LC	Schedule IV	Resident	frequent
42	Purple Sunbird	*Cinnyris asiaticus*	LC	Schedule IV	Resident	frequent

S. No.	Common Name	Scientific Name	IUCN Status	WPA Schedule	Migratory Status	Sighting frequency
43	Red Rumped Swallow	*Cecropis daurica*	LC		R/WV (Winter visitors migrates from temperate southern Europe and Asia)	frequent
44	Red Vented Bulbul	*Pycnonotus cafer*	LC	Schedule IV	Not migratory	frequent
45	Rock Dove	*Columba livia*	LC		Not migratory	frequent
46	Rose ringed Parakeet	*Psittacula krameri*	LC	Schedule IV	Not migratory	frequent
47	Rosy Starling	*Pastor roseus*	LC	Schedule IV	WV (from Himalaya, Central Asia)	frequent
48	Scaly Breasted Munia	*Lonchura punctulata*	LC	Schedule IV	Resident	rare
49	Short Toed Snake Eagle	*Circaetus gallicus*	LC	Schedule I	Resident	frequent
50	Common Stonechat	*Saxicola rubicola*	LC	Schedule IV	WV (from Himalaya)	rare
51	Southern Coucal	*Centropus (sinensis) parroti*	LC	Schedule IV	Resident	rare
52	White Browed Wagtail	*Motacilla maderaspatensis*	LC	Schedule IV	Resident	rare
53	White Eyed Buzzard	*Butastur teesa*	LC	Schedule I	Resident	frequent
54	White Throated Kingfisher	*Halcyon smyrnensis*	LC	Schedule IV	Resident	frequent

S. No.	Common Name	Scientific Name	IUCN Status	WPA Schedule	Migratory Status	Sighting frequency
55	Wood Sandpiper	*Tringa glareola*	LC	Schedule IV	WV (from Europe, North Asia)	frequent
56	Yellow Billed babbler	*Turdoides affinis*	LC	Schedule IV	Resident	frequent
57	Booted Warbler	*Iduna caligata*	LC	Schedule IV	Widespread WV	frequent
58	Clamorous Reed Warbler	*Acrocephalus stentoreus*	LC	Schedule IV	Resident	rare
59	Northern Pintail	*Anas acuta*	LC	Schedule IV	Widespread WV	rare
60	Indian Peafowl	*Pavo cristatus*	LC	Schedule I	Resident	rare
61	Common Sandpiper	*Actitis hypoleucos*	LC	Schedule IV	WV (from Europe, North Asia)	frequent
62	Brahminy Kite	*Haliastur indus*	LC	Schedule I	Resident	rare
63	Little Egret	*Egretta garzetta*	LC	Schedule IV	Resident	frequent
64	Oriental Magpie Robin	*Copsychus saularis*	LC	Schedule IV	Resident	frequent
65	Shikra	*Accipiter badius*	LC	Sch I (Part III)	Resident	frequent
66	Purple rumped Sunbird	*Leptocoma zeylonica*	LC	Schedule IV	Resident	frequent
67	River Tern	*Sterna aurantia*	NT	Schedule IV	Resident	rare
68	Whiskered Tern	*Chlidonias hybridus*	LC	Schedule IV	Widespread WV &	rare

S. No.	Common Name	Scientific Name	IUCN Status	WPA Schedule	Migratory Status	Sighting frequency
					resident	
69	Common Tailorbird	*Orthotomus sutorius*	LC	Schedule IV	Resident	frequent
70	Lesser Whitethroat	*Sylvia curruca*	LC	Schedule IV	Widespread WV	rare
71	Red wattled lapwing	*Vanellus indicus*	LC	Schedule IV	Resident	frequent
72	Spot Billed duck	*Anas poecilorhyncha*	LC	Schedule IV	Resident	rare
73	Little Swift	*Apus affinis*	LC		Resident	frequent

LC: Least Concerned; NT: Near Threatened

5.4 SOCIOECONOMIC 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.

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 VII.** 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.

Study Area

The proposed project is located in eight villages which are spread out in three mandals (tehsil) - Kambadur, kanaganapalle and Ramagiri of Anantapur district in the state of Andhra Pradesh. Refer **Table 5.4** for village list. Total eight villages have been considered in the study area for socio economic profiling which are located within 5-10 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 **Annexure VIII.**

TABLE 5-5: LIST OF VILLAGES WITHIN THE STUDY AREA

Sl. No	State and District	Mandal/Tehsil	Village	Panchayat
1	**Andhra Pradesh, Anantapur**	Kambadur	Chennampalle	Chennampalle
2			Ralla Anantapuram	Ralla Anantapuram
3			Rallapalle	
4			Kurakulapalle	Kurakulapalle
5		Kanaganapalle	Maddalacheruvu	Maddalacheruvu
6			Konetinayanipalyam	Konetinayanipalyam
7			Vepakunta	Vepakunta
8		Ramagiri	Perur	Perur

Source: Census 2011/primary consultation

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 VIII.**

Population & Sex ratio

State: As per census 2011, the total population of Andhra Pradesh is 84,580,777 of which male and female are 42,442,146 and 42,138,631 respectively. Sex ratio in Andhra Pradesh is 993 i.e. for each 1000 male there is 993 females, which is more than national average of 940 as per census 2011.

Anantapur district: As per census 2011, respect to the district level, Anantapur has population of 4,081,148 of which male and female are 2,064,495 and 2,016,653 respectively. With regards to sex ratio in Anantapur, it stood at 977 per 1000 male which is below state average of 993. As presented in as details referred in **Annexure VIII.**

Kambadur tehsil: as per census, respect to the tehsil level, Kambadur has population of 50, 799 of which male and female are 25, 972 and 24, 827 respectively. With regards to sex ratio in Kambadur, it stood at 956 per 1000 male which is below the state average of 993 and district (977).

Kanaganapalle tehsil: as per census, respect to the tehsil level, Kanaganapalle has population of 39, 673 of which male and female are 20, 529 and 19, 144 respectively. With regards to sex ratio in Kanaganapalle, it stood at 956 per 1000 male which is below the state average of 933 and district (977).

Ramagiri tehsil: as per census, respect to the tehsil level, Ramagiri has population of 34, 001 of which male and female are 17, 364 and 16, 637 respectively. With regards to sex ratio in Ramagiri, it stood at 958 per 1000 male which is below the state average of 993 and district (977).

Study Areas Villages: As per census 2011, with respect to the study area villages, the total population of the area is 27,269 out of which 13,991 are male and 13,278 are females. Perur village has the highest population (77234) followed by Maddalacheruvu (6426) and Rallapalle has the lowest population (1283).

The average sex ratio in the study area villages is 941 which is lower as compared to average sex ratio of mandal Kambadur (956) & Ramagiri (958) and higher as compared to average sex ratio of mandal Kanaganapalle (933). The state average sex ratio is 993. The lowest sex ratio has been recorded in Kurakulapalle (889) and highest sex ratio has been recorded for Chennampalle (977) followed by Ralla Anantapuram (972). As presented in as details referred in **Annexure VIII.**

Household Size

As per census 2011, an average house hold size of dist. Anantapur is 4.2 and in regards to tehsil Kambadur (4.4), Kanaganapalle (4.2) and Ramagiri (4.2). In regards to study area

villages an average house hold size is 4.1 which is lowest to the average of tehsil and district (4.2). Details can be referred in **Annexure VIII.**

Schedule Caste (SC) and Schedule Tribes (ST)

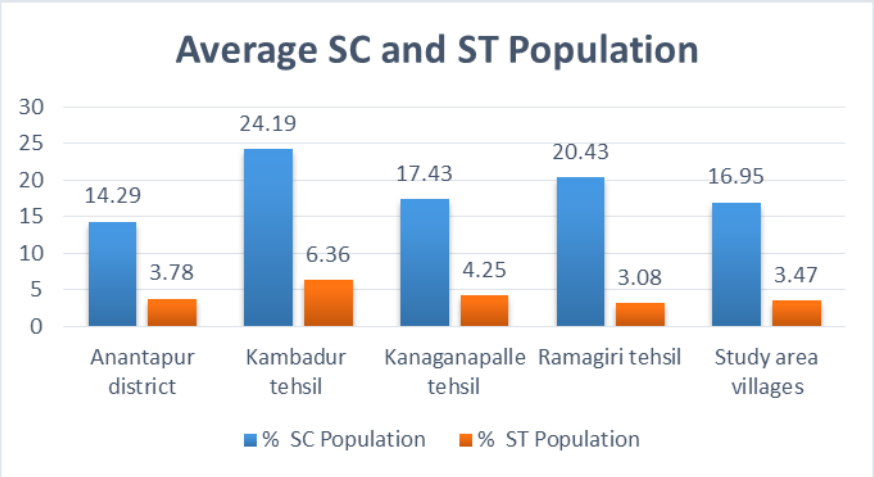
Kambadur, Kanaganapalle, Ramagiri tehsil and Anantapur district

As per census 2011, in respect to Anantapur district, the average SC and ST population constitute 14.29% and 3.78%. In respect to the tehsil Kambadur SC and ST population constitute 24.19% and 6.36%, ST population is found to be more than that of average of district (3.78%). In respect to the Kanaganapalle tehsil, SC and ST population constitute 17.43% and 4.25%, SC population is found to be mora than average of district (14.29%). And in respect to the Ramagiri tehsil, SC and ST population constitute 20.43% and 3.08%, as shown in **Figure 5-15**.

Study area villages

As per census 2011, with respect to the study area villages, the average SC and ST population is 16.95% and 3.47% respectively as shown in **Fig 5-15**. Proportion of SC population is higher than the average proportion in district, and ST population is lower than average in tehsil and district. The maximum ST population is in Rallapalle (16.29%) followed by Maddalacheruvu village (8.67%). Details of SC and ST population in the study area is given in ***Annexure IX.***

FIGURE 5-14: SC AND ST POPULATION IN PROJECT IMPACTED VILLAGES



Source: census 2011

Literacy

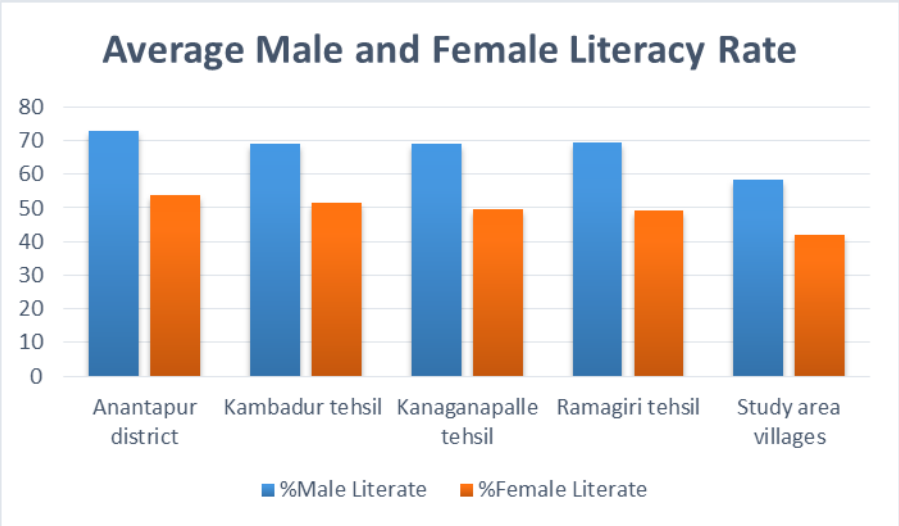
Kambadur, Kanaganapalle, Ramagiri tehsil and Anantapur district

As per census 2011, average literacy rate of Anantapur district is 63.57 %. Of that, gender wise, male and female literacy is 73.02 and 53.97 respectively. With respect to tehsil level, an average literacy rate of tehsil Kambadur tehsil is 60.48%, Kanaganapalle tehsil is 59.66% and Ramagiri tehsil is 59.59%. As shown in **Fig 5-16.** Details as presented in **Annexure X.**

Study area villages

As per census 2011, with respect to study area villages, the average literacy rate of the eight villages are 50.53%. Gender wise male and female literacy is 58.47% and 42.13 which is below the average of district Ananytapur (63.57) and tehsil Kambadur is 60.48, Kanaganapalle tehsil is 59.66% and Ramagiri tehsil is 59.59%. The maximum literacy rate is in Konetinayanipalyam village (61.76%) and lowest literacy rate is observed in Rallapalle village (52.21%). The maximum female literacy rate is observed for Konetinayanipalyam village (52.36%) followed by Perur (51.86%) and lowest literacy rate recorded for Rallapalle village (40.77%). The village wise literacy rate provided in ***Annexure X.***

FIGURE 5-15: AVERAGE LITERACY OF MALE AND FEMALE (STUDY AREA VILLAGES)



Source: census 2011

Workforce Participation

Anantapur District

As per the agriculture department Anantapur, the population of the district is 40.81 lakhs. About 8.0 lakhs farmers and 6.71 lakhs agricultural labourers are there in the district. In all, 32% and 18% of the total population constitutes agricultural labour and cultivators. However, an average 27.61 % of other workers in the district indicates that labour work is also the main source of livelihood. Household workers in the district are 4.28 % which is below the average of agriculture and cultivators.

Tehsil/Mandal:

As per census 2011, with respect to the tehsil/Mandal level, Agriculture labour (34.86%) and Cultivators (25.87 %) its reveal that major source of livelihood in Kambadur. Other work force participation rates of Kambadur is 11.93% it's also reveal that another main source of livelihood. With respect to Kanaganapalle Mandal- Agriculture labour (35.32%) and cultivator (30.09%). With respect to Ramagiri Mandal- Agriculture labour (36.22%) and

cultivator (29.30%). Its reveal that main source of livelihood and which are highest to an average Anantapur district data and other two Mandal.

Study area villages

As per Census 2011, with respect to the study area villages, the average percentage of agriculture, cultivator labours and other workforce participation are 34.19%, 26.83% and 8.44 % respectively. House hold workers in the study villages is 0.93%. Comparative analysis of workforce participation data with the district and tehsil 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. Details of work force participation of district, tehsil and village level has provided in ***Annexure XI*.**

Females 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

Livelihood source

As per 2011 census, 71.93 % population of Anantapur districts lives in rural areas of villages. Agriculture sector plays an important role in the economy of the District. The 70 % of the District population depends on Agriculture for their livelihood. The share of Agriculture and allied sectors in Gross Domestic Product (GDP) of the district ranges from 24-25%. (Agriculture-16.88%, Livestock-6.30, Forestry & Logging-0.88%, Fishing-0.18%). Main occupation in the study area villages is agriculture and cultivator labour. As per census 2011, the average percentage of agriculture, cultivator's labors and other workforce participation are 39.07%, 30.67% and 9.67 % respectively. During consultation it was observed that more than 20% marginal labour (less than 180 days of employment) lives in the study area. 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 migrate to other city like Bangalore and other state from the study area for other jobs.

Agriculture in the study area

Anantapur is the lowest rainfall receiving district in the state with a mean rainfall of 553 mm. The rainfall intensity, frequency, pattern and distribution is highly erratic. The dry spells and drought are very common. Groundnut is the predominant crop grown in the area, however, other crops are also grown which include sunflower, jowar, pulse, tomato (vegetable) and cotton as shown in **Table 5.5.**

TABLE 5-6: MAJOR CROPPING PATTERNS IN THE DISTRICT

Season	Condition	Cropping pattern
Kharif	Rainfed	**a. Groundnut +Red gram** **b. Groundnut** **c. Jowar** **d. Sunflower**
	Irrigated	**a. Paddy** **b. Sunflower** **c. Groundnut** **d. Cotton**
Rabi	Rainfed	**a. Red gram** **b. Sunflower.** **c. Jowar**
	Irrigated	**a. Groundnut** **b. Sunflower**

Source: primary consultation

Productivity and production of major crops in the Anantapur district during both season (Kharif and Rabi) (average of 04-05 and 05-06) is presented in below **Table: 5.6.**

TABLE 5-7: INFORMATION ON AREA, YIELD AND PRICE OF KHARIF CROP

Sl. No.	Crop	Anantapur District		Consulted Villages	
		Area in Ha	Productivity (Kg/ha)	Productivity (Kg/Acre)	Yield/Price/ Quintal
1	Rice	23655	2672	400	1500
2	Maize	4823	4138	-	-
3	Jowar	8299	433	-	-
4	Bajra	1368	806	-	-
5	Ragi	3203	1854	-	-
6	Red gram	33728	365	600	6000
7	Green gram	1139	394	-	-
8	Groundnut	801889	516	400	5000
9	Sunflower	21000	305	-	-
10	Cotton	5055	178	800	5500
11	Castor	2800	505	300	3000

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

Photo-Agriculture within project area

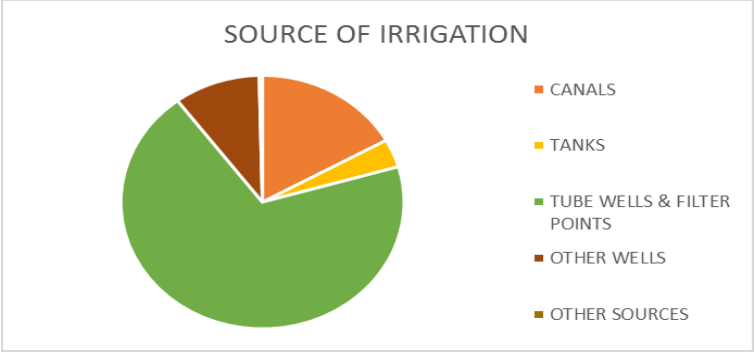
Irrigation

As per the ICAR report 2012, in the past decade the contribution of tanks and canals is declining. Irrigation from tanks accounted for 12 percent of net irrigated area in the early 1980s, which came down to 6% in 2010-11, irrigation from canals also decreased from 27 to 14 per cent in the same period. However the area under tube wells increased from 0 to 79 per cent and now is the major source. Anantapur is the second largest ground water exploited district followed by Ranga Reddy in Andhra Pradesh. The dependence on ground water is increasing, which is a matter of great concern as the ground water status is under semi-critical to over-exploited category.

The steep increase in tube well irrigation systems could impact groundwater status in the district. The steep increase in tube well irrigation systems could impact groundwater status in the district. During 2010-11, tube wells constituted 70% of the total irrigation source, followed by 20% through canals, 8% through tanks and 2% through other sources **(Figure 5.17).** In the respect to the study area villages, major source of irrigation is tube wells. Refer **Fig 5.18.**

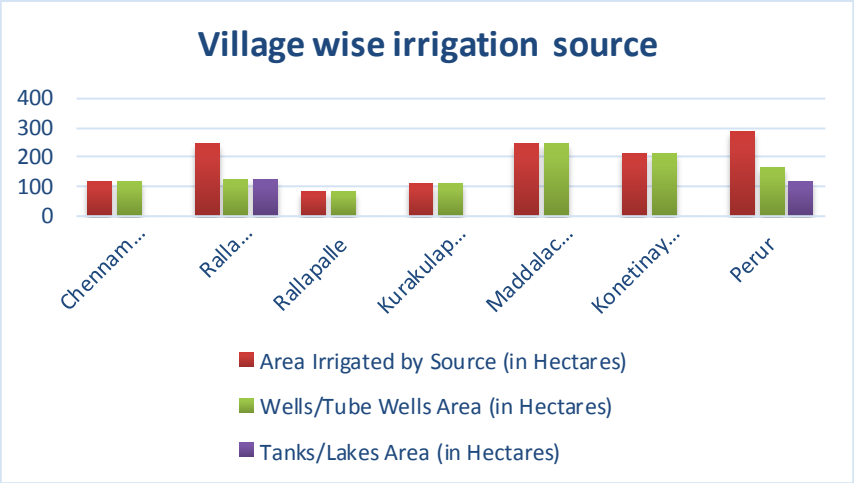
During consultation it was observed that, agriculture is dependent on rain and tube wells are the main source of irrigation in the project area villages. In the consulted villages adequate irrigation facilities were not available. Limited number of farmers have their own tube wells and rest are only dependent on rainfall for cropping.

FIGURE 5-16: SOURCE OF IRRIGATION IN ANANTAPUR



Source: Agriculture Department, Anantapur

FIGURE 5-17: SOURCE OF IRRIGATION IN STUDY AREA VILLAGES



Source: District statistical handbook-2011, Anantapur

Minor irrigation schemes in Anantapur District

The total area of Anantapur District 19,130 Sq. Km., forest area 196.97 Sq. Km and the total irrigation area is 26.27 lakhs Acres. There are 2711 Minor Irrigation sources and with 16 system tanks including spring channels and supply channels serving an ayacut of 1, 65,147 acres, spread over 63 Mandals of Anantapur district.

Land Holding

The category wise number and area of operational holdings in the district is as following **Table: 5-7.** The detailed information of land utilization in project influenced villages is shown in **Table 5-8.**

TABLE 5-8: ESTIMATED LAND HOLDING SIZE IN KAMBADUR, KANAGANAPALLE, RAMAGIRI MANDAL AND ANANTAPUR DIST.

Sl. No	Size group(ha)	Ananthapur Dist.		Kambadur mandal		Kanaganapalle mandal		Ramagiiri	
		Total holdings		Total holdings		Total holdings		Total holdings	
		Number	Area	Number	Number	Number	Area	Number	Area
1	Marginal Farmers (Below 1 Ha)	226411	133545	1848	1260	1482	941	1767	1040
2	Small Farmers (1-2 Ha)	208185	302218	4704	7514	4730	7229	4260	6651
3	Semi-Medium	161795	42115	7113	16901	7213	16383	4817	11766

Sl. No	Size group(ha)	Ananthapur Dist.		Kambadur mandal		Kanaganapalle mandal		Ramagiiri	
		Total holdings		Total holdings		Total holdings		Total holdings	
		Number	Area	Number	Number	Number	Area	Number	Area
	(2.0 - 3.99)		2						
4	Medium Farmers (2-10 Ha)	52899	307455	876	4528	748	3951	1003	5442
5	Large Farmers (>10 Ha)	7678	103426	53	769	58	765	90	1332
	ALL GROUPS	**656968**	**1267796**	**14594**	**30972**	**14231**	**29270**	**11937**	**26230**

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

TABLE 5-9: LAND UTILIZATION IN STUDY AREA VILLAGES (IN HECTARES)

Village Name	Net Area Sown (in Ha)	Forest Area (in Ha)	Barren & Un-cultivable Land Area (in Ha)	Permanent Pastures and Other Grazing Land Area (in Ha)	Culturable Waste Land Area (in Ha)	Fallows Land other than Current Fallows Area (in Ha)	Current Fallows Area (in Ha)	Total Unirrigated Land Area (in Ha)	Area Irrigated by Source (in Ha)
Chennampalle	649	0	407	0	110	41	922	1493	119
Ralla Anantapuram	1489	0	324	0	251	162	437	1843	245
Rallapalle	704	0	14	0	0	0	171	790	85
Kurakulapalle	998	550.2	278.8	0	0	0	501	1388	111
Maddalacheruvu	424.92	347.63	396.24	0	152.79	572.63	2997.97	3752.58	242.94
Konetinayanipalyam	1391.31	0	138.09	0	124	87.02	813.42	2080.43	211.32
Kanaganapalle	1409.12	50.18	2367.29	0	0	9.71	3060.24	4320.07	159
Vepakunta*	-	-	-	-	-	-	-	-	-
Perur	1943.72	0	814.5	149.79	201.21	354.25	1830.76	3841.63	287.1

Source: District Census Hand Books-villages 2011

Livestock

Anantapur district is having rich source of livestock. As per the latest (18th) livestock census, the district had 7.3% of cattle, 4.0% of buffaloes, 12.6% of sheep, 9.4% of goats and 5.4% of pig population of the state. 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 livestocks.

Goatery and sheeps in the study area

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 Anantapur district portal site, as on 2010-11 total SHGs no. 51,488 has been formed with total no. of SHG members are included 5, 74,488 and total 21,843 no. of SHGs are linked with different bank branches of district.

Many Self Help Groups (SHGs)/ Mahila Mandal formed in every consulted villages. SHGs observed during community consultation at village level as provided in Table 5.9. The Maximum SHGs were linked with banks and taken loans for farming, livestock, inter group finance on petty interest, and small business purpose. They also engaged in NRGES scheme in the area. Training and capacity builing has not obtained as reported by female participants. They were too much interested for training program and employment opportunity. Drinking water availability and health facilties are main concern in the consulted villages as reported by female participants.

Consultation with women in the project area

TABLE 5-10: VILLAGE WISE SHGS

Sl. No.	Village Name	Mahila Mandal (Sangam)/ Women Self Help Groups	Activity
1	Chennampalle	40	livestock/Agriculture
2	Ralla Anantapuram	40	Micro financing activity /Agriculture
3	Rallapalle	10	Micro financing activity
4	Kurakulapalle	60	livestock/Agriculture
5	Maddalacheruvu	60	livestock/Agriculture
6	Konetinayanipalyam	-	-
7	Vepakunta	50	Construction work, micro financing activity
8	Perur	70	Micro financing activity

Source: primary consultation

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 community consultation it was observed that, some vulnerable group like landless family, physically handicapped and widows are available in all consulted villages as shown in following **Table 5.10.** Government provides pension to those who comes in vulnerable group especially for widow and physically handicapped persons.

TABLE 5-11: VILLAGE WISE VULNERABLE GROUP

Sl. No.	Village Name	Vulnerable group (lump sum)		
		Widows	Physically handicapped	Landless HH/ homeless HH
1	Chennampalle	50	20	50
2	Ralla Anantapuram	60	80	160
3	Rallapalle	25	15	10
4	Kurakulapalle	100	60	70

Sl. No.	Village Name	Vulnerable group (lump sum)		
		Widows	Physically handicapped	Landless HH/ homeless HH
5	Maddalacheruvu	-	-	50
6	Konetinayanipalyam	100	60	800
7	Vepakunta	50	20	100
8	Perur	300	100	250

Source: primary consultation

The project proponent should be identified vulnerable community members as above mentioned during land procurement process. The project proponent should also avoid or minimize land purchase from the vulnerable groups especially women (widow)/ disabled persons headed house hold and marginal farmers. During dialogue with Ecoren land team, it was ensured that, land will be not taken from the vulnerable HHs family and they are also focus on no one will be landless after the land is purchased from them for the proposed project.

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.

Social infrastructure

Village and district level integrated education, health 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 XII.***

Education

As per census 2011, in Anantapur district there are six Engineering Colleges; 12 B.Ed. Colleges; one Medical college; one Pharmacy college; two Polytechnic Colleges; 35 Degree Colleges; 96 Junior Colleges; 465 High Schools; 610 Upper Primary Schools and six Industrial Training Institutions. Oil Technological Research Institute only one of its type in the south and dry land agriculture research station are situated in Anantapur.

In the consulted villages it was observed that, every village has a primary school. Four villages have high schools (Vepakunta, Maddalacheruvu, Rala Anantapur and Perur) and four villages have middle school. Senior collage up to 12^{th} class is available only at Perur village. Other Senior and Graduate colleges are available at Kambadur, Dharmapur and Kalyanduurga which is 15-20 km distance from the project area villages. Consultation with school staff was not possible due to vacation of Dassehra festival. The details are presented in ***Annexure XII.***

Health

As per health survey report 2010 conducted by Indian Institute of Public Health, Hyderabad, the Anantapur district has a vast network of public health services including 1 district hospital, 11 community health centres (CHCs), 75 primary health centers (PHCs), and 578 sub-centers.

Health Sub Centre, Chennampalle

Health care facilities are not adequate in the villages. As per census 2011, health sub centre presence at seven study area villages except Rallapalli. However, during consultation it was observed that, ANM's are not presence regularly. Perur village has a primary health center which is available at 5-10 km distance from the other project area villages. The closest Community Health Centre and Govt. hospital available at Kamabadur and Kalyandurga Mandal which is located at more than 15-20 km distance from the project area villages. During consultation with community members it was observed that, joint pen, Malaria, Dengue and general diseases are common problem in the project area villages. The details are presented in ***Annexure XII.***

Drinking water

Anantapur district is one of the most chronically drought affected areas in the country, where the available ground water has high fluoride content. Tap water is main source of drinking water in the area, government constructed an overhead tank in every villages of Kambadur, Kanaganapalle and Ramagiri Mandal. In consulted villages (Maddalacheruvu, Kurakulapalle) water supplied by Sri Sathya Sai Water Trust after the treatment of water. Drinking water contaminated with high fluoride is a major problem in the area reported by community. Ground water depth is more than 500 ft to 1000 ft (152.4 m to 304.8 m) in the consulted area villages. The details are presented in **Annexure XII.**

Photo- Drinking Water Facility in study area villages

Sanitation

During consultation it was observed that, toilets facility is available in 15-20% in houses among consulted villages and rest of 80-85% house hold use open defecation. However, Sanitation scheme under Swach Bharat mission is presence in the area. An amount of INR 9,000 (allocation from central Govt.) and INR 3,000 (allocation from State Govt.) per household provision is provided there under this scheme. During dialogue with program director of RDT (Rural Development Trust, Anantapur) it was inform that, due to water scarcity in the area open defecation is common.

Roads and Transportation

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 XII.***

Village approach road and transportation

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 i.e. 100 percent villages have electricity. As per census 2001, in the all study area village's electricity facility available for domestic and agriculture purpose both. The details are presented in ***Annexure XII.***

During consultation with community it was observed that, power supply is there in the villages around 15-20 hrs. /day.

Common Property Resources (CPR)

During consultation it was observed that, religious and worship place presented in every consulted villages. Community ponds and cremation ground available in two villages, community hall available in three villages and dry canal channel available within a km in 4 villages as provided in **Table 5.11.** It was also confirmed that, due to WTG erections CPR will not be affected.

TABLE 5-12: VILLAGE WISE COMMON PROPERTY RESOURCES

Sl. No.	Village Name	Common Property Resources (CPR)

		Religious and cultural place	Community Ponds	Cremation ground	Community hall	Canal
1	Chennampalle	12	-	1	1	Available (1km)
2	Ralla Anantapuram	5-6	1	1	-	Available
3	Rallapalle	-	1	1	-	-
4	Kurakulapalle	-	2	1	-	-
5	Maddalacheruvu	-	-	1	-	-
6	Konetinayanipalyam	-	1	1	-	Available
7	Vepakunta	5	1	-	-	Available
8	Perur	8	-	-	-	Dam (1km)

Source: P rimary consultation

Archeology sites in the District

As per archaeology department, Anantapur, total 46 protected monuments sites identified in the district has been provided as an **Annexure XIII**. Three protected monuments sites out of the 46 available in Budvagavi village of Uravakonda Mandal, Anantapur. Which are located at around 5-7 km distance from the proposed project affected village area. During consultation with Asst. Director, Archaeology department, Anantapur, it was confirmed that, there is no impact due to proposed project.

Some important schemes in District

Drought Prone area Programme and Desert Development Programme (DDP) Schemes:

In Andhra Pradesh, the Drought Prone Area Programme (DPAP) and Desert Development Programme (DDP) are being implemented since 1995 in 6 districts. Watershed programmes are implemented in Srikakulam, Prakasam, Chittoor, Kadapa and Kurnool districts under DPAP and in Anantapur district under DDP Programme.

Traditionally, the watershed approach was aimed at treating degraded lands with the help of low costs and locally accessed technologies such as in-situ soil & moisture conservation, afforestation etc by involving village communities in the implementation of watershed programme under DPAP and DDP to promote overall development of poorer sections of people inhabiting in the programme areas.

Activities:-

- Development of water harvesting structures such as low cost farm ponds, nalla bunds, Check dams, Percolation tanks and groundwater recharge measures to conserve and allow percolation of water.
- Desilting of village tanks for drinking/Irrigation/Fisheries development
- Afforestation including block plantations, Agro-forestry and Horticulture development, Pasture development.
- Land development including in-situ soil and moisture conservation measures like contour and graded bunds, nursery raising for fodder, timber, fuel wood, horticulture and non-timber forest product species
- Drainage line treatment with a combination of vegetative and engineering structures
- Crop demonstrations for popularizing new crops/varieties
- Repair, restoration and up-gradation of existing common property assets and structures in the watershed to obtain optimum and sustained benefits from previous public investments.

Mahatma Gandhi National Rural Employment Guarantee Scheme (MNREGS) Scheme in the district

- MNREGA was set up on Feb 2, 2006 from district Anantapur in the state of Andhra Pradesh, India and originally protected 200 real "poorest" zones of the nation. MNREGA seeks to provide at least 100 days of guaranteed wage employment in a financial year to every rural household whose adult members volunteer to do unskilled manual work.
- As per MGNREGS-AP Abstract Report under the implementation of this scheme in Anantapur district, the details of NREGA scheme, as on May'2015 overall 770796 cards issued in all 63 mandals and 198948 families were provided employment opportunity and nearly worth of Rs.15280 lakhs were spent in this scheme in the district.

During consultation it was confirmed that MNRGES scheme has been implemented in the study area . Most of the locals have job cards issued under MNRGES.

N.T Rama Rao Bharosa Pension schemes

Andhra Pradesh State Government has introduced *N.T Rama Rao Bharosa Pension scheme* for the poor and vulnerable for the state of Andhra Pradesh. Under this scheme, pension amount from Rs.200/- to Rs.1000/- per month to Old Age, Widow, Weavers, is being provided. Further in cases of HIV/AIDS infected patients are also covered in the said scheme.

During consultation, it was confirmed that, old age, widow and physically disabled persons are getting benefits in the study area from the said scheme.

5.5 STAKEHOLDER CONSULTATION

Community consultation was carried out in eight villages.Consultations were also conducted with village panchayats presidents (Sarpanch), village community, forest department, irrigation department, tehsildar and sub- register offices and a local NGO named 'RTD' working in the study area. The list of stakeholder consulted for the proposed project is provided in **Table 5.13.** MoMs of the aforementioned consultations provided in **Annexure XIV & XV.** Photo documentation of stakeholder provided in in **Annexure XVII.**

TABLE 5-13: CONSULTATION WITH DIFFERENT STAKEHOLDERS

S. No.	Stakeholder type	Designation	Department/Address
1	Community	Land sellers	Vepakunta
2			Perur
3			Konetinayanipalyam
4		Sarpanch and other community members	Chennampalle
5			Ralla Anantapuram
6			Rallapalle
7			Kurakulapalle
8			Maddalacheruvu
9			Konetinayanipalyam
10			Vepakunta
11			Perur
12	Local Govt. institution	Executive engineer	Irrigation Department, kalyandurga, Anantapur
13		Jr. assistant, Sub-Registrar	Sub- Registrar office , kalyandurga, Anantapur
14		Forest Range officer	Forest Range office, Kalyandurga, Anantapur
15	NGO/Trust	Program Director	Rural Development Trust, Anantapur
16	Project developer	Project and land team	M/s Ecoren

Source: Primary consultation

Consultation with Land Aggregator

M/s Ecoren, which will be acting as subcontractor to Suzlon, will be the main land aggregator for this project. During the course of ESIA, land purchase was in the process (for WTG location and access roads) on willing buyer and willing seller basis. All land required

for this project will be private..The compensation for the purchased land is reportedly above the existing market rate.

Consultation with Land Sellers

Consultation with land owners from the three villages were held on 24 Nov'15 at neutral place of two villages Vepakunta and Perur. Consultation with 17 landowners out of the 26 was conducted. Agreement to sale (ATS) for the aforementioned 26 locations were reportedly completed. Based on land owners consultation, ATS was signed after mutual agreement between the landowners Ecoren.Reportedly, 10-20 percent of land value was paid to landowners in advance. Average land holding size in the project area villages is around 5-6 acre per household. The sold land is mostly single cropped and and only rainfed, without any irrigation system. During consultations, the landowners reported that the land sale is on willing buyer – willing seller basis. Most of the land owners reported to purchase another agricultural land parcels within the village or adjoining villages from the money obtained through land sale., Some landowners have plan to use money to pay bank loan which they taken for agricultural purpose. Further, some of landowners they will pay college (B.tech) fees for their children. Details of consulted land owners is provided in **Annexure XVI.**

The key findings of consultation:

- Economy of the region is mainly dependent on agriculture and main workers are engaged as cultivators and agriculture labour.
- Agriculture is mainly rain fed in the area.
- Main crops includes groundnut, sunflower, ragi, cotton, maize etc.
- Significanct number of 'self help groups ' (SHGs)/Mahila Mandals are present in every village.
- The consulted villages has large populations of livestock and small ruminants. Cow, sheep, goats and bull are the primary livestock.
- There is no other irrigation source available in the local area.
- Groundwater is the sole source for drinking and domestic purpose. As reported by the villagers, most of the villages in the area are impacted by high concentration of fluoride in groundwater.
- Toilets facility is available in only15-20% houses among consulted villages and rest of 80-85% house hold use open defecation.
- Health care facilities are not adequate in the villages.
- Roads connectivity within the study area villages is good.
- Only private land is involved for this project.
- M/S Ecoren is a main land aggregator/developer for this project

- There won't be any issues pertaining to any 'common property resources' (CPR) or any other protected monuments due to the proposed project
- As reported by Ecoren land team, 'No objection Certificate' will be obtained from village panchayats after completion of ATS.

Grievance Redressal Mechanism (GRM)

As the land procurement was in progress grievance redressal mechanism and grievance register were not in place. Project related grievances will be addressed by Ecoren's land Team. Grievance redressal mechanism should be maintained at site to record all grievances. Further, Ostro 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 in **Annexure XXV.**

Public disclosure Public disclosure about the proposed wind project was not conducted, however, during community consultations, it was learnt that villagers were aware of the upcoming project.

Community Development Plan Under CSR

As reported by Ostro, site specific CSR plan will be developed, which will be jointly implemented by Suzlon foundation and Ostro duting construction phase of the project. OSTRO has a CSR policy in place with focus areas on basic education, drinking water and community health. OSTRO's CSR policy is attached as **Annexure XXII**.

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

As per Backward Regions Grant Fund Programme (BRGF) annual report 2007-08, Anantapur district ranks 3rd in terms of backwardness in Andhra Pradesh. The Anantapur district is highly backward due to several reasons i.e low irrigation facilities, no industries and less employment opportunities. In order to define backwardness baseline survey and comparative analysis of indicators like number of people below poverty line, family's road connectivity, literacy, agriculture production percentage of migration was done. The existing medical and health facilities are not fulfilling the needs of the poor people particularly at sub center level.

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 5-14: KEY NEEDS/GAPS IDENTIFIED AND RECOMMENDATION FOR CSR ACTIVITY

Key Areas	Needs identified	Recommendation for CSR

Key Areas	Needs identified	Recommendation for CSR
Education	• To improve female literacy as there is low female literacy compared to the male in study area villages. • Need of vocational training in study area for skill development. • Need to promote computer literacy in study area ,especially at primary school. • Provision of adequate drinking water facility in some primary schools.	• Awareness programme regarding female education at village level • Conduct adequate vocational training programs. Provide computer literacy program at village level. • Providing additional drinking water facility at school level.
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. • Providing R.O treated water in Ralla Anantapur, Rallapalle, Vepakunta, Perur and Maddalchervu villages.
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.
Sanitation	• Provision of sanitation facilities as nearly 80-85% house hold don't have sanitation facility. . • Sanitation scheme are being implemented in these villages under Swachh Bharat mission.	• Organizing awareness camp on sanitation and to be linked with sanitation programme in the study area villages. • Low cost community toilets based on best practices to use less water can be worked out with the panchayats intervention.
Agriculture/ Irrigation	• No irrigation facilities available. Canal a available in the study area remain	• Awareness on drip irrigation among villagers. • Rain Water harvesting

Key Areas	Needs identified	Recommendation for CSR
	majorly dry. •	wherever possible.
Employment opportunities in the area	• Need to have more employement 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.

6 ANALYSIS OF ALTERNATIVES & 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

6.1 CURRENT OR NO PROJECT SCENARIO

There is a need to bridge the gap between the demand and supply, renewable/non-conventional sources of power to supplement the conventional sources. The proposed project intends to contribute towards bridging this demand supply gap being a non-conventional source of power generation. In Andhra Pradesh, existing renewable capacity commissioned is about 1,815 MW of which wind power contributes to 1119MW, solar power contributes to 146MW (State as well as GoI) and others (like hydro, biomass, solid waste) contributes to 550MW as on October 2015 (Status of Renewable Energy Power Projects Commissioned in Andhra Pradesh State, NREDCAP)

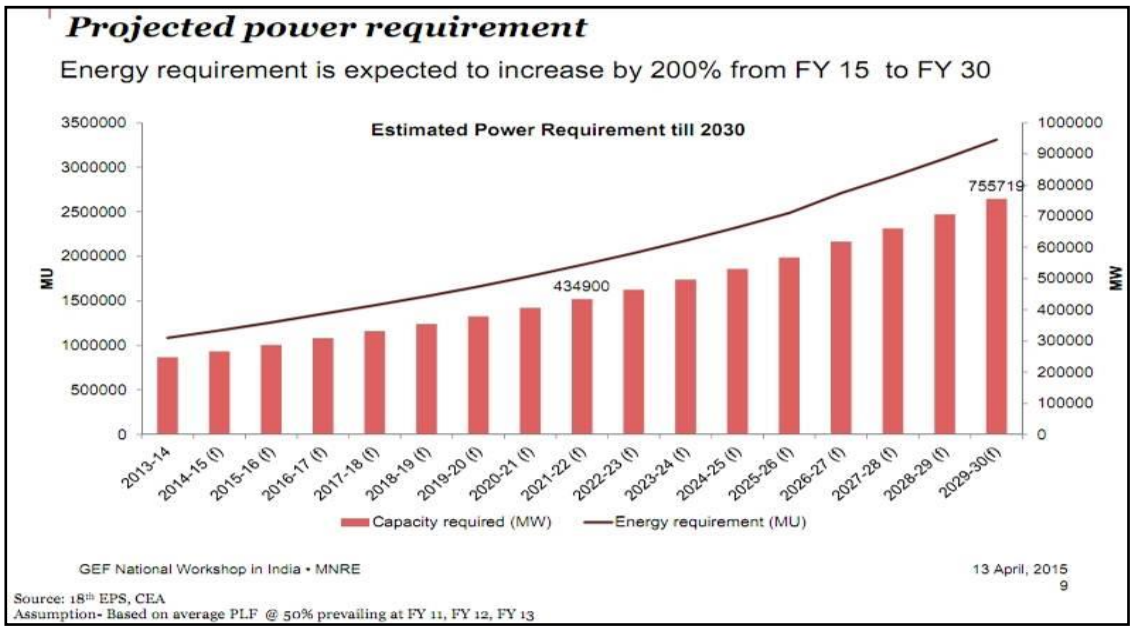
About 2,846.12 MW capacity wind power projects have been sanctioned by the Non-conventional Energy Development Corporation of Andhra Pradesh Limited (NREDCAP), the sanctioning authority in the state, out of which projects of about 103.00 MW have been commissioned till October 31 during 2015-16. The proposed project presents an opportunity to utilize the potential for wind power generation. A "No Project Scenario" will not address the issue of power shortage. An alternative without the project is undesirable, as it would worsen the power supply-demand scenario, which would be a constraint on economic growth of the surrounding region.

The Project being a wind power project will not lead to CO_2 and SO_2 emissions during the operation phase. It does not deplete the natural resource except a small part of land will be occupied by the turbines, ancillary facilities and access roads. Project has a life of 25 years.

6.1.1 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 6.1**, India's projected power requirement uptil 2030 has been indicated.

FIGURE 6-1: INDIA'S PROJECTED POWER REQUIREMENT



Source: Central Electricity Authority

6.2 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 • Provides predictable and stable power. •	• Non-renewable energy source • Large water requirement • High GHG 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.	• Non-renewable energy source • Working environment

	• Oil and gas can be easily transported by pipes or ships. • Natural gas is the "cleanest" of the fossil fuels. • Provides predictable and stable power. •	risks to staff and environment • Burning oil and gas releases can cause pollution & health impacts. • High GHG emission.
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. • Provides predictable and stable power. • Low emission as low as 2 tonnes CO2e/GWh	• Expensive, especially in capital • costs, maintenance costs • 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. • GHG emission as low as 13 tonnes CO2e/GWh	• Solar power stations are expensive to build at the moment. • Only specified places are right for solar power. • 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	• Need a lot of turbines to make electricity. • Wind turbines can only be used where it is windy. On days where there is little wind, less energy will be generated.
Hydroelectric	• Hydroelectricity creates no greenhouse gases.	• Hydroelectric power needs enough water to

	• Energy from water is free and will not run out. • Hydroelectric energy is more reliable than wind or solar power. • Low GHG emission.	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.
	•	•

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. It does not have any kind of emissions during operation. As per MNRE, 2015, the installed capacity of wind power in India until March 2015 is 22645 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.

6.3 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.

6.3.1 Identification of sites for WTG's

According to National Institute of Wind Energy (NIWE), Andhra Pradesh has estimated installable wind power potential of 14,497 MW at 80m hub height for wind turbines. Wind power density map of India is shown in **Figure 6.2**. The southern region of Andhra Pradesh comprising of Anantapur, Kadapa, Kurnool and Chittoor districts have good wind power potential. Approximately 1000 MW of wind projects will be developed in the 1st phase while in the second & third phases, the capacity planned is 1500 MW & 1650 MW respectively.

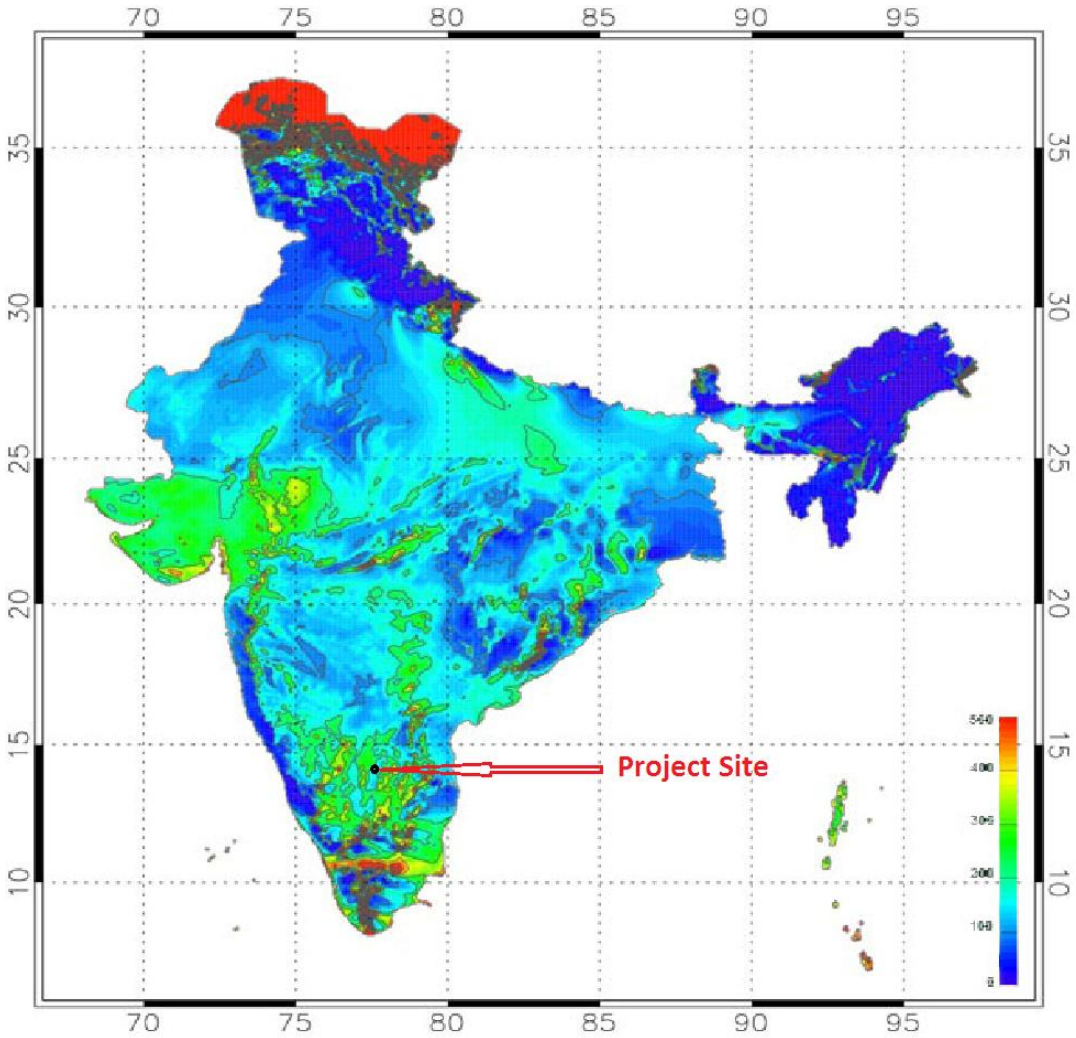
The key factors considered for selecting the project included the following:

- The locations of WTGs fall on arid & rain fed agricultural land
- Privately owned land is selected for WTG sites, creating access routes and erecting 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 project.
- The distance of the WTGs from the highways, village habitation shall be at a safe distance, and in normal course, a distance of 300 m would be considered safe.

FIGURE 6-2: WIND POWER DENSITY MAP AT 80 M LEVEL



Source: http://niwe.res.in/department_wra_est.php

6.3.2 Alternate routes for transmission lines

Laying of transmission line comprises 220 kV moose DC line up to upcoming 400/200 kV Borampalli substation from the proposed pooling substation on site. Ecoren to construct the 200 kVA pooling substation that will directly connect to 400/200kV 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 sensitive receptors like schools, health centers, religious places 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.

6.4 CONCLUSION

Various factors are considered such as wind resource potential at the project site, favorable 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. There are about three more wind power projects of other developers that are in operation in the same district. This is due to availability and suitability of wind power generation potential. Besides, one of the OSTRO wind power project is under construction in the same district at a distance of approximately 50 km.

The proposed wind power project site has following locational advantages and is the most suitable for wind power project:

- Approved C-WET site for wind energy production
- The locations selected for wind turbine erections mostly fall on arid & rain fed agricultural land which is cultivated once depending on the monsoon.
- Privately owned land is selected for WTG sites, creating access routes and erection of transmission towers. The land being purchased is on the basis of willing to sell and willing to buy method which does not involve forceful acquisition of land.
- The route for transmission line designed for the proposed project is the shortest route possible to evacuate power generated from WTGs to the pooling substation and then the grid substation.
- The WTG locations were selected keeping in mind the distance from settlements. The proposed sites for WTGs are located away from 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.
- The distance of the wind mill turbines from the highways, settlement/ habitation is located at a safe distance, and in normal course, a distance of 300 m is considered to be safe.
- 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 the wind farm.
- No cultural property of archaeological importance located within the project site

7 ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT

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 potential for 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). Also, 100 m RoW along the transmission line route is also considered for impact assessment. 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.

7.1 APPROACH & METHODOLOGY

The assessment process has taken into consideration the impacts due to project sitting, land preparation, and construction and operation of the project. 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.

The risks and impacts of the proposed wind power project has been assessed on the social and physical environment. The ESIA 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.

7.2 POTENTIAL IMPACT GENERATING ACTIVITIES

All the project related attributes and activities have been analyzed 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 Ralla 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 7-1: PROJECT RELATED ACTIVITIES IN DIFFERENT PHASES 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	

Pre-Construction Phase	**Construction Phase**	**Operation & Maintenance Phase**	**Decommissioning Phase**
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 colored "red" denotes the likelihood to cause impact that is generated due to the interaction from project ac tivities. 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 colored "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. Cells highlighted in 'orange' indicates positive impact.

TABLE 7-2: 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																	

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**																	
	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					
	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

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**																	
	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

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**																	
	Substation construction															L		
	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																	M

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**																	
	yards and stores.																	
	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										

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**																	
All phases of project																		
	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

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

(C) 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 behavior.

TABLE 7-3: 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	
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	

7.3 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 7-4**. 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 7-4: 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						
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,	Conflicts between labour and	High	PS-2: Labour working	Applicable

		kitchen, etc. • Local community interaction	contractors as well as conflict between labours and local community		condition	
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

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.

(a) 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 being 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 Ecoren 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 Ecoren and so the impact of land procurement process is considered to be insignificant. However, land procurement was not completed till the time of study, it was under progress, therefore following suggestion are recommended to be consider during land procurement process:

- Proper compensation amount should be paid to the land owners to rule out conflict in future,
- Grievance Redressal mechanism should be followed onsite.

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).

(b) 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. However, compensation in terms of agreed price nullified the impact to a great extent. 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 will also use compensation money to buy more fertile land parcels in some other places to continue with the agricultural practices. Other sources of income include cattle rearing, working as labourers in nearby towns and dairy. 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.

(c) Engagement of Local and Migrant Labour

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 7.4** and discussed here have been used to assess the social impact. Considering the project in designing phase and construction phase yet to be started, indicators have been discussed to provide sense of what should not be done with respect to labour engagement. The issues discussed here in the form of indicators IFC PS 2 and Indian Labour Act.

Indicators in Labour Engagement:

Abolition of child and forced labor: Engagement of child and forced labour by contractor or developer in any form for the proposed project will be unfair with the children's right & the law.

Gender equity and non-discrimination: Discrimination and imbalance in gender equity in employment and opportunity may lead to conflicts between contractor and labour.

Freedom of association and right to collective bargaining: Not giving freedom to labor to express their views and form association may cause conflicts between labor and contractor but this is not applicable for wind power plant as the labour requirement is of short duration restricted to construction phase only and number of labour employed is not very large for the same phase.

Impact Significance:

Considering the sensitiveness associated with the engagement of child, forced labour & not maintaining gender equity, the impact considered will be of moderate significance. OSTRO has laid down policies through which it demonstrates compliance to all of the above factors. Its contractors should be made aware of all its policies for labour requirements and incorporated in their contracts prior to the starting of the project. OSTRO need to monitor the implementation of the policies on regular basis.

OSTRO needs to adopt the following measures:

- OSTRO should include clause or provisions related with non-engagement of forced and child labour, gender equity, non-discrimination on employment in contractors agreement and HR policy.
- OSTRO through its contractors should inform the labour about the grievance redressal mechanism by which they can inform about any grievances
- Grievances related with non fulfilment of labour welfare measures shall be monitored by the contractor employed by OSTRO.
- It will be the responsibility of principal employer to get it ensure through its contractors. OSTRO is not going to employ labours directly for the project activity.
- OSTRO needs to ensure that labour is being adequately paid by contractors. The contractor should ensure that wages is being paid as per the requirement of minimum wages act.
- OSTRO needs to ensure the compliance of labour law and availability of facilities mentioned their by reviewing muster roll, wages register, attendance register through its contractors.
- OSTRO shall conduct internal audits to monitor the performance of contractor.
- OSTRO through its contractor should ensure that labour receives training on health and safety issues during the construction and operation of the project

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 7.4** and described below indicate the reasons which can cause conflicts of labour with contractors and community.

Absence of basic amenities or facilities

In case, absence of basic amenities such as kitchen, good quality drinking water, clean and inadequate sanitation facilities, rest room and crèches for children at the labour camp during construction phase, may cause dissatisfaction between labours which in turn result in conflict with contractors.

Interaction with Local Community

In case of significant migrant labour influx, 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.

Access to Common Property Resources

Absence of any common property resources near the project site & WTG locations makes this impact not applicable in the proposed project.

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 to be planned and follow in case of accidental discovery of artifacts during construction activities. The World Bank Chance Find Procedure is attached as **Annexure XXIV.**

OVERALL SOCIO ECONOMIC IMPACT ASSESSMENT

The overall assessment suggests that the proposed project will lead to minor impact on the socio economy conditions of the community from the project. Impact due to loss of land and livelihood is considered to be minor as land is being purchased is seasonal agriculture land and purchased through willing to sell and willing to buy basis. One time compensation would be paid to the landowners for establishment of transmission line. The proposed project will have two labor camps set up during construction phase. . No impact is anticipated due to project activity as there is no common property resources near the project site & WTG locations makes this impact not applicable in the proposed project. The project will be providing employment to local people during construction phase hence it will bring a positive impact on the socio economic conditions of the community. During operation phase the project will have no impact due to the proposed project.

Phase Of the Project	Risk Assessed
Construction	Minor
Operation	Minor

7.4 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

7.4.1 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, SO_2 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 SO_2, 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 nearby settlements will be minor owing to the considerable distance from the wind turbines. Construction of transmission lines, from PSS to GSS is about 37 km, 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. Reportedly the transmission line will pass through land parcels away from the settlements. Hence impact on ambient air environment is anticipated to be minor.

Mitigation measures

Following mitigation measures are recommended to control the minor impact on ambient 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 and water tankers need to be purchased from authorised vendors.
- 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

The overall assessment suggests that the proposed project will lead to minor impact on air quality during construction phase due to fugitive dust emissions due to movement of project vehicles through village roads. During operation phase the proposed will have access roads constructed for approaching the WTGs and 2-3 vehicles would be used for Operation and Maintenance. Hence, insignificant impact on air quality is anticipated.

Phase Of the Project	Risk Assessed
Construction	Minor
Operation	Minor

7.4.2 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 and 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 3-5 KLD for domestic water use considering 75 workers during peak hours. As per Central Ground Water Board the ground water in Kambadur, Ramagiri and Kanaganapalli mandal where the proposed project site is located is falling in the **Semi-Critical zone**. Therefore, moderate but temporary impact due to consumption of water is anticipated on ground water.

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

Mitigation measures

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

- Alternative source of water like from Perur reservoir can be explored to minimize the use of ground water during construction phase.
- Soak pits should be established for wastewater dischsrge from labour camps.
- Regular inspection for identification of water leakeges and preveting wastage of water from water supply via tankers should be undertaken by contractors and supervised by Ecoren.
- Optimizing the use of water for sprinkling, washing of vehicles, concrete mixing, etc.

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 30-40 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

The overall assessment suggests that the proposed project will have moderate impact on ground water as the proposed project site falls within semi critical area for ground water as categorized by Central Ground Water Board. During operation phase the proposed project is anticipated to have minor impact as 2-3 KLD water would be

required on site considering 30-40 personnel for maintenance and operation of the WTGs.

Phase Of the Project	Risk Assessed
Construction	Moderate
Operation	Minor

7.4.3 Impact on Noise

Noise is mostly generated during construction 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 & Decommissioning Phase

(A) Impact on Communities

During the construction phase, noise will be generated mainly due to excavating activities, drilling tower foundations, road construction, grading, concrete batching, tower erection, construction of ancillary structures, diesel generators, movement of materials and site cleanup, etc. The sound power of equipment and machineries generally involved during construction phase is presented in **Table 7-5.** 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 85 to 110 dB (A).

TABLE 7-5: INDICATIVE NOISE FROM DIFFERENT EQUIPMENT AND VEHICLES

S. No	Type of Vehicle	Description	Typical Sound
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	Concrete Mixer	110
10.	Compressor	Air compressor	100
11.	Compressor	Vibratory compactor	110

The noise propagation during the construction phase has been analyzed with the help of equation given below:

$$L_p = L_W - \left|10 \cdot \log\left(\frac{Q}{4\pi \cdot r^2}\right)\right|$$

Where,

Lp = Sound Pressure Level
Lw = Sound Power Level
Q = Directivity Factor (taken as 1)
r = Distance to sound source

The analysis indicates that sound power pressure level decreases with increase in distance from the source. The maximum sound power level of 110 dB (A) referred from Table 7.5, reduces upto 52 dB(A) at a distance of 200 m from the source and it further reduces upto 45 dB(A) at distance of 500 m from the source. In India, NAAQS prescribed by CPCB for noise emission are 55 dB (A) and 45 dB (A) for day and night time value respectively. As the receptors or residential colonies near the proposed WTG locations are more than 500 m therefore noise pressure level at receptor locations are expected to be within the CPCB noise standards. Further, construction time at a single WTG will be much shorter thus insignificant impact on nearby communities from the construction noise is anticipated.

Impact on Workers at Project Site

During the construction phase, workers will be exposed continuously to high levels of noise from machinery thus high noise is anticipated. However, considering the temporary nature and short term duration of project activities minor significant impact is anticipated and can be mitigated by following mitigation measures.

Mitigation measures

The following mitigation measures shall be incorporated to avoid/reduce noise impacts on surrounding environment.

- 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.

Noise Impact in Operation Phase

During operational phase, wind turbine will be the main noise source. The noise 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. The mechanical noise was an issue in old time wind turbines. Now a days, wind turbines are being manufactured with latest technology design to control the mechanical noise. 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).

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. Blades moving through the air produce an aerodynamic noise. This noise is detectable when it is greater than the background noise.

Noise Modeling – Methodology

To assess the impact of wind turbine noise during operational phase, noise modeling was conducted using Windpro software. A noise modeling scenario was developed with the following inputs:

- Wind Speed Range – 4 m/s – 15 m/s
- Turbine Locations – Geographical coordinates of 101 wind turbines was provided as input
- Receptor Locations – Receptor locations was also identified within the 1 km from the proposed wind turbine locations

In addition to the input, following assumption were also considered during noise modeling:

- Ground Attenuation – The ground attenuation values was calculated by model on the basis of height contours. The model takes the ground attenuation value by calculating average vertical distance between line of sight between receptor and hub of the turbine and the terrain between the two points. Further, air absorption value 1.9 dB/km was also considered during the modeling.
- Meteorological coefficient – The meteorological coefficient value was taken as 0 to which signifies the minimum dumping of noise in downwind direction.

On the basis of inputs and assumptions as mentioned above software provides the value of predicted noise on the nearby receptors, distance from the source and sensitive wind turbine locations. The predicted noise value will be then compared with the ambient noise level (day time and night time) monitored in the project site area to find the significant noise level. The ability to hear wind turbines noise depends on the ambient noise level. When the background noise level are higher than the wind turbine noise level then 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 noise with a potential to impact the receptors. The predicted noise level will also be compared with the noise standards mentioned in NAAQS of CPCB for residential area to assess the significance of impact on surrounding environment.

Noise Modeling Result Analysis

The noise modeling result analysis reveals that total 7 receptors are predicted to have impact due to 2 wind turbine (P69 and P60) operation. The details of receptors and wind turbine are presented in the Table 7.7 and indicated as impacted receptors and sensitive wind turbine locations. The predicted maximum noise level on these receptors falls in the range of 46.8 – 47.5 dB (A). The ambient noise level in the project site area varies within the range of 54.6 – 58.2 dB (A) and 41.2 dB(A) – 48.5 dB(A) for day and night time respectively. The comparative analysis of predicted noise level and the ambient noise level in the project site area shows that noise level are significant during the night time and have potential to impact the receptors. While during the day noise level are insignificant and does not have impact on surrounding. The comparison of predicted noise level range with the noise standards specified by NAAQS for residential area also reveals that noise level are significant only during night period. Maps showing the WTGs noise contour and receptor location are provided as Figure 7.1.

TABLE 7-6: AMBIENT NOISE MONITORING RESULTS

Noise Receptors	Village	Coordinates		Wind speed (m/s)	Max. sound level from WTGs dB(A)	Ambient noise level range (night time) dB(A)	Ambient noise level (night time) dB(A)	Day time limit dB(A) as per NAAQS for residential area	Night time limit dB(A) as per NAAQS for residential area
		Easting	Northing						
I(RE9)	**Chennampalli**	**750193**	**1588058**	**4.0 to 15.0**	**47.3**	41.2– 48.5	54.6 – 58.2	55	45
J(RE10)	**Chennampalli**	**750147**	**1588040**	**4.0 to 15.0**	**46.9**				
K(RE11)	**Chennampalli**	**750193**	**1588057**	**4.0 to 15.0**	**47.4**				
R(RE18)	**Chennampalli**	**750196**	**1588054**	**4.0 to 15.0**	**47.5**				
AQ(RE42)	**Shivapuram**	**754095**	**1592315**	**4.0 to 15.0**	**46.8**				
AW(RE49)	**Shivapuram**	**754096**	**1592315**	**4.0 to 15.0**	**46.8**				
BA(RE54)	**Shivapuram**	**754095**	**1592314**	**4.0 to 15.0**	**46.8**				

TABLE 7-7: NOISE RECEPTOR DESCRIPTION

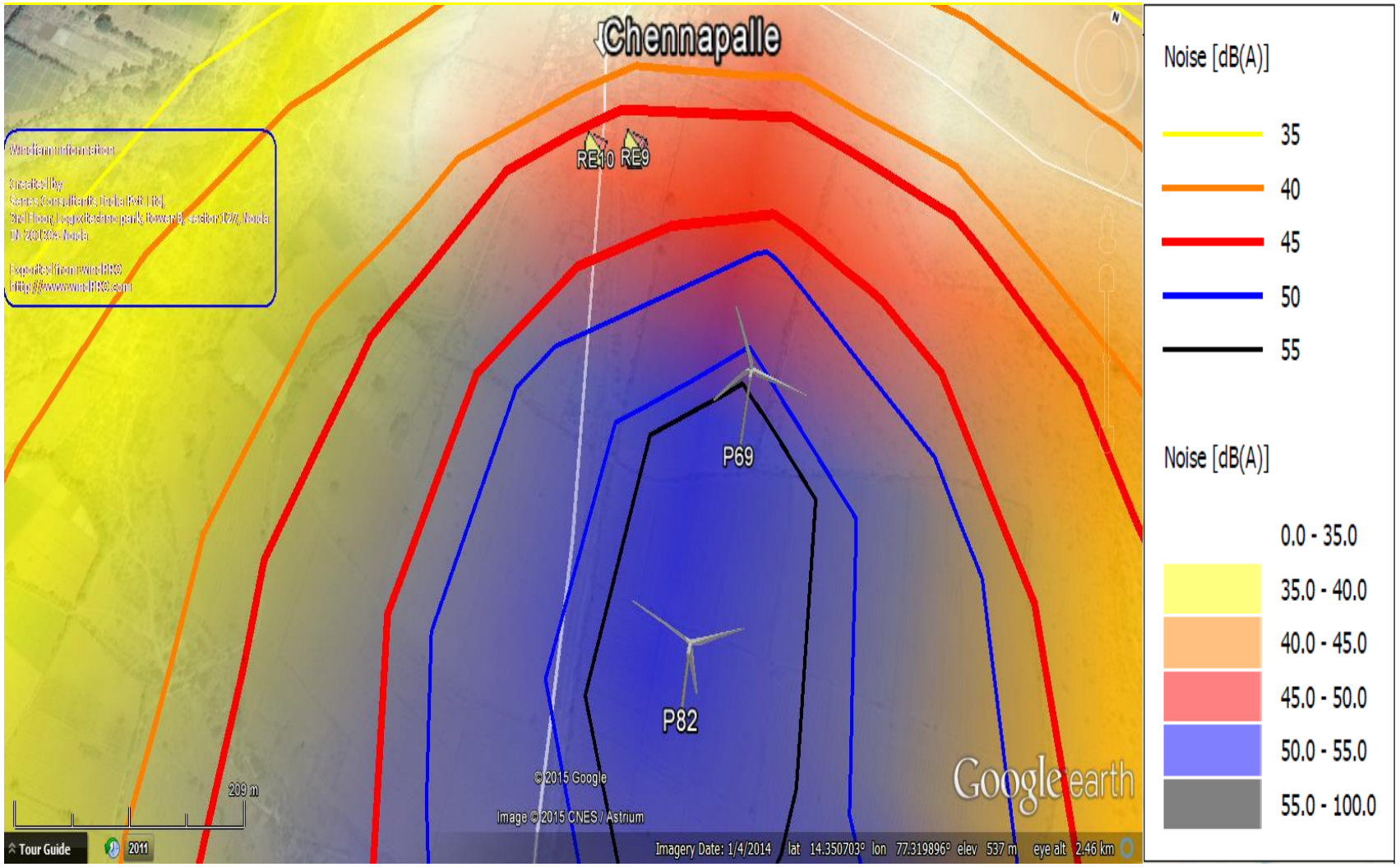
Noise Receptors	Receptor Coordinates		Village	WTG Name	WTG coordinates		Distance (in Km)	Description	Photographs
	Easting	Northing			Easting	Northing			
I(RE9)	750193	1588058	Chennampalli	**P69**	**750380**	**1587797**	***0.32***	***kaccha households***	
K(RE11)	750193	1588057					***0.33***		
J(RE10)	750147	1588040	Chennampalli				***0.35***	***Group of households***	

Noise Receptors	Receptor Coordinates		Village	WTG Name	WTG coordinates		Distance (in Km)	Description	Photographs
	Easting	Northing			Easting	Northing			
R(RE18)	750196	1588054	Chennampalli				***0.33***	***Group of households***	
AQ(RE42)	754095	1592315	Shivapuram	**P60**	**754433**	**1592637**	***0.47***	***Group of households***	
BA(RE54)	754095	1592314					***0.47***		

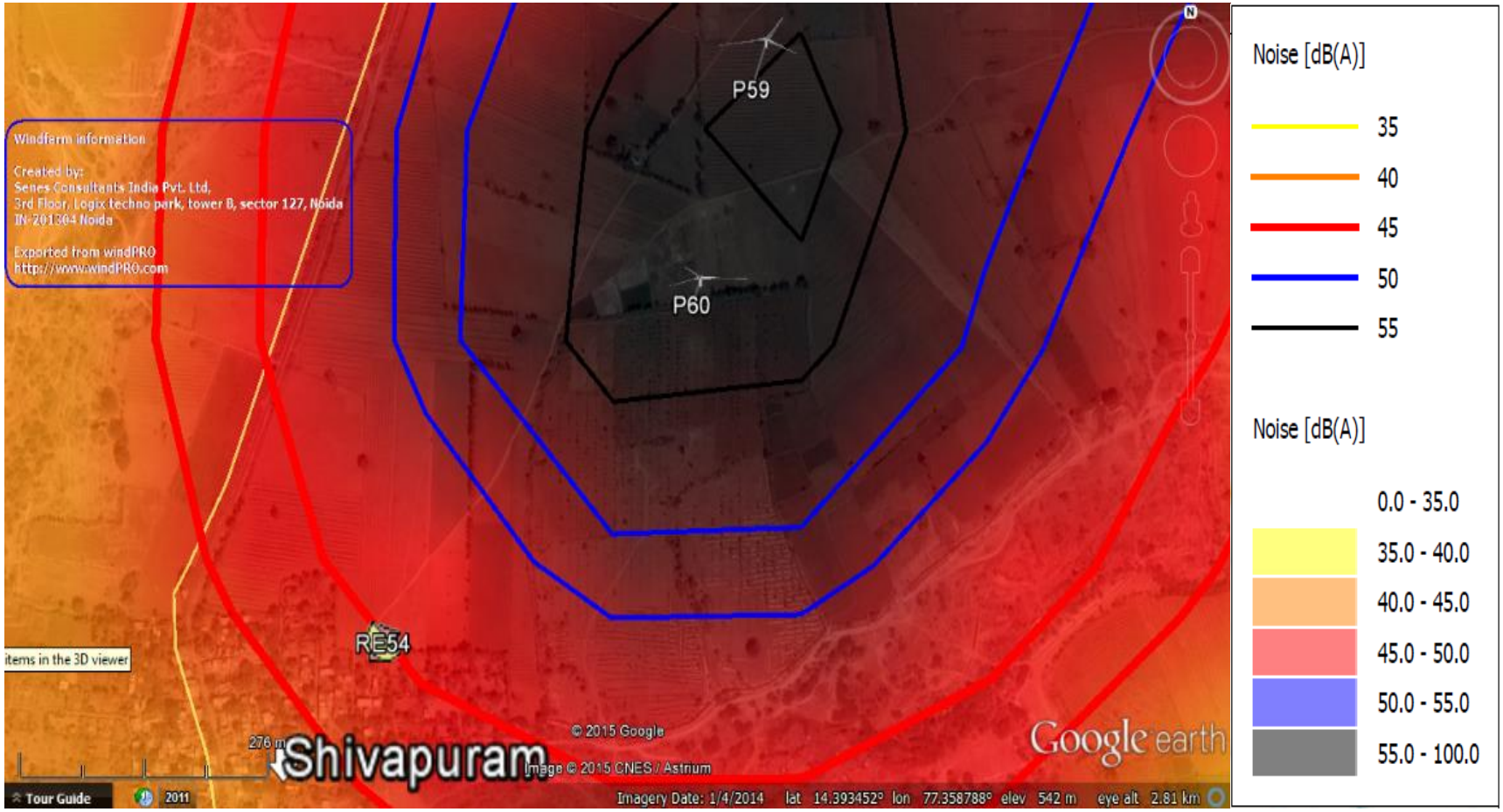
Noise Receptors	Receptor Coordinates		Village	WTG Name	WTG coordinates		Distance (in Km)	Description	Photographs
	Easting	Northing			Easting	Northing			
AW(RE49)	754096	1592315	Shivapuram				***0.48***	***Group of households***	

FIGURE 7-1: NOISE MODELLING RESULTS

(RE 9 & 10)



(RE 54)


P59
P60
RE54
Windfarm information
Created by:
Senes Consultants India Pvt. Ltd,
3rd Floor, Logix techno park, tower B, sector 127, Noida
IN-201304 Noida
Exported from windPRO
http://www.windPRO.com
Noise [dB(A)]
35
40
45
50
55
Noise [dB(A)]
0.0 - 35.0
35.0 - 40.0
40.0 - 45.0
45.0 - 50.0
50.0 - 55.0
55.0 - 100.0
Shivapuram
© 2015 Google
Image © 2015 CNES / Astrium
Google earth
Tour Guide
Imagery Date: 1/4/2014 lat 14.393452° lon 77.358788° elev 542 m eye alt 2.81 km

Mitigation Measures

The following mitigation measures shall be incorporated to avoid/reduce potential impacts-

- WTG models should be selected having inbuilt noise control mechanism.
- Regular maintenance of WTGs should be carried out for attenuation of noise.
- In case of complaints of high noise levels from inhabitants of nearby settlements, possibility of putting noise barriers such as development of green belt plantation between source and receptors should be considered.
- Noise monitoring should be carried out quarterly to understand the extent of noise generation near the turbines and its impacts on local community.

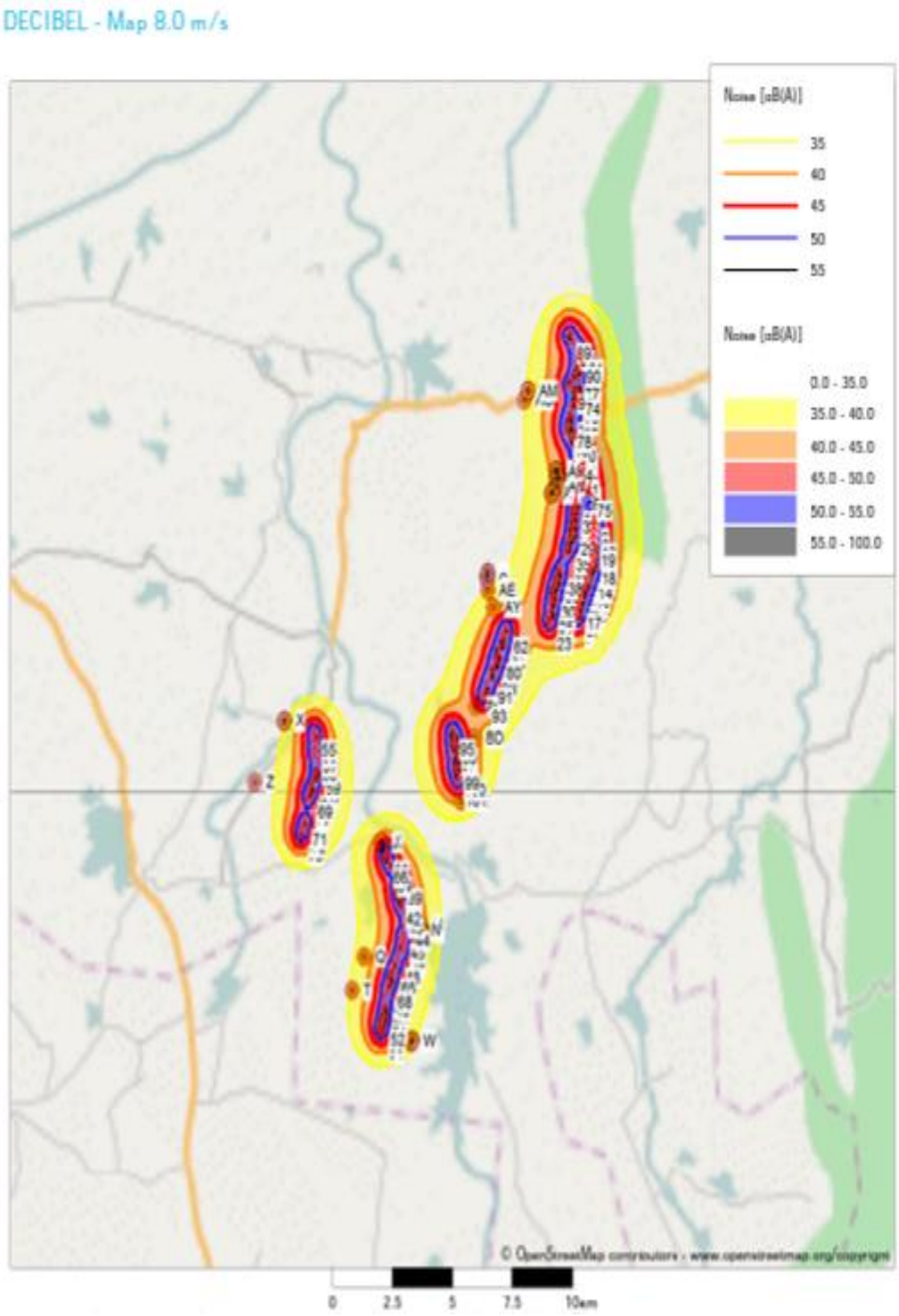
OVERALL IMPACT ASSESSMENT

The overall assessment suggests that the proposed project will have minor impact due to noise generation from construction activity and movement of construction vehicles due to project activity. As the nearest settlement is located at a distance of 300 m (Chennampalli) hence the impact anticipated to be minor.

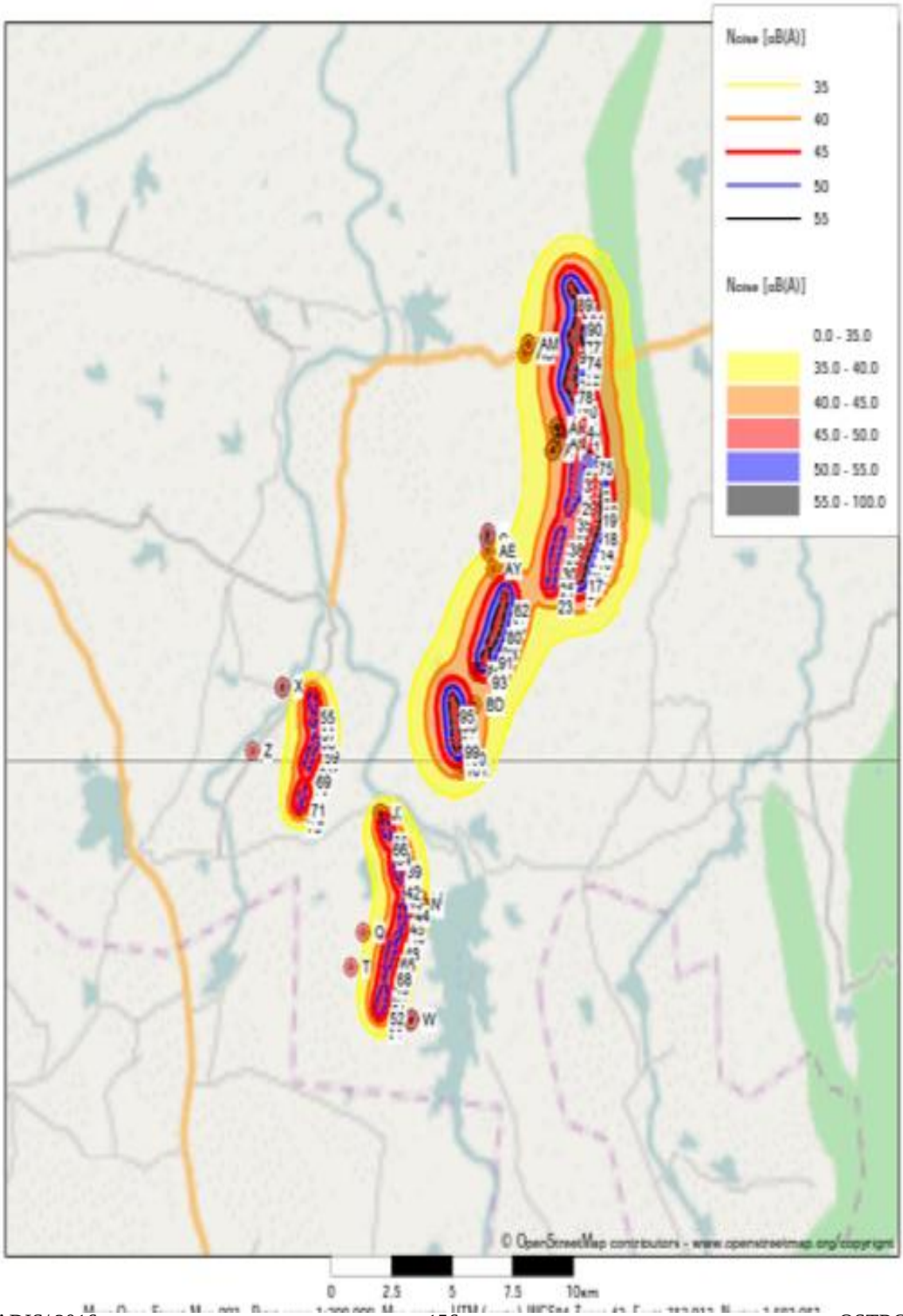
During operation phase, worst case scenario noise modelling has been carried out for all 101 WTGs and the results shows that two WTGs (P-60 & P -69) is generating noise levels higher than the threshold levels hence impact on receptors/ settlements is anticipated. But, from the latest update on WTG locations it is now confirmed that the two above mentioned WTGs are not in consideration for the proposed project.

Phase Of the Project	Risk Assessed
Construction	Minor
Operation	Minor

FIGURE 7-2: NOISE MODELLING RESULTS (AT 8.0 M/S AND AT 15.0 M/S)



DECIBEL - Map 15.0 m/s



7.4.4 Impact on Land & 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 leveling and road work. The soil structure of this area is rocky and loamy. This rocky excavated earth material be utilized on site for road soling and site leveling 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 leveling 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 will 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

The overall assessment suggests that the proposed project will have minor impact due to construction phase and operation phase on soil loss and contamination of soil due to project activity.

Phase Of the Project	Risk Assessed
Construction	Minor
Operation	Minor

7.4.5 Impact On Ecology

Construction Phase

Vegetation Clearance

Project construction involved land clearance, excavation, filling and leveling, 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 negligible 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. Most of the site consists of agricultural land which remains fallow most of the year. 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.

Presence of bears were reported by the local villagers near Kamandurga Reserved Forest (2.92 kms towards south west from the nearest WTG P93). It has been already mentioned that black buck, Indian hare and wild boar are present in the project area. As the construction phase of wind turbines will involve the movement of heavy and light vehicles, influx of workers within the project site and noise from the project activities during construction, wildlife may get impacted in following ways:

- Injury and death due to collision with project vehicles

- Injury and death may result by falling in pits dug at project site
- Hunting
- Electrocution if get contacted with electric cables

There has been a record of conflicts between the farmers and bear, wild boar & black bucks in the region due to incidents of crop raiding else they are found to reside in the area. The incidence of conflict between the villagers and bear near Kamandurga forest was last reported by local people six months back. Although the construction activity is very short, but the impact on these mammalian species from the construction related activities may be termed as minor. There is a risk of conflict between the construction workers and bears but the severity on these species can be lowered by adopting best management practices. Management plan for at least black buck and wild boar during the construction and operation phase of the project has been incorporated in the Environment & Social Management Plan in **Table 8.1.**

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.
- Shepherd be informed through sign boards to avoid the construction area for grazing their livestock.
- 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.
- Trapping, hunting and injuring wildlife should be strictly prohibited.
- 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.
- Awareness programme regarding the significance of conserving wildlife and the penalty associated with killing wild animals should be conducted for the laborers and sub-contractors.
- Signage near the Reserved Forests should be in place indicating the presence of wild animals.
- Laborers should not be encouraged to fetch wild boar meat from the local market.

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. Also, the project area is not known for ground birds of very high conservation value expect for Jerdon's Coursor (*Rhinoptilus bitorquatus)* which is now believed to be extinct and was last reported from Anantapur in 1900[9]. As the species is not reported recently from the district as such displacement of the habitat is not anticipated currently due to the proposed project. Detailed bird and bat study should be conducted for a year to understand the presence of ground birds and if impact any during operation phase of the project.

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 behavior, weather condition, topography and scale of wind farm.

As per the site visits and vantage point study for WTGs and transmission line at 8 locations around the project site to assess the bird and bat presence in the area, local flying path of birds and identified location with large usage of birds on and around the project site is present therefore obstruction to local birds flyway is envisaged here. Thus, effect of wind turbines on local birds cannot be ruled out. Also, the site visits were conducted in October and November months. Eight Schedule-I species, three Near Threatened species of birds were observed within the study area. The list of these species has been shown in the Table 7.8. **Out of the total 73 species observed, fifteen bird species were migratory.** Detailed and thorough assessments based on the data collected during both site visits and vantage point study was conducted to find out collision risks associated with the project activity.

[9] http://www.conservationindia.org/
http://www.iucnredlist.org/
Rhinoptilus bitorquatus is a rare and local endemic to the Eastern Ghats of Andhra Pradesh and extreme southern Madhya Pradesh, **India** (BirdLife International 2001). Historically, it was known from just a few records in the Pennar and Godavari river valleys and was assumed to be extinct until its rediscovery around Lankamalai in 1986. It has since been found at six further localities in the vicinity of the Lankamalai, Velikonda and Palakonda hill-ranges, southern Andhra Pradesh, with all localities probably holding birds from a single population, the majority of which are contained within the Sri Lankamaleswara WildLife Sanctuary. Two individuals were sighted in 2009 in the Cudaapah District of Andhra Pradesh, the first confirmed sightings for several years (BirdLife International 2009). At present the situation raises the faint possibility that the species may still persist in the wild.

Vantage point study at eight locations were carried out covering all clusters of WTGs and transmission route. A total of nine "Schedule-I" species, two "Near Threatened" species were recorded. Results of vantage point study is presented in Table 7.9.

TABLE 7-8: LIST OF SCHEDULE I AND NEAR THREATENED SPECIES OBSERVED

S. No.	Common Name	Scientific Name	IUCN Status	WPA Schedule	Migratory Status	Sighting frequency
1	Black winged Kite	*Elanus caeruleus*	LC	Schedule I	Resident	frequent
2	Eurasian Marsh Harrier	*Circus aeruginosus*	LC	Schedule I	WV	frequent
3	Montagu`s Harrier	*Circus pygargus*	LC	Schedule I	WV (From Central Asia, Europe)	frequent
4	Short Toed Snake Eagle	*Circaetus gallicus*	LC	Schedule I	Resident	frequent
5	White Eyed Buzzard	*Butastur teesa*	LC	Schedule I	Resident	frequent
6	Indian Peafowl	*Pavo cristatus*	LC	Schedule I	Resident	rare
7	Brahminy Kite	*Haliastur indus*	LC	Schedule I	Resident	rare
8	Shikra	*Accipiter badius*	LC	Schedule I (Part III)	Resident	frequent
9	Pallid Harrier	*Circus macrourus*	NT	Schedule I (part III)	WV (from Central Asia)	frequent
10	Black Headed Ibis	*Threskiornis melanocephalus*	NT	Schedule IV	Resident	frequent
11	River Tern	*Sterna aurantia*	NT	Schedule IV	Resident	rare

The collision zone of birds and bats near to a WTG ranges between a radius of 40m to 120m (from shaft to hub). As per Table 7.7, the species having general flight height >40m can be

considered to be at a risk of collision with the blades of the operating WTG. As per the results, the impact on birds and the risk of collision with the operating WTGs is high for the WTG cluster close to Upper Penneru Reservoir (WTG Nos-P71, P72, P73, P74, P75, P76, P77, P78, P79, P80, P81, P83, P84, P85, P87, P89, P91, P93, P95). Three "Schedule I" species were reported (mainly raptors) and birds flying at a height greater than 40m has been observed in and around the reservoir. As such it is recommended that the WTGs near Penneru reservoir has the highest risk of bird collision during operation phase and should be considered for relocation. Further, long term study is required to assess the risk for each of the WTGs in the same cluster. **Hence, the significance of impact on birds from collision during operational period is assumed to be moderate.** Detailed assessments of collision risk of birds with WTGs has been presented in Table 7.10 and represented in Figure 7.3 & 7.4.

As per the aforementioned recommendation for relocation of the concerned locations, Ostro has already shifted some of the concerned location as given in the table below:

SN	Locations	Status	SN	Locations	Status
1	P-71	Shifted 260 m southwest from the earlier position i.e further away from the penneru reservoir.	11	P-83	Shifted approx. 780 m west from the earlier position.
2	P-72	Shifted 260 m southwest from the earlier position.	12	P-84	Shifted approx.2 km west from the earlier position.
3	P-73	Shifted 170 west from the earlier position.	13	P-85	Shifted 300 m west from the earlier position
4	P-76	Shifted 290 m west .from the earlier position.	14	P-87	Shifted 170 m west from the earlier position
5	P-78	Shifted 120 m south from the earlier position.	15	P-91	Shifted approx. 1 km north west from the earlier position.
6	P-79	Shifted approx. 1.2 km northwest from the earlier position.	16	P-93	Shifted approx. 1 km north west from the earlier position.
7	P-81	Shifted approx. 820 m northwest from the earlier position.			

Analyzing the vantage point study it is observed that the presence of three species of birds were found in abundance during the study period. They include Rosy Startling, Barn Swallow and Ashy crowned sparrow Lark. Rosy starling is a winter visitor to the study area and moves throughout India during autumn and spring season. Barn swallow is also a winter visitor

throughout India. Jerdon's Bush Lark is a resident bird abundantly found near agricultural field and scrub lands. **None of the species observed are endemic to the project area. Also, there is no Important Bird Area (IBA) in Annatapur district[10]. Also, no wildlife sanctuary, national parks or bird sanctuaries are present within 50 kms from the proposed project site.**

During the site visits no bats were spotted or any suitable habitat, roosts were identified. As the project site is devoid of large trees, old /abandoned structures, caves, abandoned dug well etc, the presence of bat is not anticipated but there are few patches near to the villages where large trees are present that may harbor bat roosting sites.

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. The majority of the birds recorded feed on insects followed by grains, nuts, seeds etc. With or without this project, scarce of foods (millet, nuts, seeds, nectar, insects, fish, shrimps, crabs, worms, small prey etc) are not envisaged on the basis of the type of farming and variety & growth of ground cover. 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.

[10] http://www.birdlife.org/

TABLE 7-9: VANTAGE POINT STUDY RESULTS

Vantage Point	Species Observed	*Scientific Name*	Sighted Habitat	Habitat Range	Count/Abundance	Observed Flight height (in m)	General Flight Height (in m)
VP1 (Upper Penneru reservoir) **Nearest WTGS-** P71, P72, P73, P74, P75, P76, P77, P78, P79, P80, P81, P83, P84, P85, P87, P89, P91, P93, P95	Little Swift	*Apus affinis*	Agricultural land and open scrubland	Rocky ravine and cliffs	73	30	30-40m.
	Common Myna	*Acridotheres tristis*	On dam boundary	Open woodland, cultivation and around habitation	3	10	within 20m from ground
	Rose ringed Parakeet	*Psittacula krameri*	Cultivated land and trees near dam	Cultivated areas, urban parks and gardens, open countryside with trees, palm-trees thickets, dry and open forest	18	10	flies on an average altitude of 15m
	Whiskered Tern	*Chlidonias hybridus*	Near waterbody	Shallow terrestrial freshwater wetlands, freshwater swamps, brackish and saline lakes, floodwaters, irrigated croplands and large dams	1	5	stays below 100 m
	Cattle Egret	*Bubulcus ibis*	Near marshy areas	Marshes, reservoirs, lakes, quarries, swamps, riverside woodlands, and upland forests	11	>100	10-20m
	House crow	*Corvus splendens*	On dam boundary and on trees	Near human habitation like villages, towns, buildings and on trees.	15	OTH	5-20m
	Little Cormorant	*Microcarbo niger*	Within waterbody	Found in bodies of water inland and occasionally sheltered coastal areas.	8	50	more than 40m
	Green Bee-eater	*Merops orientalis*	Agricultural land and open scrubland	Grassland, thin scrub and forest often quite far from water.	5	20	10-20m from ground
	White Browed Wagtail	*Motacilla maderaspatensis*	Near marshy areas	Open freshwater wetland habitats	2	5	Hardly fries above 30m
	Grey Heron	*Ardea cinerea*	Near water body	seen around lakes, rivers, ponds, marshes and on the sea coast	1	20	20-30m
	Laughing Dove	*Streptopelia senegalensis*	On trees	Dry scrub, semi-desert habitats, dry farmlands and habitation	2		Hardly flies above 30-40m
	Purple Sunbird	*Cinnyris asiaticus*	Cultivated land near dam	farmland, rural gardens, subtropical and tropical forests, and shrubland	2	10	within 15m from ground
	Barn Swallow	*Hirundo rustica*	Agricultural land and open scrubland	Forage in open areas, agricultural fields, beaches, and over open water such as lakes, ponds and coastal waters	1	*30-40*	within 20m
	Southern Coucal	*Centropus (sinensis) parroti*	Agricultural land and open scrubland	Wide range of habitats from jungle to cultivation and urban gardens	1	50	within 5m of ground
	Shikra	*Accipiter badius*	Cultivated land near dam	Forests, farmland and urban areas	3	20-30	50m-100m
	Brahminy Kite	*Haliastur indus*	Near marshy areas	On the coast and in inland wetlands	2	50	50m-300m

Vantage Point	Species Observed	*Scientific Name*	Sighted Habitat	Habitat Range	Count/Abundance	Observed Flight height (in m)	General Flight Height (in m)
	River Tern	*Sterna aurantia*	Within waterbody	Found in freshwtare like rivers	1	>10	within 5m from the water surface
	Short Toed Snake Eagle	*Circaetus gallicus*	Cultivated land	Open cultivated plains, arid stony deciduous scrub areas and foothills and semi-desert areas	1	*80*	80-300 m
	Blue Tailed Bee-eater	*Merops philippinus*	Near waterbody	It is most often seen near large waterbodies, farmland, parks or ricefields.	2	20-30	40-50m
VP2 (Konetinayanipalyam Water Body) Nearest WTGs-P63-68 and P-47. P-50, P-44, P-51,P-58, P-59, P-60.	Little Cormorant	*Microcarbo niger*	Near waterbody	Found in bodies of water inland and occasionally sheltered coastal areas.	24	40	more than 40m
	Montagu`s Harrier	*Circus pygargus*	Agricultural land	Nests mostly in broad river valleys, plains, and levels bordering lakes and the sea. Also in farmlands and grasslands.	2	20	60m to 300m
	Cattle Egret	*Bubulcus ibis*	Near marshy areas	Marshes, reservoirs, lakes, quarries, swamps, riverside woodlands, and upland forests	16	20	10-20m
	House crow	*Corvus splendens*	On trees	Near human habitation like villages, towns, buildings and on trees.	2	30	5-20m
	Rosy Starling	*Pastor roseus*	Agricultural land	A bird of steppe and open agricultural land	7	20	Capable of flying more than 100m from the ground
	Pond Heron	*Ardeola grayii*	Cultivated land or agricultural land	Rivers, lakes, marshes, mangroves, streams and paddy fields. Also in towns and cities	1	10	at 20-30m
	Eurasian Collared Dove	*Streptopelia decaocto*	Agricultural land	Mostly in agricultural areas	6	30	Hardly flies above 30-40m
	Barn Swallow	*Hirundo rustica*	Agricultural land	Forage in open areas, agricultural fields, beaches, and over open water such as lakes, ponds and coastal waters	45	30-50	within 20m
	Jerdon`s bushlark	*Mirafra affinis*	Agricultural land	Rocky scrubland, scrubby hill meadows and clearings in open-type forests, shrub-edged unused croplands, and thickets of bamboo	3	40	40-50m
	Black Drongo	*Dicrurus macrocercus*	Agricultural land	Open agricultural areas and light forest	1	30	15-20m
	Common Myna	*Acridotheres tristis*	Agricultural land	Open woodland, cultivation and around habitation	2	20	within 20m from ground
	Green Bee-eater	*Merops orientalis*	Open scrubland	Grassland, thin scrub and forest often quite far from water.	4	20	10-20m from ground
	Eurasian Marsh Harrier	*Circus aeruginosus*	Marshy areas near waterbody	Dense marsh vegetation, in fresh or brackish water, generally in lowlands	2	80	60m to 300m
	Brahminy Starling	*Sturnia pagodarum*	Marshy areas	Dry forest, scrub jungle and cultivation. Favour areas with waterlogged or marshy lands	2	10	<20 m

Vantage Point	Species Observed	*Scientific Name*	Sighted Habitat	Habitat Range	Count/Abundance	Observed Flight height (in m)	General Flight Height (in m)
	Purple Sunbird	*Cinnyris asiaticus*	Cultivated land	Farmland, rural gardens, subtropical and tropical forests, and shrubland	1	10	flies within 15m from ground
	White Throated Kingfisher	*Halcyon smyrnensis*	Cultivated land	Mostly in the plains with trees, wires or other perches	2	5	10-15m
VP3 (Acchampalli) **Nearest WTG-**P70-P75.	Barn Swallow	*Hirundo rustica*	Agricultural land	Forage in open areas, agricultural fields, beaches, and over open water such as lakes, ponds and coastal waters	31	20	within 20m
	Red wattled lapwing	*Vanellus indicus*	Near marshy areas	In close proximity to freshwater, such as wet grasslands, rivers, streams, creeks, marshes and pools. It may also be found on artificial land such as corn fields, ploughed land, rural gardens, and even occasionally on grass along highways	2	5	10-20m
	Pond Heron	*Ardeola grayii*	Cultivated land	Rivers, lakes, marshes, mangroves, streams and paddy fields. Also in towns and cities	1	5	at 20-30m
	Whiskered Tern	*Chlidonias hybridus*	Near waterbody	Shallow terrestrial freshwater wetlands, freshwater swamps, brackish and saline lakes, floodwaters, irrigated croplands and large dams	1	30	stays below 100 m
	Pallid Harrier	*Circus macrourus*	Agricultural land	open plains, bogs and heathland	2	10	60m to 300m
	Little Cormorant	*Microcarbo niger*	Near waterbody	Found in bodies of water inland and occasionally sheltered coastal areas.	1	50	more than 40m
	Black Drongo	*Dicrurus macrocercus*	Agricultural land	Open agricultural areas and light forest	1	30	15-20m
	Rosy Starling	*Pastor roseus*	Agricultural land	A bird of steppe and open agricultural land	6	50	Capable of flying more than 100m from the ground
	River Tern	*Sterna aurantia*	Within waterbody	Found in freshwtare like rivers	1	20	within 5m from the water surface
	Jerdon`s bushlark	*Mirafra affinis*	Agricultural land	Rocky scrubland, scrubby hill meadows and clearings in open-type forests, shrub-edged unused croplands, and thickets of bamboo	6	30	40-50m
VP4 (Reserve Forest) Nearest WTGs- P01-P-20, P15, P 27, P 25, P32, P29, P22, P37, P39, P52, P56,P40.	Laughing Dove	*Streptopelia senegalensis*	Woody plants	Dry scrub, semi-desert habitats, dry farmlands and habitation	5	10	Hardly flies above 30-40m
	Purple Sunbird	*Cinnyris asiaticus*	Cultivated land	farmland, rural gardens, subtropical and tropical forests, and shrubland	2	10	flies within 15m from ground
	Red Vented Bulbul	*Pycnonotus cafer*	open scrubland	dry scrub, open forest, plains and cultivated lands	5	20	10-15m from ground
	Black	*Dicrurus*	Agricultural	Open agricultural areas and light forest	1	20	15-20m

Vantage Point	Species Observed	*Scientific Name*	Sighted Habitat	Habitat Range	Count/Abundance	Observed Flight height (in m)	General Flight Height (in m)
	Drongo	*macrocercus*	land				
	Eurasian Collared Dove	*Streptopelia decaocto*	Agricultural land	Mostly in agricultural areas	7	40	Hardly flies above 30-40m
	Common Hoopoe	*Upupa epops*	Agricultural land	heathland, wooded steppes, savannas and grasslands, as well as forest glades	2	20	within 25m
	Jerdon`s bushlark	*Mirafra affinis*	Agricultural land	Rocky scrubland, scrubby hill meadows and clearings in open-type forests, shrub-edged unused croplands, and thickets of bamboo	3	20	40-50m
	House crow	*Corvus splendens*	On trees	Near human habitation like villages, towns, buildings and on trees.	6	40	5-20m
	Purple rumped Sunbird	*Leptocoma zeylonica*	Cultivated land	farmland, rural gardens, subtropical and tropical forests, and shrubland	2	10	30-40m
	Barn Swallow	*Hirundo rustica*	Agricultural land	Forage in open areas, agricultural fields, beaches, and over open water such as lakes, ponds and coastal waters	2	30	within 20m
	Montagu`s Harrier	*Circus pygargus*	Agricultural land	Nests mostly in broad river valleys, plains, and levels bordering lakes and the sea. Also in farmlands and grasslands.	2	10	60m to 300m
	White Eyed Buzzard	*Butastur teesa*	Agricultural land	dry, open forest or cultivation	1	80	>60m
	Cattle Egret	*Bubulcus ibis*	Near marshy areas	Marshes, reservoirs, lakes, quarries, swamps, riverside woodlands, and upland forests	1	20	10-20m
	Red Rumped Swallow	*Cecropis daurica*	Agricultural land	Mostly grasslands	2	30	20m from ground
VP5 (Potapallem Water Body) **Nearest WTGs**-P54, P46, P55, P48, P61, P30,P24,P42,P34,P33,P35.	House crow	*Corvus splendens*	On trees	Near human habitation like villages, towns, buildings and on trees.	30	40	5-20m
	Indian Robin	*Saxicoloides fulicatus*	Open scrublands	open stony, grassy and scrub forest habitats	1	10	30-40
	Rose ringed Parakeet	*Psittacula krameri*	Cultivated land and trees	Cultivated areas, urban parks and gardens, open countryside with trees, palm-trees thickets, dry and open forest	2	50	flies on an average altitude of 15m
	Red Vented Bulbul	*Pycnonotus cafer*	open scrubland	dry scrub, open forest, plains and cultivated lands	2	30	10-15m from ground
	Laughing Dove	*Streptopelia senegalensis*	On trees	Dry scrub, semi-desert habitats, dry farmlands and habitation	5	10	Hardly flies above 30-40m
	Barn Swallow	*Hirundo rustica*	Agricultural land	Forage in open areas, agricultural fields, beaches, and over open water such as lakes, ponds and coastal waters	47	20	within 20m
	White Throated Kingfisher	*Halcyon smyrnensis*	Cultivated land	Mostly in the plains with trees, wires or other perches	1	20	10-15m

Vantage Point	Species Observed	*Scientific Name*	Sighted Habitat	Habitat Range	Count/Abundance	Observed Flight height (in m)	General Flight Height (in m)
	Ashy crowned Sparrow Lark	*Eremopterix griseus*	Agricultural land	Rocky scrubland, scrubby hill meadows and clearings in open-type forests, shrub-edged unused croplands, and thickets of bamboo	100+	30-40	40-50m
	Pallid Harrier	*Circus macrourus*	Agricultural land	open plains, bogs and heathland	2	20	60m to 300m
	Eurasian Collared Dove	*Streptopelia decaocto*	Agricultural land	Mostly in agricultural areas	4	10	Hardly flies above 30-40m
	Cattle Egret	*Bubulcus ibis*	Cultivated areas	Marshes, reservoirs, lakes, quarries, swamps, riverside woodlands, and upland forests	36	20	10-20m
VP6 (Ralla Anantapur) **Nearest WTGs-** R89,R86,R84,R81,R80,R79,R77,R75,R72,R70,R68,R67.	Red wattled lapwing	*Vanellus indicus*	Near marshy areas	In close proximity to freshwater, such as wet grasslands, rivers, streams, creeks, marshes and pools. It may also be found on artificial land such as corn fields, ploughed land, rural gardens, and even occasionally on grass along highways	13	20	10-20m
	Eurasian Collared Dove	*Streptopelia decaocto*	Agricultural land	Mostly in agricultural areas	2	20	Hardly flies above 30-40m
	Pond Heron	*Ardeola grayii*	Cultivated land or agricultural land	Rivers, lakes, marshes, mangroves, streams and paddy fields. Also in towns and cities	3	10	at 20-30m
	Barn Swallow	*Hirundo rustica*	Agricultural land	Forage in open areas, agricultural fields, beaches, and over open water such as lakes, ponds and coastal waters	21	40	within 20m
	Green Bee-eater	*Merops orientalis*	Open scrubland	Grassland, thin scrub and forest often quite far from water.	1	40	10-20m from ground
	House crow	*Corvus splendens*	On trees	Near human habitation like villages, towns, buildings and on trees.	29	50	5-20m
	Purple rumped Sunbird	*Leptocoma zeylonica*	Cultivated land	farmland, rural gardens, subtropical and tropical forests, and shrubland	1	10	30-40m
	Cattle Egret	*Bubulcus ibis*	Cultivated areas	Marshes, reservoirs, lakes, quarries, swamps, riverside woodlands, and upland forests	48	30	10-20m
	Eurasian Marsh Harrier	*Circus aeruginosus*	Marshy areas near waterbody	Dense marsh vegetation, in fresh or brackish water, generally in lowlands	4	20	60m to 300m
	Little Cormorant	*Microcarbo niger*	Near waterbody	Found in bodies of water inland and occasionally sheltered coastal areas.	4	5	more than 40m
	River Tern	*Sterna aurantia*	Within waterbody	Found in freshwtare like rivers	12	4	within 5m from the water surface
	Common Hoopoe	*Upupa epops*	Agricultural land	heathland, wooded steppes, savannas and grasslands, as well as forest glades	1	30	within 25m
	Spot Billed	*Anas*	Within	freshwater lakes and marshes	1	2	within 5m

Vantage Point	Species Observed	*Scientific Name*	Sighted Habitat	Habitat Range	Count/Abundance	Observed Flight height (in m)	General Flight Height (in m)
	duck	*poecilorhyncha*	waterbody				from the water surface
	Jerdon`s bushlark	*Mirafra affinis*	Agricultural land	Rocky scrubland, scrubby hill meadows and clearings in open-type forests, shrub-edged unused croplands, and thickets of bamboo	15	50	30-40m
VP7 (Kurakullapalle) Nearest WTGs- P71, P72, P73, P74, P75, P76, P77, P78, P79, P80.	Red Rumped Swallow	*Cecropis daurica*	Agricultural land	Mostly grasslands	2	20	20m from ground
	Indian Silverbill	*Euodice malabarica*	Agricultural land	dry open scrub, fallow land and cultivation, sometimes near water	3	10	10-15m
	Common Hoopoe	*Upupa epops*	Agricultural land	heathland, wooded steppes, savannas and grasslands, as well as forest glades	1	15	within 25m
	Purple Sunbird	*Cinnyris asiaticus*	Cultivated land	farmland, rural gardens, subtropical and tropical forests, and shrubland	3	10	flies within 15m from ground
	Green Bee-eater	*Merops orientalis*	Open scrubland	Grassland, thin scrub and forest often quite far from water.	1	10	10-20m from ground
	Common Myna	*Acridotheres tristis*	On wires above agricultural land	Open woodland, cultivation and around habitation	1	10	within 20m from ground
	Laughing Dove	*Streptopelia senegalensis*	Woody plants	Dry scrub, semi-desert habitats, dry farmlands and habitation	1	20	Hardly flies above 30-40m
	Pond Heron	*Ardeola grayii*	Cultivated land	Rivers, lakes, marshes, mangroves, streams and paddy fields. Also in towns and cities	1	10	at 20-30m
	Eurasian Collared Dove	*Streptopelia decaocto*	Agricultural land	Mostly in agricultural areas	1	5	Hardly flies above 30-40m
	House crow	*Corvus splendens*	On wires above agricultural land	Near human habitation like villages, towns, buildings and on trees.	4	10	5-20m
	Cattle Egret	*Bubulcus ibis*	Near marshy areas	Marshes, reservoirs, lakes, quarries, swamps, riverside woodlands, and upland forests	2	30	10-20m
VP8 (Ayyampalli Near Rservered Forest) Nearest WTGs- P81, P83, P84, P85, P87, P89, P91, P93, P95.	Rosy Starling	*Pastor roseus*	Agricultural land	A bird of steppe and open agricultural land	8	10	Capable of flying more than 100m from the ground
	Lesser Whitethroat	*Sylvia curruca*	Agricultural land	Farmlands, grassland, town gardens and woodland	1	5	30-40m
	Barn Swallow	*Hirundo rustica*	Agricultural land	Forage in open areas, agricultural fields, beaches, and over open water such as lakes, ponds and coastal waters	4	10	within 20m
	Common	*Acridotheres*	Agricultural	Open woodland, cultivation and around habitation	9	30	within 20m

Vantage Point	Species Observed	*Scientific Name*	Sighted Habitat	Habitat Range	Count/Abundance	Observed Flight height (in m)	General Flight Height (in m)
	Myna	*tristis*	land				from ground
	Cattle Egret	*Bubulcus ibis*	Near marshy areas	Marshes, reservoirs, lakes, quarries, swamps, riverside woodlands, and upland forests	7	30	10-20m
	Laughing Dove	*Streptopelia senegalensis*	Woody plants	Dry scrub, semi-desert habitats, dry farmlands and habitation	6	20	Hardly flies above 30-40m
	Jerdon`s bushlark	*Mirafra affinis*	Agricultural land	Rocky scrubland, scrubby hill meadows and clearings in open-type forests, shrub-edged unused croplands, and thickets of bamboo	18	30	30-40m
	Rose ringed Parakeet	*Psittacula krameri*	Cultivated land and trees	Cultivated areas, urban parks and gardens, open countryside with trees, palm-trees thickets, dry and open forest	3	10	flies on an average altitude of 15m
	Common Hoopoe	*Upupa epops*	Agricultural land	heathland, wooded steppes, savannas and grasslands, as well as forest glades	2	20	within 25m
	Black Drongo	*Dicrurus macrocercus*	Agricultural land	Open agricultural areas and light forest	4	20	15-20m
	Green Bee-eater	*Merops orientalis*	Open scrubland	Grassland, thin scrub and forest often quite far from water.	2	10	10-20m from ground
	Eurasian Collared Dove	*Streptopelia decaocto*	Agricultural land	Mostly in agricultural areas	2	10	Hardly flies above 30-40m
	Purple Sunbird	*Cinnyris asiaticus*	Cultivated land	farmland, rural gardens, subtropical and tropical forests, and shrubland	1	10	flies within 15m from ground
	Black winged Kite	*Elanus caeruleus*	On tree	preferred habitat is open grasslands with scattered trees	1	30	>60m

FIGURE 7-3: TYPE OF BIRD SPECIES OBSERVED IN THE PROJECT AREA

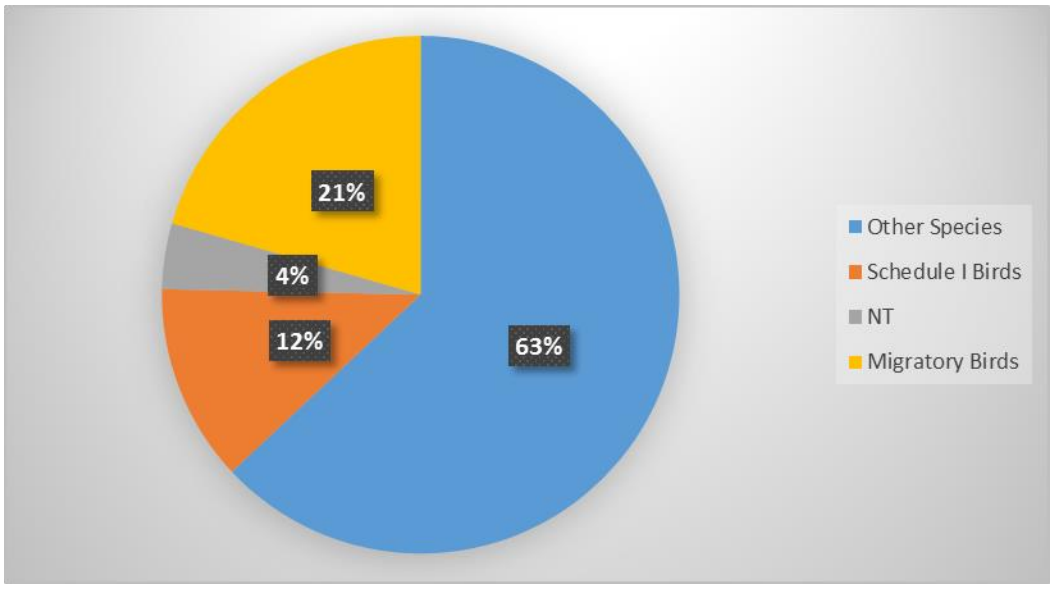


FIGURE 7-4: RISK CATEGORY FOR COLLISION OF BIRDS WITH RESPECT TO ABUNDANCE

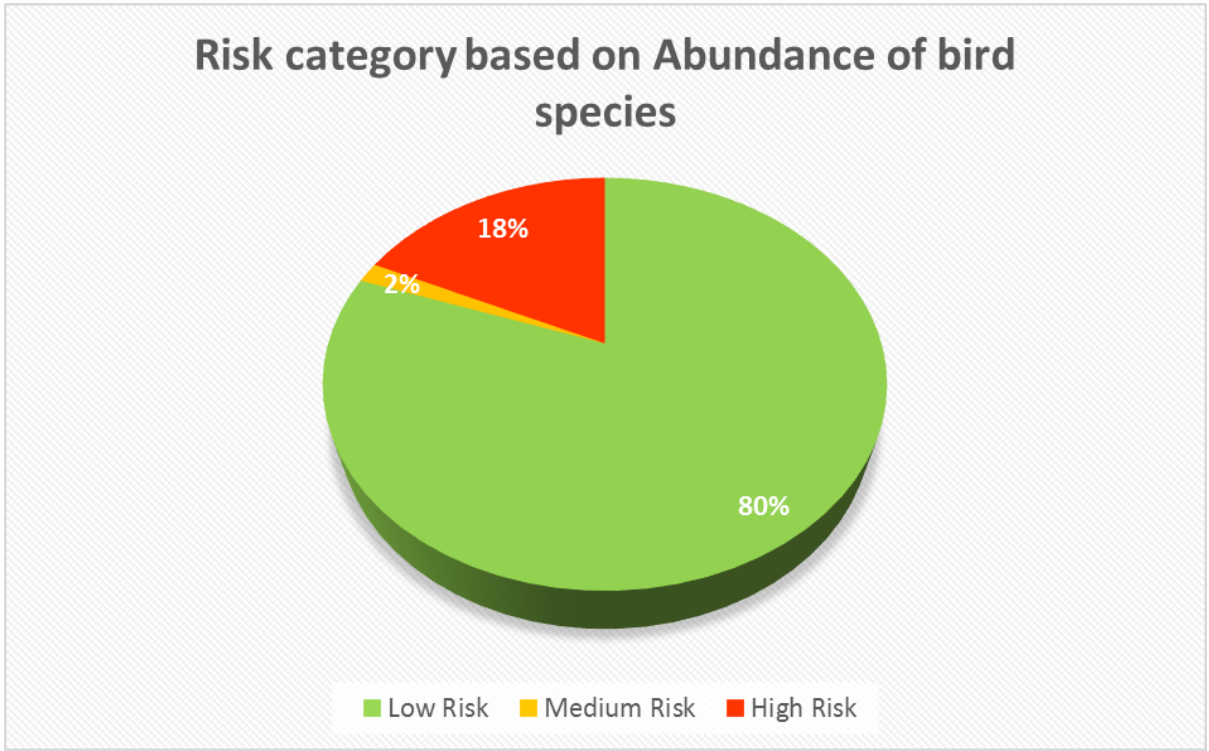


TABLE 7-10: COLLISION RISK ASSESSMENT

Vantage Point	Species Observed	*Scientific Name*	*IUCN Status*	*WPA Schedule*	Count (No. Observed)	General Flight Height (in m)	Probable Collision Risk	Degree of Impact
VP1 (Upper Penneru reservoir) **Nearest WTGS-** P71, P72, P73, P74, P75, P76, P77, P78, P79, P80, P81, P83, P84, P85, P87, P89, P91, P93, P95	Little Swift	*Apus affinis*	LC		73	30-40m.	High	Minor
	Common Myna	*Acridotheres tristis*	LC	Schedule IV	3	within 20m from ground	Low	Minor
	Rose ringed Parakeet	*Psittacula krameri*	LC	Schedule IV	18	flies on an average altitude of 15m	Low	Minor
	Whiskered Tern	*Chlidonias hybridus*	LC	Schedule IV	1	stays below 100 m	Medium	Minor
	Cattle Egret	*Bubulcus ibis*	LC	Schedule IV	11	10-20m	Low	Minor
	House crow	*Corvus splendens*	LC	Schedule IV	15	5-20m	Low	Minor
	Little Cormorant	*Microcarbo niger*	LC	Schedule IV	8	more than 40m	High	Moderate
	Green Bee-eater	*Merops orientalis*	LC	Schedule IV	5	10-20m from ground	Low	Minor
	White Browed Wagtail	*Motacilla maderaspatensis*	LC	Schedule IV	2	Hardly flies above 30m	Low	Minor
	Grey Heron	*Ardea cinerea*	LC	Schedule IV	1	20-30m	Low	Minor
	Laughing Dove	*Streptopelia senegalensis*	LC	Schedule IV	2	Hardly flies above 30-40m	Medium	Minor
	Purple Sunbird	*Cinnyris asiaticus*	LC	Schedule IV	2	within 15m from ground	Low	Minor
	Barn Swallow	*Hirundo rustica*	LC		1	within 20m	Low	Minor
	Southern Coucal	*Centropus (sinensis) parroti*	LC	Schedule IV	1	within 5m of ground	Low	Minor
	Shikra	*Accipiter badius*	LC	Schedule I	3	50m-100m	Medium	Major
	Brahminy Kite	*Haliastur indus*	LC	Schedule I	2	50m-300m	High	Major
	River Tern	*Sterna aurantia*	NT	Schedule IV	1	within 5m from the water surface	Low	Moderate
	Short Toed Snake Eagle	*Circaetus gallicus*	LC	Schedule I	1	80-300 m	High	Major
	Blue Tailed Bee-eater	*Merops philippinus*	LC		2	40-50m	Medium	Minor
VP2 (Konetinayanipalyam Water Body) **Nearest WTGs-**P63-68 and P47, P50, P44, P51, P58, P59, P60.	Little Cormorant	*Microcarbo niger*	LC	Schedule IV	24	more than 40m	High	Minor
	Montagu`s Harrier	*Circus pygargus*	LC	Schedule I	2	60m to 300m	High	Major
	Cattle Egret	*Bubulcus ibis*	LC	Schedule IV	16	10-20m	Low	Minor
	House crow	*Corvus splendens*	LC	Schedule IV	2	5-20m	Low	Minor
	Rosy Starling	*Pastor roseus*	LC	Schedule IV	7	Capable of flying more than 100m from the ground	High	Moderate
	Pond Heron	*Ardeola grayii*	LC	Schedule IV	1	at 20-30m	Low	Minor
	Eurasian Collared Dove	*Streptopelia decaocto*	LC	Schedule IV	6	Hardly flies above 30-40m	High	Moderate

Vantage Point	Species Observed	*Scientific Name*	*IUCN Status*	*WPA Schedule*	Count (No. Observed)	General Flight Height (in m)	Probable Collision Risk	Degree of Impact
	Barn Swallow	*Hirundo rustica*	LC		45	within 20m	Medium	Minor
	Jerdon`s bushlark	*Mirafra affinis*	LC	Schedule IV	3	40-50m	Medium	Minor
	Black Drongo	*Dicrurus macrocercus*	LC	Schedule IV	1	15-20m	Low	Minor
	Common Myna	*Acridotheres tristis*	LC	Schedule IV	2	within 20m from ground	Low	Minor
	Green Bee-eater	*Merops orientalis*	LC	Schedule IV	4	10-20m from ground	Low	Minor
	Eurasian Marsh Harrier	*Circus aeruginosus*	LC	Schedule I	2	60m to 300m	High	Major
	Brahminy Starling	*Sturnia pagodarum*	LC	Schedule IV	2	<20 m	Low	Minor
	Purple Sunbird	*Cinnyris asiaticus*	LC	Schedule IV	1	flies within 15m from ground	Low	Minor
	White Throated Kingfisher	*Halcyon smyrnensis*	LC	Schedule IV	2	10-15m	Low	Minor
VP3 (Acchampalli) **Nearest WTG-**P70-P75.	Barn Swallow	*Hirundo rustica*	LC		31	within 20m	Medium	Minor
	Red wattled lapwing	*Vanellus indicus*	LC	Schedule IV	2	10-20m	Low	Minor
	Pond Heron	*Ardeola grayii*	LC	Schedule IV	1	at 20-30m	Low	Minor
	Whiskered Tern	*Chlidonias hybridus*	LC	Schedule IV	1	stays below 100 m	Medium	Minor
	Pallid Harrier	*Circus macrourus*	NT	Schedule I	2	60m to 300m	High	Major
	Little Cormorant	*Microcarbo niger*	LC	Schedule IV	1	more than 40m	Medium	Minor
	Black Drongo	*Dicrurus macrocercus*	LC	Schedule IV	1	15-20m	Low	Minor
	Rosy Starling	*Pastor roseus*	LC	Schedule IV	6	Capable of flying more than 100m from the ground	High	Moderate
	River Tern	*Sterna aurantia*	NT	Schedule IV	1	within 5m from the water surface	Low	Moderate
	Jerdon`s bushlark	*Mirafra affinis*	LC	Schedule IV	6	40-50m	High	Moderate
VP4 (Reserve Forest) **Nearest WTGs-** P01-P20, P15, P27, P25, P32, P29, P22, P37, P39, P52, P56, P40.	Laughing Dove	*Streptopelia senegalensis*	LC	Schedule IV	5	Hardly flies above 30-40m	High	Moderate
	Purple Sunbird	*Cinnyris asiaticus*	LC	Schedule IV	2	flies within 15m from ground	Low	Minor
	Red Vented Bulbul	*Pycnonotus cafer*	LC	Schedule IV	5	10-15m from ground	Low	Minor
	Black Drongo	*Dicrurus macrocercus*	LC	Schedule IV	1	15-20m	Low	Minor
	Eurasian Collared Dove	*Streptopelia decaocto*	LC	Schedule IV	7	Hardly flies above 30-40m	High	Moderate
	Common Hoopoe	*Upupa epops*	LC	Schedule IV	2	within 25m	Low	Minor
	Jerdon`s bushlark	*Mirafra affinis*	LC	Schedule IV	3	40-50m	medium	Minor
	House crow	*Corvus splendens*	LC	Schedule IV	6	5-20m	Low	Minor
	Purple rumped Sunbird	*Leptocoma zeylonica*	LC	Schedule IV	2	30-40m	Medium	Minor
	Barn Swallow	*Hirundo rustica*	LC		2	within 20m	Low	Minor
	Montagu`s	*Circus pygargus*	LC	Schedule I	2	60m to 300m	High	Major

Vantage Point	Species Observed	*Scientific Name*	*IUCN Status*	*WPA Schedule*	Count (No. Observed)	General Flight Height (in m)	Probable Collision Risk	Degree of Impact
	Harrier							
	White Eyed Buzzard	*Butastur teesa*	LC	Schedule I	1	>60m	Medium to High	Major
	Cattle Egret	*Bubulcus ibis*	LC	Schedule IV	1	10-20m	Low	Minor
	Red Rumped Swallow	*Cecropis daurica*	LC		2	20m from ground	Low	Minor
VP5 (Potapallem Water Body) **Nearest WTGs-**P54, P46, P55, P48, P61, P30, P24, P42, P34, P33, P35.	House crow	*Corvus splendens*	LC	Schedule IV	30	5-20m	Medium	Minor
	Indian Robin	*Saxicoloides fulicatus*	LC	Schedule IV	1	30-40	Medium	Minor
	Rose ringed Parakeet	*Psittacula krameri*	LC	Schedule IV	2	flies on an average altitude of 15m	Low	Minor
	Red Vented Bulbul	*Pycnonotus cafer*	LC	Schedule IV	2	10-15m from ground	Low	Minor
	Laughing Dove	*Streptopelia senegalensis*	LC	Schedule IV	5	Hardly flies above 30-40m	Medium	Minor
	Barn Swallow	*Hirundo rustica*	LC		47	within 20m	Medium	Minor
	White Throated Kingfisher	*Halcyon smyrnensis*	LC	Schedule IV	1	10-15m	Low	Minor
	Ashy crowned Sparrow Lark	*Eremopterix griseus*	LC	Schedule IV	100+	40-50m	High	Moderate
	Pallid Harrier	*Circus macrourus*	NT	Schedule I	2	60m to 300m	High	Major
	Eurasian Collared Dove	*Streptopelia decaocto*	LC	Schedule IV	4	Hardly flies above 30-40m	Medium	Minor
	Cattle Egret	*Bubulcus ibis*	LC	Schedule IV	36	10-20m	Medium	Minor
VP6 (Ralla Anantapur) **Nearest WTGs-**R89, R86, R84, R81, R80, R79, R77, R75, R72, R70, R68, R67.	Red wattled lapwing	*Vanellus indicus*	LC	Schedule IV	13	10-20m	Low	Minor
	Eurasian Collared Dove	*Streptopelia decaocto*	LC	Schedule IV	2	Hardly flies above 30-40m	Medium	Minor
	Pond Heron	*Ardeola grayii*	LC	Schedule IV	3	at 20-30m	Low	Minor
	Barn Swallow	*Hirundo rustica*	LC		21	within 20m	Medium	Minor
	Green Bee-eater	*Merops orientalis*	LC	Schedule IV	1	10-20m from ground	Low	Minor
	House crow	*Corvus splendens*	LC	Schedule IV	29	5-20m	Medium	Minor
	Purple rumped Sunbird	*Leptocoma zeylonica*	LC	Schedule IV	1	30-40m	Medium	Minor
	Cattle Egret	*Bubulcus ibis*	LC	Schedule IV	48	10-20m	Medium	Minor
	Eurasian Marsh Harrier	*Circus aeruginosus*	LC	Schedule I	4	60m to 300m	High	Major
	Little Cormorant	*Microcarbo niger*	LC	Schedule IV	4	more than 40m	Medium	Minor
	River Tern	*Sterna aurantia*	NT	Schedule IV	12	within 5m from the water surface	Low	Moderate
	Common Hoopoe	*Upupa epops*	LC		1	within 25m	Low	Minor
	Spot Billed duck	*Anas poecilorhyncha*	LC	Schedule IV	1	within 5m from the water surface	Low	Minor
	Jerdon`s bushlark	*Mirafra affinis*	LC	Schedule IV	15	30-40m	High	Moderate
VP7 (Kurakullapalle)	Red Rumped	*Cecropis daurica*	LC		2	20m from ground	Low	Minor

Vantage Point	Species Observed	*Scientific Name*	*IUCN Status*	*WPA Schedule*	Count (No. Observed)	General Flight Height (in m)	Probable Collision Risk	Degree of Impact
	Swallow							
Nearest WTGs- P71, P72, P73, P74, P75, P76, P77, P78, P79, P80.	Indian Silverbill	*Euodice malabarica*	LC	Schedule IV	3	10-15m	Low	Minor
	Common Hoopoe	*Upupa epops*	LC		1	within 25m	Low	Minor
	Purple Sunbird	*Cinnyris asiaticus*	LC	Schedule IV	3	flies within 15m from ground	Low	Minor
	Green Bee-eater	*Merops orientalis*	LC	Schedule IV	1	10-20m from ground	Low	Minor
	Common Myna	*Acridotheres tristis*	LC	Schedule IV	1	within 20m from ground	Low	Minor
	Laughing Dove	*Streptopelia senegalensis*	LC	Schedule IV	1	Hardly flies above 30-40m	Medium	Minor
	Pond Heron	*Ardeola grayii*	LC	Schedule IV	1	at 20-30m	Low	Minor
	Eurasian Collared Dove	*Streptopelia decaocto*	LC	Schedule IV	1	Hardly flies above 30-40m	Medium	Minor
	House crow	*Corvus splendens*	LC	Schedule IV	4	5-20m	Low	Minor
	Cattle Egret	*Bubulcus ibis*	LC	Schedule IV	2	10-20m	Low	Minor
VP8 (Ayyampalli Near Rservered Forest) **Nearest WTGs-** P81, P83, P84, P85, P87, P89, P91, P93, P95.	Rosy Starling	*Pastor roseus*	LC	Schedule IV	8	Capable of flying more than 100m from the ground	High	Moderate
	Lesser Whitethroat	*Sylvia curruca*	LC	Schedule IV	1	30-40m	Medium	Minor
	Barn Swallow	*Hirundo rustica*	LC		4	within 20m	Low	Minor
	Common Myna	*Acridotheres tristis*	LC	Schedule IV	9	within 20m from ground	Low	Minor
	Cattle Egret	*Bubulcus ibis*	LC	Schedule IV	7	10-20m	Low	Minor
	Laughing Dove	*Streptopelia senegalensis*	LC	Schedule IV	6	Hardly flies above 30-40m	Medium	Minor
	Jerdon`s bushlark	*Mirafra affinis*	LC	Schedule IV	18	30-40m	High	Moderate
	Rose ringed Parakeet	*Psittacula krameri*	LC	Schedule IV	3	flies on an average altitude of 15m	Low	Minor
	Common Hoopoe	*Upupa epops*	LC		2	within 25m	Low	Minor
	Black Drongo	*Dicrurus macrocercus*	LC	Schedule IV	4	15-20m	Low	Minor
	Green Bee-eater	*Merops orientalis*	LC	Schedule IV	2	10-20m from ground	Low	Minor
	Eurasian Collared Dove	*Streptopelia decaocto*	LC	Schedule IV	2	Hardly flies above 30-40m	Medium	Minor
	Purple Sunbird	*Cinnyris asiaticus*	LC	Schedule IV	1	flies within 15m from ground	Low	Minor
	Black winged Kite	*Elanus caeruleus*	LC	Schedule I	1	>60m	Medium to high	Major

General Flight Height	Less than 34m	34 to 167m	More than 167m

Vantage Point	**Species Observed**	***Scientific Name***	***IUCN Status***	***WPA Schedule***	**Count (No. Observed)**	**General Flight Height (in m)**	**Probable Collision Risk**	**Degree of Impact**

Probable Collision Risk:

No. Observed for each species			
Less than 5	Low	Medium	Medium
5 - 20	Low	High	Medium
More than 20	Medium	High	High

Degree of Impact:

Collision Risk / **Conservation Status**	**High**	**Medium**	**Low**
Schedule I	Major	Major	Moderate
Near Threatened	Major	Moderate	Moderate
Schedule IV	Moderate	Minor	Minor
Others	Minor	Minor	Minor

Mitigation Measures

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

- The tip of blades of WTGs should be painted to increase visibility and avoid collision. This is also done for established aircraft navigation path.

- Any dead animals/carcass shall be removed in time from the site so that it does not attract movement of raptors near to the WTGs

- Training of local staff and security guards for spotting of bird carcass and reporting the same. 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.

- A detailed bird and bat survey and monitoring for all season shall be required post operation of the project preferable for 1 year.

OVERALL IMPACT ASSESSMENT

The overall assessment suggests that the proposed project will not lead to displacement of habitat for birds. Also, loss of habitat is not anticipated for mammals and other avifauna. The vantage point study undertaken for bird collision risk assessment revealed that there is total nine Schedule- I species (as per Indian Wildlife Protection Act, 1972)and three Near Threatened species (as per IUCN Classification of species) observed to be present in the study area. Eleven species of birds are observed to under high collision risk assessed on the basis of conservation status, abundance, general flight height and migratory status. About 12% of observed bird species are categorized as Schedule-I species, 4% comprises of Near Threatened species and 21 % comprises of migratory birds. About 18% of the species of birds observed in the area has a high risk of collision with the wind turbine out of which 8.8% comprises of Schedule I species and 9.26% comprises of other high risk species. However, in terms of abundance only 5.36% of the total bird population in the area has high risk of collision out of which 2.6% of birds belong to Schedule-I category.

Based on above discussion, the impact on birds during operation phase of the project is envisaged to be moderate. WTGs located close to Penneru reservoir is at high risk for bird collision mortality and may be considered for relocation.

Phase Of the Project	Risk Assessed
Construction	Minor
Operation	Moderate

7.4.6 Impact on Traffic

The road from Dharamavram- Kalyandurg road 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 labors 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. The movement of public buses and two wheelers were also observed moderately in the project area. Considering the shorter period of construction activities and adequate preventive measures to curb the incremental load of vehicular traffic in the project area, the impact can be anticipated as minor. .

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.
- Alternative access routes for the transport of project construction equipment and wind turbine parts to project site shall be identified whenever 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

Phase Of the Project	Risk Assessed
Construction	Minor
Operation	Minor

7.4.7 Effect On Rainfall

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.

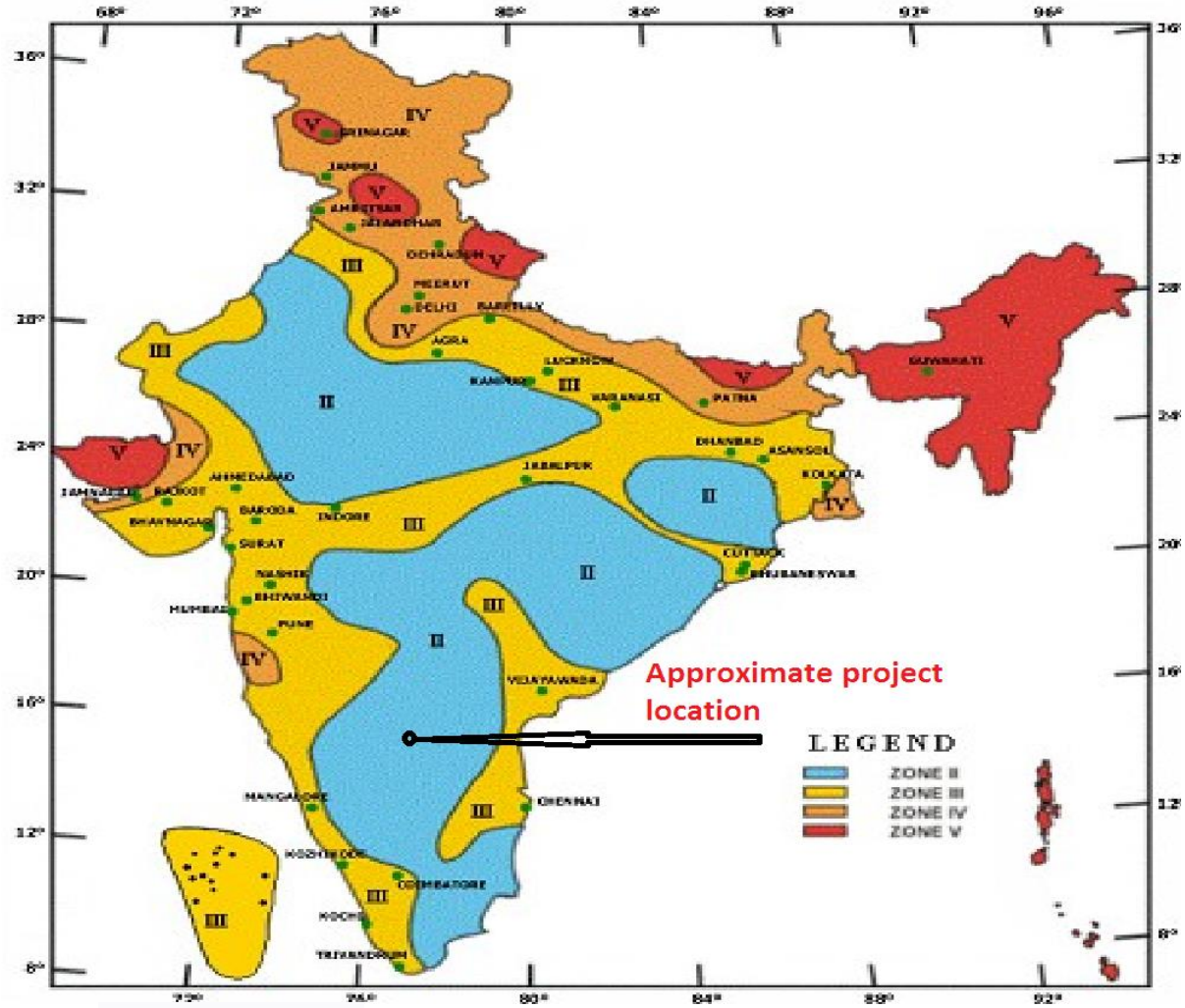
OVERALL IMPACT ASSESSMENT

Phase Of the Project	Risk Assessed
Construction	No impact
Operation	No impact

7.4.8 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 7.2.**

FIGURE 7-5: SEISMIC ZONING MAP OF INDIA



Source: www.isr.gujarat.gov.in

OVERALL IMPACT ASSESSMENT

Phase Of the Project	Risk Assessed
Construction	No impact
Operation	Minor

7.4.9 Aviation Hazard

No aviation hazard will be created by the Project as it is located about 200 km from Bangalore Airport. There are no small and large airports nearby.

OVERALL IMPACT ASSESSMENT

Phase Of the Project	Risk Assessed
Construction	No impact
Operation	No impact

7.4.10 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 7.9.

TABLE 7-11: SHADOW FLICKER SENSITIVITY

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 modeling has also been conducted to estimate the shadow flicker hours on nearby receptors or community.

Shadow Flicker Modeling

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

Both the worst case and real 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.

(A) Worst Case Scenario

Initially, the modeling 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 and S-111

The proposed project is planned with wind turbine model S-97 and S-111. These turbine models are manufactured by Suzlon and technical specification (already presented in Table 3.9; chapter -3) of these turbine was used while modeling.

Total 57 receptors have been identified through desktop study and site visit. 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 modeling:

- The sun is shining all the day, from sunrise to sunset
- The rotor plane is always perpendicular to the line from the WTG to the sun
- The WTG is always operating

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 scenario approach will be in the form of cumulative impacted receptors location and number of shadow flicker impact. The analysis of outcome will provide sensitive locations of WTGs with respect to shadow flicker impact. The outcome of worst case scenario approach will be then used for real scenario modeling.

(B) Real Case Scenario

The sensitive WTG locations resulted from the analysis of worst case scenario outcome will then be used as input in real scenario approach. The outcome of real scenario approach will be in the form of expected hours of shadow flickering on identified receptors. To run the real case scenario for shadow flickering following data have been used in software:

- Annual operational hours estimated for WTGs
- Sunshine hours of project site/nearby location

The real case scenario result will be then analyzed with respect to cumulative impacted receptors and sensitive locations of WTGs. The maximum no. of hours (more than 30 hrs/year[11]) of shadow flickering occurrence in real scenario will be considered as **significant cumulative impact on the receptors**. The locations of WTGs contributing the significant cumulative impact will be identified and mitigation measures will be delineated for such locations.

Shadow Flicker Analysis Results

The cumulative impact of proposed wind farm with 101 WTG locations (including alternative locations) was assessed for shadow flicker impact. Out of 57 identified receptors, 16 receptors have been identified with **significant cumulative impact** in worst case scenario and presented in Annexure XIX. The locations of WTGs causing significant cumulative impacts on 16 receptors has also been identified and represented as **sensitive WTG locations** in Annexure XIX. Based on the worst case scenario result, real case scenario was developed for the sensitive WTG locations (as identified in worst case scenario modeling) and modeled in Windpro software to estimate the expected number of shadow flickering hours.

Analysis of real case scenario result reveals that only two receptor's locations (L (RE12) & M (RE13)) are expected to face more than 30 hrs/year of shadow flicker. The

[11] Dutch standards of 30 hrs/year was used in analysis of significant impact. In, India shadow flickering standards are not available

locations of WTGs causing this cumulative impacts of shadow flickering was also identified and presented in Table 7.12. The graphical presentation of cumulative shadow flickering impact (contour line) on these two significant impacted receptors is presented as Figure 7.7. Detailed modelling results for all WTGs and receptors are presented in ***Annexure XIX.***

Mitigation Measures:

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

- Total 94 WTGs are proposed in this project while 101 WTG locations have been analyzed for shadow flicker impact therefore identified sensitive WTG locations which are P76 & P77 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.
    - Undertake plantation to hide shadow flicker near receptors (households) identified with significant impact

Details modelling results for all WTGs and receptors are presented in ***Annexure XIX.***

FIGURE 7-6: SHADOW FLICKER MAP SHOWING THE TWO WTGS IMPACTING RECEPTORS-REAL CASE SCENARIO

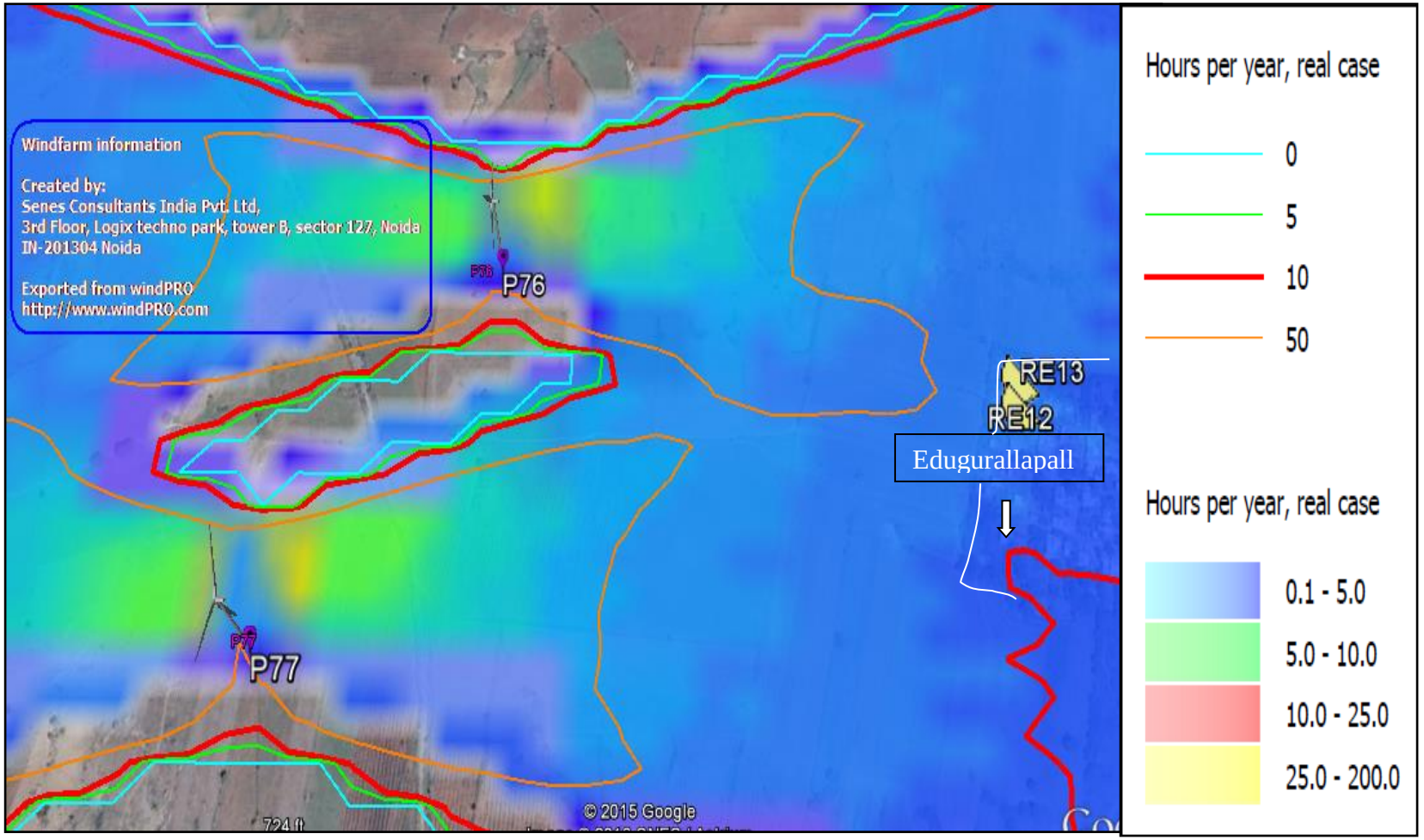
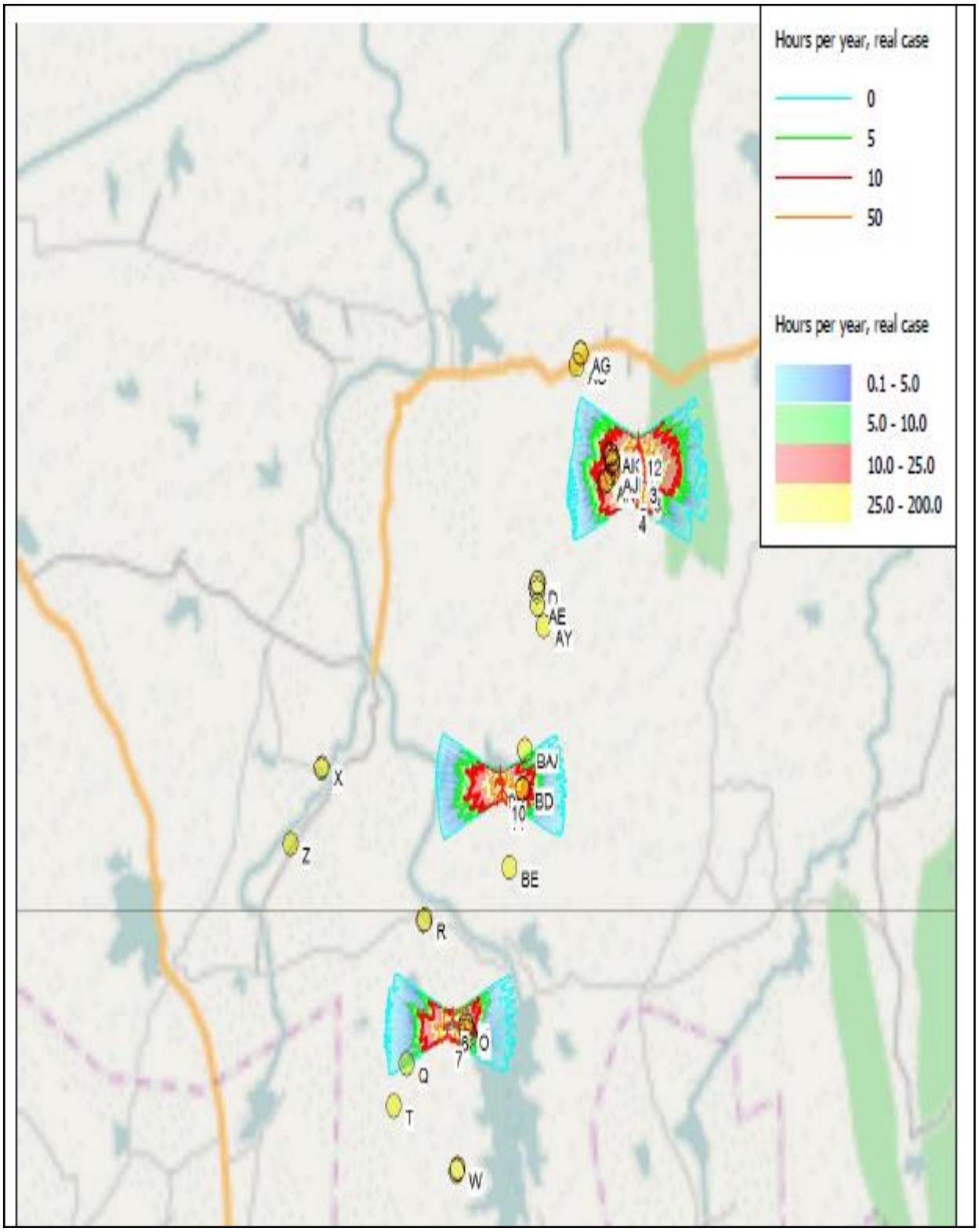


TABLE 7-12: SHADOW FLICKER ANALYSIS RESULTS – REAL CASE

Shadow Receptors	Receptor photograph	Village Name	Receptor Coordinates		Shadow hours per year (h/year)	WTGs Impacting the Receptor	WTG Coordinates		Distance of WTG from the Receptor (in km)
			Easting	Northing			Easting	Northing	
L(RE12) ***Group of households***		Edugurallapalle	751847	1585474	34:56	P76	751300	1585623	0.56
						P77	751090	1585259	0.79
M(RE13) ***Group of households***		Edugurallapalle	751851	1585501	31:56	P76	751300	1585623	0.57
						P77	751090	1585259	0.82

FIGURE 7-7: SHADOW FLICKER MAP



OVERALL IMPACT ASSESSMENT

Phase Of the Project	Risk Assessed
Construction	No Impact
Operation	Minor

7.4.11 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 about 90m (S111) and 120m (S97) 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 300 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

Phase Of the Project	Risk Assessed
Construction	No impact
Operation	Minor

7.4.12 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 90 meters and 120 m above the ground the EMF[12]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)[13], 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.[14] Hence, no impact anticipated during construction phase and minor impact is anticipated during operation phase for the proposed project.

[12] 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].

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

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

OVERALL IMPACT ASSESSMENT

Phase Of the Project	Risk Assessed
Construction	No Impact
Operation	Minor

7.4.13 Cumulative Impacts

There are three other renewable energy projects located near the proposed project site. Two of them are wind power projects in Rayala (Greenko) and Nimbagulla (OSTRO) located at a distance of about 22 kms and 50 kms respectively from the project site. The other is solar power project in Borampalli located at a distance of approximately 26 kms from 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. As the proposed wind power project do not involve forceful acquisition of land and the settlements are located far away (Approx. 2-3 kms) as such no resettlement issues are there. Also, the other nearest wind power project is located about 22 kms from the proposed project site as such visual impacts are not anticipated in the area and no obstruction to common property resources are anticipated. Hence, no cumulative impact is envisaged due to the proposed project.

OVERALL IMPACT ASSESSMENT

Phase Of the Project	Risk Assessed
Construction	No impact
Operation	No impact

TABLE 7-13: OVERALL PROJECT RISK 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

Environment and Social Parameters	Impact During Construction Phase	Impact during Operation Phase
Air Quality	Minor	Minor
Noise Quality	Minor	Moderate
Ground Water Quality	Moderate	Minor
Surface Water Quality	Minor	Minor
Soil Contamination	Minor	Minor
Top Soil Loss	Minor	Minor
Shadow Flicker Analysis	No Impact	Minor
Impact on Wildlife other than avifauna	Minor	Minor
Impact on avifauna	Minor	Moderate
Visual Effects	Minor	Minor
Aviation Hazard	No Impact	No impact
Rainfall	No Impact	No Impact
Occupational Health and Safety	Minor	Minor
Unnatural Events like Earthquake, floods etc.	Minor	Minor

Conclusion:

The proposed wind power project will have minor as well as short term impact during construction phase. Moderate impact due to ground water utilization during construction phase is anticipated. Minor 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. There will be no impact on cultural resources as well as indigenous people due to their absence in the study area. Land for the proposed project is private land which is being purchased on willing to sell and willing to buy basis. Impact analysis reveals that minor impact is anticipated on livelihood of local community. Overall moderate impact is anticipated due to generation of noise from the operating WTGs and minor impact anticipated due to shadow flicker generation from operating WTGs. Moderate impact on avifauna is also anticipated due to collision risk with the 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 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.

8 ENVIRONMENTAL & SOCIAL MANAGEMENT PLAN

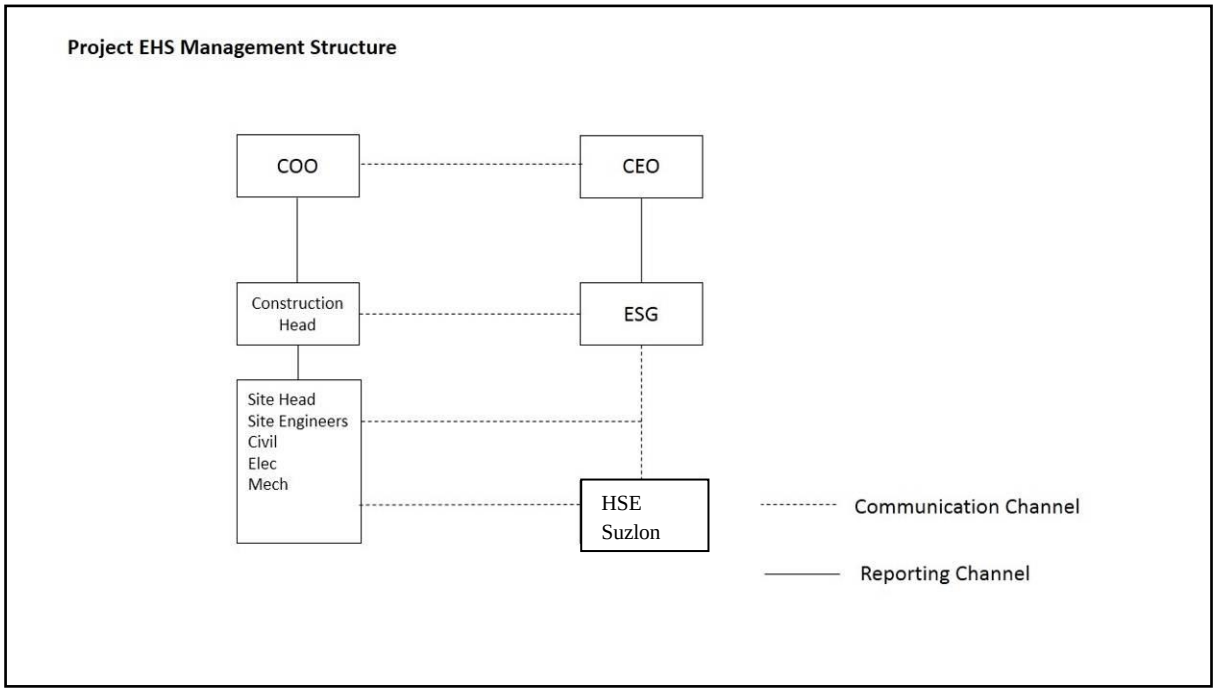
This chapter addresses the requirement of IFC Performance Standard-1 which highlights the importance of managing the social and environmental performance throughout the life of the project. OSTRO is committed to implement an effective Environmental and Social Management System (hereinafter referred as 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.

8.1 ORGANIZATIONAL STRUCTURE

The overall management and coordination of the Project will be managed by COO & CEO (OSTRO), who shall be supported by the Head (Construction) & Head ESG. The Construction Head is supported by site head, site engineers, civil, electrical and mechanical personnel, while the ESG head will be supported by the HSE personnel of Ecoren. 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, OSTRO shall ensure that the EPC and O&M Contractor deploys a Social Officer or Site –In-charge to manage social (including labor and community) issues.

FIGURE 8-1: ORGANIZATION STRUCTURE



8.2 TRAINING OF PERSONNEL & CONTRACTORS

OSTRO 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 so 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.

8.3 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, laborers, suppliers and the local community impacted by the project activities and associated facilities thereby increasing the effectiveness of suggested mitigations measures. OSTRO shall 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.

8.4 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 shall 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.

8.5 ENVIRONMENTAL & SOCIAL MANAGEMENT PLANS

Social and Environmental Management & Monitoring Plan for the project, presented in **Table 8.1**.

TABLE 8-1: ENVIRONMENT AND SOCIAL MANAGEMENT PLAN

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 Ecoren under the supervision of OSTRO's Personnel	IFC performance Standards

S. N	Environmental/ Social Aspect or Issue	Impacts/Issue	Mitigation Measures	Responsibility	Reference
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 OSTRO's Personnel	EHS guidelines Wind energy- IFC and World Bank Group

S. N	Environmental/ Social Aspect or Issue	Impacts/Issue	Mitigation Measures	Responsibility	Reference
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 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.		EHS guidelines Wind energy- IFC and World Bank Group
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	Contractor and sub-contractors of Ecoren under the supervision of OSTRO.	EHS guidelines Wind energy- IFC and World Bank Group

S. N	Environmental/ Social Aspect or Issue	Impacts/Issue	Mitigation Measures	Responsibility	Reference
			sources to be acoustically treated eg. Silencers, acoustic louvers, etc.		
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 OSTRO.	EHS guidelines Wind energy- IFC and World Bank Group
5.2	**Water Quality- improper management of construction**	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		EHS guidelines Wind energy- IFC and World Bank Group

S. N	Environmental/ Social Aspect or Issue	Impacts/Issue	Mitigation Measures	Responsibility	Reference
	waste		toilets. • 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 OSTRO.	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		IFC Performance Standards

S. N	Environmental/ Social Aspect or Issue	Impacts/Issue	Mitigation Measures	Responsibility	Reference
			isolated room with impervious surface. • Filling and transfer of oil to and from the container shall be on impervious surface.		
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 OSTRO.	EHS guidelines Wind energy- IFC and World Bank Group
8.1	**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. • 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	Contractor and sub-contractors under the supervision of OSTRO.	IFC Performance Standards

S. N	Environmental/ Social Aspect or Issue	Impacts/Issue	Mitigation Measures	Responsibility	Reference
			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. • Awareness programmes regarding the significance of conserving wildlife and the penalty associated with killing wild animals should be conducted for the laborers and sub-contractors. • Signages near to both the Reserved Forests should be in place indicating the presence of wild animals during construction phase for the proposed project. • Alarm systems should be fitted at strategic locations like few WTGs, PSS, Material yard etc so that an alarm can be raised if an animal is spotted close to activity area.		

S. N	Environmental/ Social Aspect or Issue	Impacts/Issue	Mitigation Measures	Responsibility	Reference
			• Dos and Don't (for wildlife management) is attached in the annexure XXVI of the ESIA report to be followed both during construction and operation phase of the project.		
8.2	**Black bucks other wildlife including bears.**	Impact on black bucks and other wildlife	• The developer should intimate the District Forest Officer about the project activity prior to the starting of the project. • Awareness programs should be conducted for all contractors and their workers regarding the presence of the species in the region and their conservation status. • The antelopes are protected under the Wild Life Protection Act and IUCN • The punishment includes punishable with imprisonment for a term which shall not be less than one year but may extend to six years and also with fine which shall not be less than five thousand rupees. • The construction area surrounding a WTG location needs to be temporally barricaded to prevent wildlife from entering the area while the	Contractor and sub-contractors under the supervision of OSTRO.	

S. N	Environmental/ Social Aspect or Issue	Impacts/Issue	Mitigation Measures	Responsibility	Reference
			work is on. • If pits are dug on the ground for any project activity it should be suitably barricaded and closed permanently after construction so that the animals are prevented from falling in the pit. • The movement of vehicles through access road (day and night time) needs to be monitored constantly for presence of black buck herds in and around the road. • Signage's showing the antelopes should be placed within the project site and near to the approach roads for generating awareness amongst the vehicle drivers and labors. • Signages prohibiting the hunting or killing of wildlife should also be placed in and around the project site. • The area around the WTGs should not be used for any other purposes other than the work specified both during construction and operation phase of the project. • The WTGs with associated facilities like generator, cables and transformer should be		

S. N	Environmental/ Social Aspect or Issue	Impacts/Issue	Mitigation Measures	Responsibility	Reference
			properly fenced to prevent accidental electrocution of wildlife.		
9	**Occupational Health & Safety of workers**	Electrocution; Firing 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	Ecoren EHS personnel under the supervision of OSTRO'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
			debris to be removed, all the pits to filled up. • 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.	Ecoren EHS personnel under the supervision of OSTRO's EHS Manager	EHS guidelines Wind energy- IFC and World Bank Group
B	**Social Management Plan**				

S. N	Environmental/ Social Aspect or Issue	Impacts/Issue	Mitigation Measures	Responsibility	Reference
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 OSTRO 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 OSTRO 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 OSTRO shall conduct internal audits as when required to monitor the performance of contractor. OSTRO through the contractor inform the labour about emergency preparedness plan and communication system to be followed during emergency situation OSTRO through contractor should ensure that labour receive training on health and safety issues involved in the proposed project.	Contractor and sub-contractors under the supervision of Ecoren'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
2	Labour Accommodation (Onsite and offsite 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 OSTRO'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	OSTRO/ Contractor/Operator	OSTRO 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.	OSTRO Renewable Private Limited	
			Opportunities for contributing to the economic and developmental needs of villagers through skill training will be explored.	OSTRO Renewable Private Limited	
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	OSTRO/ PRI representatives	OSTRO CSR policy

S. N	Environmental/ Social Aspect or Issue	Impacts/Issue	Mitigation Measures	Responsibility	Reference
			representatives and key identified leaders of the community.		
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 Ecoren should inform the labour about the grievance redressal mechanism by which they can inform about any grievances Grievances related with non-fulfilment of labour welfare measures shall be monitored through its contractors.	OSTRO/Contractor	IFC performance standards
OPERATION & MAINTENANCE PHASE					
A	**Environmental Management Plan**				

S. N	Environmental/ Social Aspect or Issue	Impacts/Issue	Mitigation Measures	Responsibility	Reference
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.	OSTRO & Ecoren 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.	Suzlon & sub-contractors	EHS guidelines Wind energy- IFC and World Bank Group
3	**Noise Quality-**	Impact on health of	• Regular maintenance of WTGs.	OSTRO & Ecoren	EHS guidelines

S. N	Environmental/ Social Aspect or Issue	Impacts/Issue	Mitigation Measures	Responsibility	Reference
		labours due to long exposure to high noise levels as well as on nearby settlements	• 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 • 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.	sub-contractors	Wind energy- IFC and World Bank Group
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.	OSTRO & Ecoren sub-contractors	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 hazardous waste through authorised vendor to avoid contamination of local resources.		
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.	OSTRO & Ecoren sub-contractors	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.	OSTRO EHS Contractors	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.		
5.1	**Biodiversity- Black bucks & other wildlife.**	Impact on black bucks	• The antelopes are protected under the Wild Life Protection Act and IUCN • The punishment includes punishable with imprisonment for a term which shall not be less than one year but may extend to six years and also with fine which shall not be less than five thousand rupees. • The presence of the antelopes need to be managed both during the construction and operation phase of the project. • The movement of vehicles through access road (day and night time) needs to be monitored constantly for presence of black buck herds in and around the road. • Signage's showing the antelopes should be placed within the project site and near to the approach roads for generating awareness	OSTRO & Ecoren sub-contractors	

S. N	Environmental/ Social Aspect or Issue	Impacts/Issue	Mitigation Measures	Responsibility	Reference
			amongst the vehicle drivers and labors. • Signages prohibiting the hunting or killing of the antelope and other wild animals should also be placed in and around the project site. • Signages should be placed near the reserved forests area where bears had been spotted in the past to raise awareness amongst the labourers during the construction phase.		
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; • 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.	OSTRO & Ecoren sub-contractors	

S. N	Environmental/ Social Aspect or Issue	Impacts/Issue	Mitigation Measures	Responsibility	Reference
			• Towers be regularly checked to avoid any nesting in any suitable gaps or platforms. • A detailed bird and bat survey and monitoring for all season preferably for one year shall be done post operation of the project.		

8.6 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. OSTRO has its own Health and Safety Policy and has been annexed as **Annexure XX**. OHS hazards specifically for the project primarily include the following:

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

M/s Ecoren has obtained permit for working at height for the proposed project. 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 include excavation/blasting for construction materials such as sands and gravels, and access road construction. If blasting is required then the procedure of blasting should be followed as per OSTRO's protocol for blasting (**Annexure XXVII**). Ecoren 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 OSTRO's H & S Policy and Ecoren's EHS Manual should be made to maintain health and safety on site both during construction and operation phase of the project.

Any incident occurring during the construction and operation phase of the proposed project should be registered and documented in Accident & Incident Investigating Form. **(Refer Annexure XXVIII).**

8.7 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 will 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 will 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.
- OSTRO has its own driving rules (**Annexure XXI**) which should be followed during the construction phase.
- The contractor(s) shall 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 shall 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.

- OSTRO has its own driving rules (Refer **Annexure XXI**) which should be followed during the operation phase to avoid/ minimize accidents due to movement of project vehicles.

8.8 EMERGENCY RESPONSE MANAGEMENT PLAN (ERMP)

Purpose

OSTRO 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 OSTRO & its Contractors to ensure preparedness and response to emergency situations throughout the life-cycle of the project. Ecoren has its own ERMP developed that can be adhered to for the project and is Annexed as Annexure XXX.

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:

1. 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.
2. 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).
3. 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.
4. 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.
5. The workers (staff & contractual workers from both OSTRO & 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:
6. 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.

8.9 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 Performance standards OSTRO 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.

8.10 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.

In efforts to develop an effective two way communication a Grievance Redressal Mechanism has been developed by OSTRO (Annexure XXV). The type of grievances has been categorized as:

1. Internal Grievances
2. Employee Grievance (Separate procedure in place as part of the Human Resources and General Administration (HRGA). These include the employees hired specifically for the site.
3. External Grievances
4. Contractor and labour related grievances;
5. Community grievances including those on land and resettlement issues, project activities, CSR intervention, employee-community conflicts, and other project related issues

Process of the Grievance Redressal:

1. The person having grievance will register his/her/their grievances either by approaching the site/project office during office hours of 9:00 AM to 6:00 PM on working days or raise the grievance during any village meeting or labor meeting to the company representative;
2. The grievance will be reported to the Central grievance committee;
3. He/She will be heard by an officer appointed by the Central grievance committee;
4. The grievance will be processed at the project or the corporate level (depending on the severity) and concerned person will be informed through a written communication/Phone in case of urgency within six working days.
5. On hearing from the grievance officer they have to come for further processing to the grievance redressal center if required.

8.11 STAKEHOLDER ENGAGEMENT PLAN (SEP)

OSTRO has developed broad level Stakeholder Engagement Plan (Refer **Annexure XXIX**) to guide stakeholder engagement across the lifecycle of the project, demonstrating Company's commitment towards its stakeholders while also addressing the requirements of the International Finance Corporation (IFC) Performance Standards (PSs). SEP is the process of developing appropriate management strategies to effectively engage stakeholders throughout the lifecycle of the project, based on the analysis of their needs, interests and potential impact on project success. This plan provides details on the general principles for Ostro stakeholder engagement which shall be used for implementing, monitoring and evaluating stakeholder engagement activities. The main objectives of the SEP are to:

- Enable management to develop effective stakeholders management strategies for the proposed project 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'

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.

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** (land sellers, local labourers, sub- contractors and Gram panchayat), those who have an indirect impact or are indirectly impacted are known as **Secondary Stakeholders as in the following table.**

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

Stakeholder engagement & Communication Strategy

Stakeholder engagement and communication strategy will take into cognisance the various stakeholder engagement and CSR activities already being undertaken by the company or partner NGO, or developer under turnkey model and existing communication routes being followed. Presence of CSR agencies needs to be considered, as they are considered to be an extension of the project and the staff therein is considered, to an extent, representative for the project. The construction team mobilised at the site, serves as another extension. Coordinated flow and collation of information, concerns and grievances, therefore becomes important.

Overall Stakeholder engagement strategy

The overall stakeholder strategy will be cognisant of the requirement of the various stakeholders and the level at which communication is presently being undertaken by the project.

Sl. No.	Particular	Responsibility
1.	Regulatory Authorities	The regulatory authorities will be coordinated directly by Ostro legal team via OEMs/developers, or project based team. These consultations are in relation to the Power purchase agreement, power evacuation arrangements; Consent to establish related permits, revenue land allotment, or other requirements required for the wind power projects. The copy of the permits and communication will be made available to Ostro at various levels. Ostro team at the corporate level will be responsible for driving the timely fulfilment of the project level regulatory compliances. After completion, a copy of the relevant permits and compliances will be provided to the corporate team from all the projects, for

		records.
2.	Community around the project	liaison officer of each site will be solely responsible for with the community members residing near each project, age meetings and other platforms. The minutes of the ll be shared with the respective site in-charge as well as te liaising team in standard reporting formats in pre- intervals.
3.	NGOs, Civil Society, Political leaders and Media	Ostro's ESG head along with the developers CSR team will be accountable for any communication with local NGOs, civil society members, political leaders and media. The details of any such communication concerning the projects will be made available to the Ostro corporate team in the form of stakeholder engagement records. Nobody apart from designated the Ostro corporate liaising in-charge will be responsible for communication with the above mentioned stakeholder.

Organizational Structure & Roles and Responsibilities

During the construction stage, owing to the interplay of the various actors involved, it is important to have a system in place which ensures that the community as one of the key stakeholders is aware about the Stakeholder engagement as well as the communication protocol including the grievance mechanism. Due to the interplay of various actors, the organizational structure for CSR and stakeholder engagement has been shown in context to the complete organizational structure.

Engagement Methods

The methods of communication can be either verbal or written, on the basis of the purpose of communication and the target stakeholder group. Some of the key methods of communication are as follows:

Meetings and Discussions: Meetings and discussions are an essential component of any communication exercise. The corporate CSR team of Ostro will have regular interface with their counterparts in the project in order to review the current engagement with local community. These discussions are will be to communicate specific information to the target stakeholders and allow for the collective opinion of the groups to be captured and assessed.

Reports and Notices: Information disclosure is an important process of communication with the local stakeholders and is part of the applicable reference framework for the project. A mandatory communication from the corporate team will guide project teams for the forthcoming meetings in each project. The process of disclosure of information to the communities at the project will involve the provisioning of information in an accessible manner (a manner which allows for easy understanding, such as in the local language) to the various stakeholders in a project. There will be visits of the designated members of corporate team at regular intervals to each project.

TABLE 8-2: STAKE HOLDER ENGAGEMENT PLAN FOR THE PROPOSED PROJECT

Relevant Stakeholders	Stage at which the consultation	Purpose of the Consultation	Mode of engagement	Responsible person	Reporting	Reporting Format
Developers and EPC Contractors (SUZLON, Ecoren)	Mobilisation Construction Stage Operation stage	• Engagement by Project team will be at various stages of the project	• Meetings • Submission of reports	• HSE officer, SUZLON/Ecoren for implementation and site head (Ostro) for supervision	• Construction head, Ostro	• Reports on various aspects
Regulatory Authorities	Mobilisation Construction Stage Operation stage	• Various permissions and licenses related to setting up of the project • Land procurement on lease; • Submission of compliance related returns;	• Meeting • Submission of compliance documents; • Official letters	• HSE officer, SUZLON/Ecoren for implementation and site head (Ostro) for supervision	• Construction head, Ostro	• Evidence as well as details of communication
District/Tehsil Administration (Sub- registrar Officer, Anantapur)	Mobilisation Construction Stage Operation stage	• Some of the regulatory permission in relation to land; • Development intervention for the district;	• Meeting • Submission of compliance documents; • Official letters	• HSE officer, SUZLON /Ecoren for implementation and site head (Ostro) for	• Construction head, Ostro	• Evidence as well as details of communication • Verbal communica

Relevant Stakeholders	Stage at which the consultation	Purpose of the Consultation	Mode of engagement	Responsible person	Reporting	Reporting Format
		• Other issues seeking participation of the project by the District Administration		supervision		tion and relevant records as applicable
Gram Panchayats (Chennampalle, Ralla Anantapuram, Rallapalle, Kurakulapalle, Maddalacheruvu, Konetinayanipalyam, Vepakunta and Perur)	Mobilisation Construction Stage Operation stage	• NOC from the local Panchayat • Information on the project at village level	• Meetings •	• Land Team, Ecoren • CSR Officer, Ostro	• Construction head, Ostro	• Records of communication at site level
Local Community (Panchayat members, Villagers)	Mobilisation	• Information sharing on the project; • Compensation and other issues; • Details on the activities to the project; • CSR and other benefits to the local population	• Meetings on regular basis	• CSR Officer, Ostro	• Construction head, Ostro	• Records of communication at site level

Relevant Stakeholders	Stage at which the consultation	Purpose of the Consultation	Mode of engagement	Responsible person	Reporting	Reporting Format
	Construction Stage	• Information on employment opportunity; • Information on movement of vehicles and equipment; • Regular update meetings on monthly or bimonthly basis	• Meetings on regular basis	• CSR Officer, Ostro	• Construction head, Ostro	• Records of communication at site level
	Operation stage	• Benefits from the project	• Meetings on regular basis			• Records of communication at site level
Vulnerable Community (Widow, Handicaped and landless people at village level)	Mobilisation	• Benefits from the project	• Meetings on regular basis	• CSR Officer, Ostro	• Construction head, Ostro	• Meeting records maintained at the village level as well as submitted to site incharge.

Relevant Stakeholders	Stage at which the consultation	Purpose of the Consultation	Mode of engagement	Responsible person	Reporting	Reporting Format
	Construction Stage Operation stage					• Meeting records submitted to the site incharge
Sub-contractor/ Local Labourers/ Migrant Workforce (Ecoren- civil contractor)	Construction Stage	• Working conditions and terms of employment; • Any other issue including conflict of the migrant population with the locals	• Meetings on regular basis	• CSR Officer, Ostro	• Construction head, Ostro	• Meeting and grievance records submitted to the site incharge
Civil Society/Local NGOs/ media (Rural Development Trust, Anantapur)	Mobilisation Construction Stage Operation stage	• Information sharing on the project; • Discussion on specific issues	• Meetings	• CSR Officer, Ostro	• Construction head, Ostro	• Records of communication at site level

OSTRO should conduct a land procurement process audit once land procurement process completed.

8.12 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 OSTRO. Monitoring requirements (including monitoring frequency) have been presented in the following **Table 8.2.**

TABLE 8-3: PROPOSED MONITORING REQUIREMENTS FOR THE PROPOSED PROJECT

A. Environmental Performance 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 Ostro 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.	Suzlon and Ostro Site team	PS I: Assessment and Management of Environment and Social Risks and Impacts
A3	Integral part of Management	Audits of the contractors and sub-contractors		Quarterly	Suzlon and Ostro Site team	PS I: Assessment and Management of

EPI No.	Environmental Performance Indicator (EPI)	Monitoring Parameter	Location	Period & Frequency	Monitoring Entity	Applicable IFC PS
	System and occupational health and safety					Environment and Social Risks and Impacts
A4	Air emissions from vehicles and machineries	CO, HC based on emission factors % of vehicles possessing valid PUC Certificates	Exhausts near project site	Monthly during construction phase	Suzlon and Ostro Site team	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	PS 3: Resource Efficiency and Pollution Prevention
A6	Noise emissions from vehicles and machineries (15-25 KVA)	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 equipments	Near WTG sites	Once in 6 months.	HSE Manager	PS 3: Resource Efficiency and Pollution Prevention

EPI No.	Environmental Performance Indicator (EPI)	Monitoring Parameter	Location	Period & Frequency	Monitoring Entity	Applicable IFC PS
		particularly DG sets.				
A7	Gaseous pollutant emissions from DG Set (15-25 KVA)	Pollutant concentrations in gaseous emissions and maintenance parameters (air, fuel filters & air-fuel ratio) of DG sets influencing air emissions Emission rates of PM, NOx, SOx, CO, HC based on emission factors	DG Stack	once during construction phase	Suzlon and Ostro 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	Suzlon and Ostro Site team	PS 3: Resource Efficiency and Pollution Prevention
A9	Fugitive emissions from handling and storage of raw materials	Visual observation	Material stockpiles	Daily during construction phase	HSE Manager onsite and corporate	PS 3: Resource Efficiency and Pollution Prevention
A10	Community health and safety	Complaints registered by the local communities No. of. Accidents reported if	Grievance Records Safety	Monthly during construction phase.	HSE Manager and head at corporate	PS 4: Community Health Safety and Security

EPI No.	Environmental Performance Indicator (EPI)	Monitoring Parameter	Location	Period & Frequency	Monitoring Entity	Applicable IFC PS
		any.	Records			
A11	Occupational health and safety	Health surveillance of workers	Medical records	Monthly during construction phase	HSE Head at corporate level	PS I: Assessment and Management of Environment and Social Risks and Impacts
		Sanitation status of labors working during construction phase	Onsite records		HSE Head at corporate level	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		HSE Head at corporate level	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	HSE Head at corporate level	PS I: Assessment and Management of Environment and Social Risks and

EPI No.	Environmental Performance Indicator (EPI)	Monitoring Parameter	Location	Period & Frequency	Monitoring Entity	Applicable IFC PS
						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	HSE Manager onsite and corporate	PS 3: Resource Efficiency and Pollution Prevention
		CPCB Inland Water Discharge Parameters	Discharge point		HSE Manager onsite and corporate	PS 3: Resource Efficiency and Pollution Prevention
A14	Domestic waste generation, storage, handling and disposal	Quantity of waste generated and recycled Visual observation of waste segregation and storage conditions viz. usage of labelled and covered bins, insect repellents etc.	Waste generating areas viz. canteen, site office.	Weekly during construction phase	HSE Manager onsite and corporate	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		HSE Manager onsite and corporate	
A16	Accidental killing of black bucks or livestock	Reporting, inspection and record keeping	Access routes and WTG locations	Once in a month	Onsite & Head EHS manager	PS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources
A17	Hunting of Black bucks and other animals					
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,			Head EHS Manager	

EPI No.	Environmental Performance Indicator (EPI)	Monitoring Parameter	Location	Period & Frequency	Monitoring Entity	Applicable IFC PS
		fire extinguisher, etc				
		Quantity of waste oil and other hazardous waste generated and recycled to registered recyclers Awareness level of onsite workers	Hazardous waste storage areas Workers involved in waste handling and storage	Weekly during construction phase		PS I: Assessment and Management of Environment and Social Risks and Impacts
B.	**OPERATIONAL PHASE**					
B1	Noise generated from operation of wind mill	Noise pressure level in dB(A)	Near noise sources (5m)	Once in 6 months		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	Volume of water sourced and	Water usage	Monthly	EHS Head	PS 3: Resource

EPI No.	Environmental Performance Indicator (EPI)	Monitoring Parameter	Location	Period & Frequency	Monitoring Entity	Applicable IFC PS
	and consumption	consumed	areas			Efficiency and Pollution Prevention
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	EHS Manager and head at corporate	PS 3: Resource Efficiency and Pollution Prevention
		CPCB Inland Water Discharge Parameters and Effluent Standards of IFC Thermal Power Plant EHS Guidelines	Discharge point		EHS Manager and head at corporate	PS 3: Resource Efficiency and Pollution Prevention
B5	Domestic waste generation, storage, handling and disposal	Quantity of waste generated and recycled needs to be monitored Segregation of wastes should be practised. Canteen wastes should be disposed through composting.	Waste generating areas viz. canteen, site office etc.	Monthly	EHS Manager and head at corporate	PS 4: Community Health Safety and Security
		Awareness level of operational workforce	Workforce involved in		EHS Manager and head at corporate	PS 4: Community Health Safety and

EPI No.	Environmental Performance Indicator (EPI)	Monitoring Parameter	Location	Period & Frequency	Monitoring Entity	Applicable IFC PS
			waste handling and storage			Security
B6	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	Monthly	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	Monthly	Head EHS Manager	PS I: Assessment and Management of Environment and Social Risks and Impacts
B7	Community health and safety	Complaints registered by the local communities No. of. Accidents to be reported	Grievance Records Safety	Monthly during operational phase	EHS Head at corporate level	PS 4: Community Health Safety and Security

EPI No.	Environmental Performance Indicator (EPI)	Monitoring Parameter	Location	Period & Frequency	Monitoring Entity	Applicable IFC PS
			Records			
B8	Occupational health and safety	Health surveillance of workers	Medical records	Monthly during operational phase	EHS Manager	PS 2: Labor and Working Conditions
		Sanitation status of onsite office building and canteen	Office building maintenance records		EHS Manager	PS 2: Labor and Working Conditions
		Potable nature of drinking water viz. coliform, pH, TSS, Residual chlorine	Drinking water storage tank		EHS Manager	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	PS 2: Labor and Working Conditions
B9	Accidental killing of black bucks and livestock	Reporting, Inspection and record keeping	Access routes and WTG site	Quarterly	Head EHS manager	PS 6: Biodiversity Conservation and Sustainable Management of

EPI No.	Environmental Performance Indicator (EPI)	Monitoring Parameter	Location	Period & Frequency	Monitoring Entity	Applicable IFC PS
B10	Hunting of black bucks					Living Natural Resources
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	

B) Environmental Quality Monitoring

EQI No	Environmental Quality Indicator (EQI)	Monitoring Parameter	Location	Period & Frequency
A.	**CONSTRUCTION PHASE**			
A1	Ambient Air Quality	Measurement of $PM_{2.5}$, SOx, NOx, CO	Nearest receptor viz. villages, ecological habitat	Once or twice during construction phase
A2	Ambient Noise quality	Measurement of Noise Pressure Level in dB(A)	Nearest receptor viz. villages, ecological habitat	Once or twice during construction phase
A3	Ground Water quality	IS 10500 parameters	Nearby villages	Once during construction phase
A5	Soil Quality	Soil parameters viz. pH, SAR, Water holding capacity, Conductivity, Organic Carbon, NPK	Project Site	Once during construction phase
B.	**OPERATIONAL PHASE**			
B1	Ambient Noise quality	Measurement of Noise Pressure Level in dB(A)	Nearest receptor viz. villages, schools, ecological habitat	Quarterly during operational phase

8.13 BUDGETARY PROVISIONS FOR ESMP IMPLEMENTATION

Environmental and social management plan will not be successful without a proper designated team and financial support for the same. The proposed team for implementation of environmental & social management plan is presented in **Fig 8.1.** Adequate budgetary provision will be made by OSTRO for execution of environmental management plan.

It is proposed that approximately 32 lacs of capital cost will required for EMP

implementation. **Table 8.3** gives possible breakup of approximate cost estimate on the environmental safeguards measures that can be proposed for the project.

Table 8.3: Approximate cost estimate for Environmental Safeguard Measures

Sl. No	Item	Frequency	Capital Cost	Recurring Cost (Annum)
2.	Provision of Solid Waste Management		Rs. 5 lacs	Rs. 0.5 lacs
3.	Provision of Hazardous Waste Management	Periodically as agreed to the PCB Authorized recycler	2 lacs	1 lac (or as agreed upon)
4.	Ambient Noise Monitoring at WTG sites	Once in six month	---	0.25lacs
5.	Bird Collision risk and mortality survey	One year covering 3 major seasons	---	7 lac
	Total		Rs. 7 lacs	Rs. 8.75.5 lacs

ANNEXURES

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Annexure – I (A): Ecoren Land Purchase Process

RSR (Available in Taluk office/ SRO Office) To verify the classification of the land

RoR (Verify the Mutation in the name of the Land owner)

Pass Book & Title Deed (to Verify with the present Land Owner)

Adangal (to Verify the possession of the Land) in case to case we have to verify the 4-13 years of the Adangal (Particularly in case of the Ancestral Property)

EC for 30 Years

Link documents if any

If no transaction (if no link documents are available) is there, need to to verify RH (Register of Holding) Available in SRO

We have to link up all the documents and submit the same with Advocate for Legal opinion.

After getting the legal opinion only will start acquiring the land process.

Identification of Turbine location points

↓

Identification of Land owner

↓

Get willing ness/ consent for required land sale

↓

Collection of Required documents

↓

Check the bank loans if any with financial institutions.

↓

Submission of the same with Advocate for legal opinion

↓

Price negations with land owner

↓

Clearance of bank loans if any and get the Titledeed's

↓

Payment of Challan for Registration fee

↓

Land registrations in the name of company

↓

Mutation to be done in favour of Companies name in revenue records

↓

Computerisation of land records in the name of company.

↓

Payment of 10% on Basic land value(as per SRO data) through challan for conversion of the land

↓

Process the same with RDO Office for NALA proceedings.

Annexure – I (B): Land Related Documents to be Maintained

Some of the important aspects to be borne in mind while purchasing a land may be classified under different heads as follows-

1. Preliminary Data Collection

- Identification of area to be purchased according to co-ordinates of WTG
- Identification of options for pathways/roads from national or state highways.
- Survey of land overlay on revenue maps to make auto cad drawing of the entire area providing details with village maps overlay, all micro level establishments, transmission lines or any other details within 75 meter radius of WTG center point.
- Auto cad drawing for each location including pathways.
- Do site visit to ascertain if there are any sort of encroachments or any other hindrances like transmission lines, forest trees etc.
- Identification of Survey/Khasra numbers to be purchased based on auto cad drawing

2. Document Collection

- Collection of land 33 years revenue records for each parcel of land to ascertain land ownership and type of land.
- Prepare detail of land ownership and other details as per format- Sub-Annexure A.
- Prima facie internal verification of documents
- Prepare Family Details and family tree as per format- Sub-Annexures B & Sub-Annexure-C.

3. Legal Due Diligence

- Legal Due Diligence by External Legal experts for validation of land title.
- Approval from client on land title to go ahead for procurement.

4. Land Purchase

- Identification of land owners of land under purchase.
- Understand the land owner's willingness to sell.
- Explain to land owners about the purpose of land purchase and what will be end use of his land.
- Prepare congenial and cordial environment for discussions meeting.
- Video recording of negotiation and discussion process.
- Document all the discussions in vernacular language with every land owner as per format Sub-Annexure-D.
- Negotiate and arrive on agreed purchase amount.
- Preparation of land document in vernacular language clearly specifying that all existing structures, trees, well etc if any are part of this land selling and land purchase price is inclusive of cost of all these establishments, structures, trees etc along with land.
- Making necessary arrangements for land owners to visit sub registrar office for registration.
- All payments are made by way of Bankers Cheque/DD of agreed purchase price.

- Payments are made before or at the time of registration of land.

5. Downstream Process

- On Site

    - Take Physical Possession of the land from Land Owner.
    - Demarcation of land boundary purchased.
    - Fix up of boundary stones on all corners of land and center point of WTG location.
    - Get the land demarcation by local revenue officers for WTG locations.

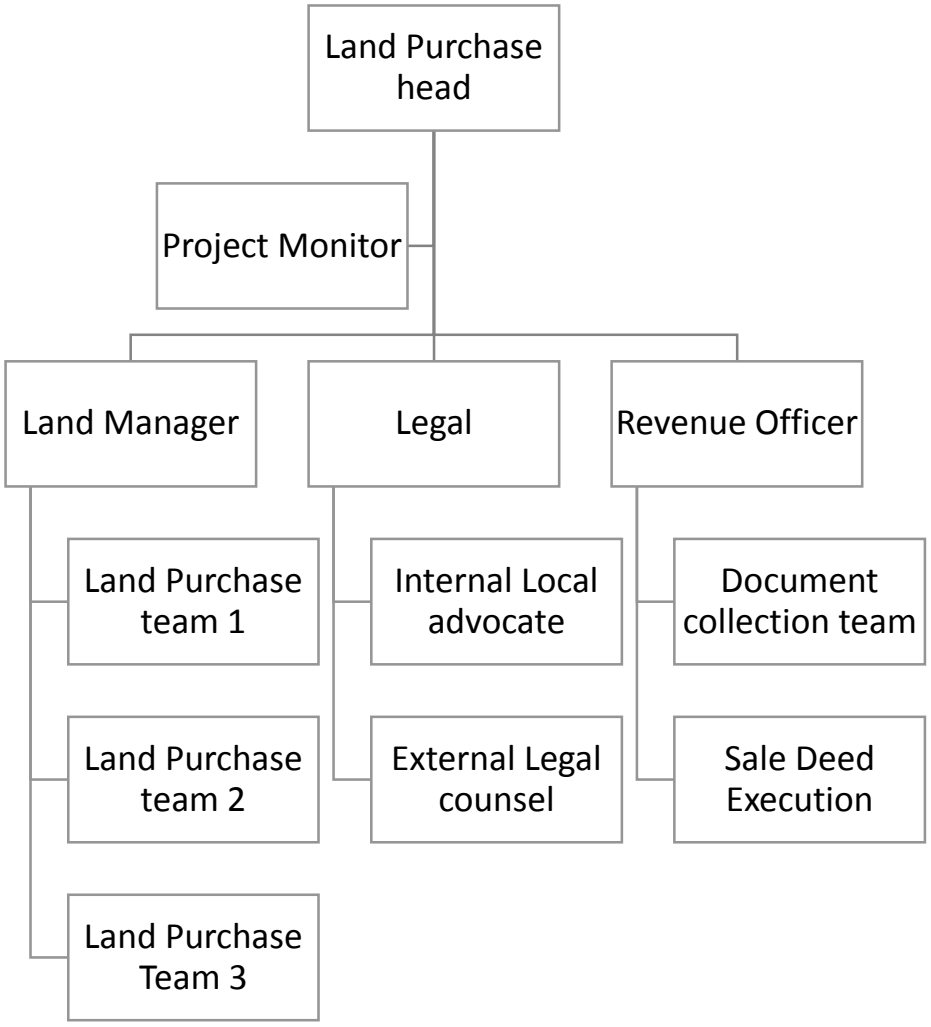
- Revenue Records

    - Apply for updation of revenue record for transfer of land ownership
    - Receive new ownership record.
    - Application for change of "Use of Land" from Agriculture to Non Agriculture.
    - Receipt of conversion order from Revenue department.

6. Record keeping

All records for individual survey number inclusive of 33 years records, Encumbrances certificates, title search, and complete information as per annexure 1 to 4 to be maintained at site office. For each survey number to be purchased, separate physical file folder shall be maintained along with soft copy on computer.

7. Model Land team Organogram



A. Format of Land Details

Survey No	
Village Name	
Tehsil & District Name	
Total Extent of Land	
Extent of Agriculure land	
Extent of Barren Land	
No of crops per Year	
Type of Crops	
Land Owners Name as per Revenue Records	
Physical Status of Land for Encroachments, Establishmetns etc if any	
Any Other Remarks	

Prepared by **Verified by**

Name:_____ **Name:_____**

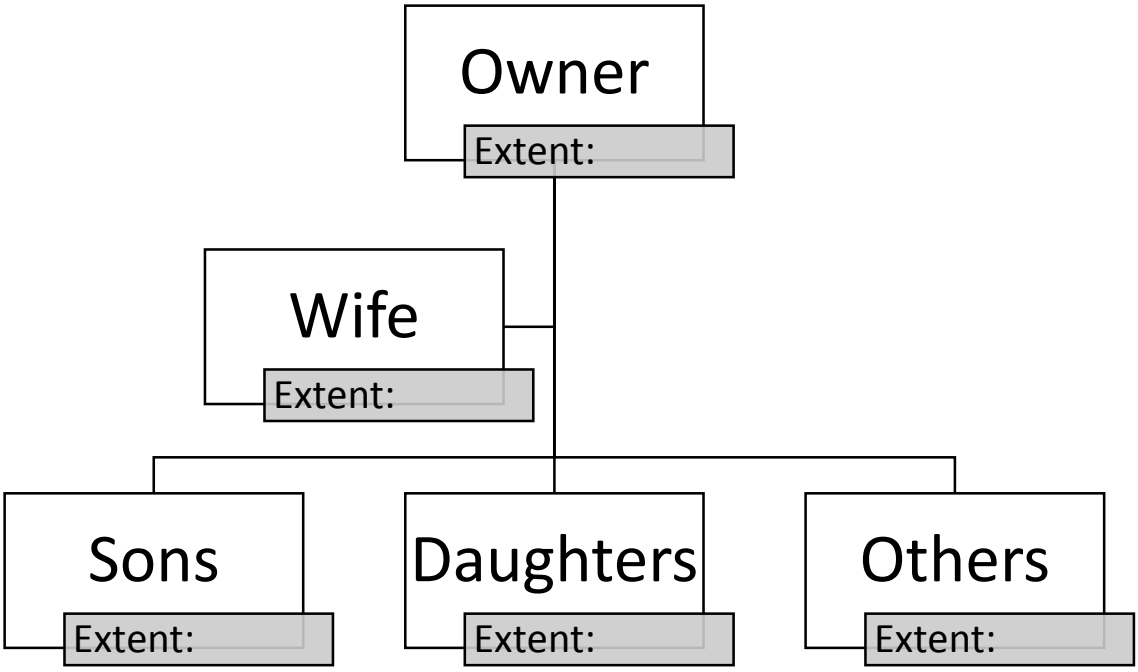
B. <u>Land Details of the farmer whose land is purchased</u>

Village name:_____ Tehsil Name:_____	Survey No:

Name of All Land Owners:

1)	2)
3)	4)
5)	6)
7)	8)
9)	10)

C. Family Tree with Extent of Ownership of Each Member



D. Individual Land Owner Details

Farmer Name:_____

Total Land owned by him

Village Name	Survey No	Land Owned by him

Land Extent to be Purchased by company

Village Name	Survey No	Land Owned by him

Land Balance with Farmer

Village Name	Survey No	Land Owned by him

E. **Format to be filled during farmer meeting**

Village name:	Survey No:	Farmer Name:	Company Rep:	Place and Date

Farmers Present:

-

_____
_____
_____
_____
_____
_____

Summary of Discussions (In Vernacular Language):

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Signed by

..... Representative

(Name:_____)

Signed by

Land Owner/s

(Name:_____)

Annexure – I (C): Sample ATS

T-96 T-96

ఆంధ్రప్రదేశ్ आंध्र प्रदेश ANDHRA PRADESH 62AA 006883

Sl. No. 13813 Date: 31/10/14 Rs. 20/-
Sold to: [illegible]
For Whom: [illegible]

A. SUKANYA, Licenced Stamp Vendor
L. No. 2/2011 R.L. No 12-09-01/2014
Fort Area, KALYANDURG - 515761.
Cell : No. 9494932908

రూ.9,75,000/-లు విక్రయ అగ్రిమెంటు

2014వ సంవత్సరము నవంబరు నెల 7 వ తేదీ

వ్రాయించుకొన్నవారు:-యెర్నినేని లక్ష్మీప్రసాద్ తండ్రి లేట్ యెర్నినేని లోకేశ్వరరావు.జరాయితి ప్లాటు నెంబర్ 481, 4వ ఫ్లోర్, రోడ్డు నెంబరు:36, జూబ్లిహిల్స్, హైదరాబాద్-500033.

వ్రాసియిచ్చినవారు:- [illegible]

[illegible] వెంకటాంపల్లి గ్రామము, వెంకటాంపల్లి పోస్టు, కనగానపల్లి మండలం, అనంతపురం జిల్లా అయిన నేను/మేము వ్రాయించి యిచ్చిన విక్రయ అగ్రిమెంటు ఏమనగా పెద్దలు దాఖలా ఆస్తిని నీకు నేను/మేము రూ.9,75,000/-(అక్షరాలా [illegible] రూపాయలుకు విక్రయించి, క్రయధనము పైకి ఈ దినము నీ వల్ల నేను/మేము రూ.[illegible]/-లు అక్షరాలా రూ. [illegible]/-లు నగదుగా

[illegible]

అడ్వాన్సుగా తీసుకొన్నాను/ము. ఈ దినము లగాయితు 3నెలల లోపల నీవు పిలిచినపుడు నేను/మేము వచ్చి, అడ్వాన్సు పోను, మిగిలిన క్రయధనము మొత్తము రూ...9,70,000.............................../-లు (అక్షరాల ...తొమ్మిది లక్షల డెబ్బై వేలు.................... రూపాయలు)నీ నుండి నేను/మేము తీసుకొని నీ పేరిట గానీ,నీవు కోరిన వారి పేరిటగానీ, నీ స్వంత ఖర్చులతో రిజిష్టరు చేయించి యివ్వగలను/ము. అట్లు పై గడువుకు నీవు పిలిచినపుడు నేను/మేము రాక, అడ్వాన్సు పోనూ, మిగితా క్రయధనము నీ నుండి నేను/మేము తీసుకొనక, నీ పేరిట గానీ,నీవు కోరిన వారి పేరిటగానీ, నీ స్వంత ఖర్చులతో రిజిష్టరు చేయించి యివ్వని ఎడల నీవు చట్టరీత్యా నా/మా నుండి రిజిష్టరు పొందవచ్చును. అందుకు కాగల నష్టమును, నేను/మేము బాధ్యుడి/లుగా ఉండగలను/ము. పై గడువుకు అడ్వాన్సు పోనూ,మిగిలిన క్రయధనము నాకు/మాకు ఇవ్వక, నా/మా నుండి రిజిష్టరు పొందని ఎడల,నీవు నాకు/మాకు ఈ దినము ఇచ్చిన అడ్వాన్సు మొత్తము నీకు వాపసు ఇవ్వబడదు. అని నా/మా రాజీన వ్రాయించి యిచ్చిన విక్రయ అగ్రిమెంటు సహీ.

షెడ్యూలు

మద్దుల చెర్వు........ రి.డి...ధర్మవరం........ రి.స.డి................................పొలం:-
S.No 430-5 4.30 పైకి 3.00 ఎక

యిందుకు చెక్కుబంది:-
తూర్పు: పోరెన్స్
పడమర: రాదిబాబి రమేలింగ
ఉత్తరం: హొసోరెడ్డి
దక్షిణం: పాల రాజుడు
ఈ మధ్య గల పై కనబరచిన ఆస్తి పూరా.

సాక్షులు:-

1) T. Sreenivasulu
2) G. Su Redd

T వెంకటేశ్వర్లు

Written by
N. Bramhaiah s/o Kotaiah
Velpumadugu

DEBIT VOUCHER

Voucher No:

Date: 7/11/2015

Debit _____

Paid to BOYA Anjanamma

Rupees five thousand rupees only/-

Towards ATS

By Cash / ~~Cheque No~~ By cash

Rs. 5,000/-

Prepared by

Payee's Signature

Annexure - II: ILO Workers' Accomodation 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 16.

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

ILO Helpdesk
Multinational Enterprises Programme
International Labour Office
4, route des Morillons
1211 Geneva 22, Switzerland
Tel: +41.22.799.6264
Fax: +41.22.799.6354
assistance@ilo.org

Annexure – III (A): Surface Water Results

Sr. No.	Parameter	Unit	Surface Water	
			Peruru Dam	K.N. Palliam
	Sample Code		**NIL/W/11/15/030**	**NIL/W/11/15/031**
1	pH	---	7.89	7.87
2	Electrical Conductivity	mS/cm	0.220	0.176
3	Dissolved Oxygen	mg/l	11.3	13.9
4	Biochemical Oxygen Demand	mg/l	<4	<4
5	Total Coliform	MPN/100ml	8	7
6	Faecal Coliform	---	Absent	Absent
7	Total Dissolved Solids	mg/l	260	140
8	Oil & Grease	mg/l	<0.2	<0.2
9	Total Hardness	mg/l	72.5	68.6
10	Chloride	mg/l	9.71	8.74
11	Sulphate	mg/l	1.64	<1.0
12	Nitrate	mg/l	0.23	<0.1
13	Fluoride	mg/l	<0.2	<0.2
14	Iron	mg/l	0.78	<0.1
15	Mercury	mg/l	<0.001	<0.001
16	Zinc	mg/l	0.094	0.021

Annexure – III (B): Ground Water Results

Sr. No.	Parameter	Unit	Ground Water	
			Peruru	Maddla Cheru
	Sample Code		**NIL/W/11/15/028**	**NIL/W/11/15/029**
1	Temperature	^{0}C	25.8	26.1
2	pH	---	7.79	7.85
3	Turbidity	NTU	<0.1	12.5
4	Total Hardness	mg/l	813.4	715.4
5	Iron	mg/l	<0.03	1.37
6	Chloride	mg/l	318.59	138.9
7	Fluoride	mg/l	0.131	0.352
8	Total Dissolved Solids	mg/l	2516	1362
9	Calcium	mS/cm	156.8	94.1
10	Magnesium	Hazen	101.1	115.2
11	Copper	mg/l	<0.01	0.0
12	Nitrate	mg/l	14.25	15.51
13	Mercury	mg/l	<0.001	<0.001
14	Arsenic	mg/l	<0.005	<0.005
15	Zinc	mg/l	0.021	1.240
16	Alkalinity	mg/l	467.50	650.00
17	Total Coliform	MPN/100ml	4	0
18	Faecal Coliform	---	Absent	Absent

Annexure - IV: WTG Profiling

ID	Older Names	Model	GPS coordinates		Type of land		Village	Nearest settlement		GPS coordinates		Water Body		Forest Area	
					Terrain	Landuse		Name	Distance (Km)/Direction			Name	stance/Directi	Name	istance/Direction
P01	T5	S111_90m	14°24'55.33"N	77°23'6.83"E	Flat	Agriculture	Vepakunta	Maddulacheruvu	2.93/NE	14°25'26.77"N	77°21'39.62"E	Bhadrapuram forest reservoir	4.33/NE	Narasampalli RF	2.55/E
P02	T16	S111_90m	14°25'2.24"N	77°23'8.30"E	Flat	Agriculture	Vepakunta	Maddulacheruvu	2.91/NE	14°25'26.77"N	77°21'39.62"E	Bhadrapuram forest reservoir	4.18/NE	Narasampalli RF	2.44/E
P03	T27	S111_90m	14°25'9.30"N	77°23'8.31"E	Flat	Open Scrublan	Vepakunta	Maddulacheruvu	2.85/E	14°25'26.77"N	77°21'39.62"E	Bhadrapuram forest reservoir	4.10/NE	Narasampalli RF	2.38/E
P04	T79	S111_90m	14°26'36.63"N	77°23'39.75"E	Flat	Open Scrublan	Vepakunta	Vepakunta	1.25/NE	14°27'4.46"N	77°23'9.91"E	Bhadrapuram forest reservoir	2.82/SE	Narasampalli RF	0.98/E
P05	T33	S111_90m	14°25'17.18"N	77°23'10.43"E	Flat	Open Scrublan	Vepakunta	Maddulacheruvu	2.79/E	14°25'36.89"N	77°21'39.11"E	Bhadrapuram forest reservoir	3.94/NE	Narasampalli RF	2.48/E
P06	T53	S111_90m	14°26'43.55"N	77°23'40.66"E	Flat	Open Scrublan	Vepakunta	Vepakunta	1.15/NE	14°27'4.46"N	77°23'9.91"E	Bhadrapuram forest reservoir	2.99/SE	Narasampalli RF	0.47/E
P07	T94	S111_90m	14°26'28.15"N	77°23'39.16"E	Flat	Agriculture	Vepakunta	Vepakunta	1.45/NE	14°27'4.46"N	77°23'9.91"E	Bhadrapuram forest reservoir	2.72/SE	Narasampalli RF	1.05/E
P09	T45	S111_90m	14°25'24.29"N	77°23'11.74"E	Flat	Agriculture	Vepakunta	Maddulacheruvu	2.86/E	14°25'40.28"N	77°21'38.20"E	Bhadrapuram forest reservoir	3.88/NE	Narasampalli RF	2.45/E
P10	T36	S111_90m	14°26'50.34"N	77°23'41.93"E	Flat	Open Scrublan	Vepakunta	Vepakunta	1.10/NE	14°27'6.50"N	77°23'11.27"E	Bhadrapuram forest reservoir	2.88/SE	Narasampalli RF	0.50/E
P11	T80	S111_90m	14°26'4.58"N	77°23'32.06"E	Flat	Agriculture	Vepakunta	Vepakunta	1.97/NE	14°27'4.46"N	77°23'9.91"E	Bhadrapuram forest reservoir	2.94/E	Narasampalli RF	1.30/E
P12	T98	S111_90m	14°26'20.98"N	77°23'37.64"E	Flat	Open Scrublan	Vepakunta	Vepakunta	1.62/NE	14°27'4.46"N	77°23'9.91"E	Bhadrapuram forest reservoir	2.77/E	Narasampalli RF	1.04/E
P14	T50	S111_90m	14°25'32.45"N	77°23'15.07"E	Flat	Agriculture	Vepakunta	Maddulacheruvu	2.91/E	14°25'36.82"N	77°21'39.10"E	Bhadrapuram forest reservoir	3.64/NE	Narasampalli RF	1.98/E
P17	T99	S111_90m	14°26'12.18"N	77°23'32.38"E	Flat	Agriculture	Vepakunta	Vepakunta	1.75/NE	14°27'4.46"N	77°23'9.91"E	Bhadrapuram forest reservoir	2.93/E	Narasampalli RF	1.23/E
P19	T86	S111_90m	14°25'40.05"N	77°23'16.68"E	Flat	Agriculture	Vepakunta	Maddulacheruvu	2.85/E	14°25'44.06"N	77°21'39.66"E	Bhadrapuram forest reservoir	3.45/NE	Narasampalli RF	1.91/E
P20	T43	S111_90m	14°26'57.49"N	77°23'41.61"E	Flat	Open Scrublan	Vepakunta	Vepakunta	0.95/NE	14°27'6.50"N	77°23'11.27"E	Bhadrapuram forest reservoir	2.98/SE	Narasampalli RF	0.71/E
P29	T97	S111_90m	14°25'48.29"N	77°23'17.87"E	Flat	Agriculture	Vepakunta	Maddulacheruvu	2.95/E	14°25'44.25"N	77°21'39.91"E	Bhadrapuram forest reservoir	3.32/NE	Narasampalli RF	1.43/E
P57		S111_90m	14°24'49.25"N	77°22'5.13"E	Flat	Agriculture	Konetinayanipal	Maddulacheruvu (Single secluded kaccha hut type)	0.83/NW	14°25'9.23"N	77°21'47.46"E	Konetinayanipalyam reservoir	3.43/SW	Narasampalli RF	4.48/NE
P69		S111_90m	14°21'3.39"N	77°19'17.53"E	Flat	Agriculture	Perur	Chennampalli (Single kaccha hut kind of)	0.32/NE	14°21'11.95"N	77°19'11.40"E	Chennampalle lake	1.13/SW	Narasampalli RF	12.54/NE
P70		S111_90m	14°20'47.93"N	77°19'21.91"E	Flat	Agriculture	Perur	Chennampalli (Single kaccha hut kind of)	0.81/NE	14°21'11.95"N	77°19'11.40"E	Chennampalle lak	0.94/SW	Narasampalli RF	12.89/NE
P71	T10	S111_90m	14°20'30.22"N	77°19'30.20"E	flat	Agriculture	Chennampalle	Chennampalle	1.38/NE	14°21'11.36"N	77°19'9.85"E	Upper Penneru Reservoir	2.81/SW	Narasampalli RF	12.84/NE
P72	T10	S111_90m	14°20'28.64"N	77°19'35.23"E	flat	Agriculture	Chennampalle	Chennampalle	1.52/NE	14°21'11.95"N	77°19'11.40"E	Chennampalle lake	1.31/W	Narasampalli RF	12.93/NE
P73	T32	S111_90m	14°20'20.47"N	77°19'32.00"E	flat	Agriculture	Chennampalle	Chennampalle	1.70/NE	14°21'11.92"N	77°19'11.38"E	Upper Penneru Reservoir	2.72/W	Narasampalli RF	12.96/NE

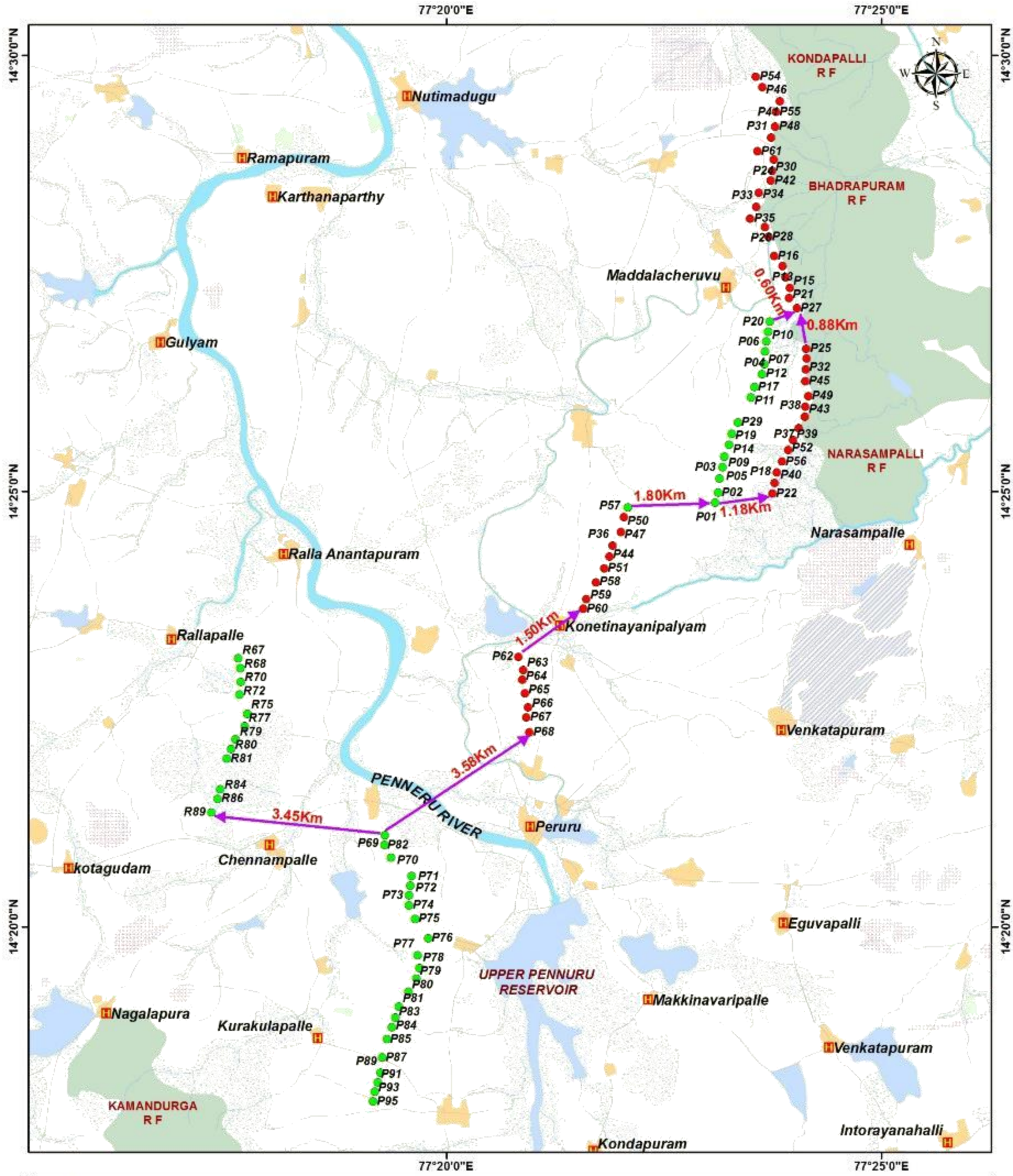
P7	T24	S111_90m	14°20'15.08"N	77°19'34.45"E	flat	Agriculture	Chennampalle	Eudugurallapalli	1.25/SE	14°19'47.35"N	77°20'5.68"E	Chennampalle lake	1.34/NW	Narasampalli RF	13.03/NE
P75	T24	S111_90m	14°20'5.71"N	77°19'38.42"E	flat	Agriculture	Chennampalle	Eudugurallapalli	0.98/SE	14°19'47.35"N	77°20'5.68"E	Chennampalle lake	1.58/NW	Narasampalli RF	13.51/NE
P76	T18	S111_90m	14°19'54.41"N	77°19'45.85"E	flat	Agriculture	Chennampalle	Edugurallapalli	0.63/SW	14°19'48.22"N	77°20'5.84"E	Upper Penneru Reservoir	1.97/w	Narasampalli RF	13.58/NE
P77	T46	S111_90m	14°19'40.61"N	77°19'40.37"E	Undulat	Open Scrublan	Chennampalle	Edugurallapalli	0.76/W	14°19'43.96"N	77°20'5.24"E	Upper Penneru Reservoir	1.74/W	Narasampalli RF	14.02/NE
P78	T31	S111_90m	14°19'31.72"N	77°19'41.51"E	flat	Agriculture	Chennampalle	Edugurallapalli	0.77/NW	14°19'42.50"N	77°20'6.78"E	Upper Penneru Reservoir	1.50/W	Narasampalli RF	13.80/NE
P79	T37	S111_90m	14°19'24.72"N	77°19'39.37"E	flat	Open Scrublan	Chennampalle	Edugurallapalli	0.99/NW	14°19'42.50"N	77°20'6.78"E	Upper Penneru Reservoir	1.59/W	Narasampalli RF	14.17/NW
P80	T63	S111_90m	14°19'15.40"N	77°19'33.94"E	flat	Agriculture	Chennampalle	Edugurallapalli	1.34/NW	14°19'40.69"N	77°20'10.48"E	Upper Penneru Reservoir	1.84/NW	Narasampalli RF	14.24/NE
P81		S111_90m	14°19'5.15"N	77°19'27.46"E	flat	Agriculture	Chennampalle	Ayyampalli	1.26/NW	14°19'16.64"N	77°18'47.07"E	Upper Penneru Reservoir	2.60/E	Narasampalli RF	14.76/NE
P82		S111_90m	14°20'56.63"N	77°19'17.13"E	flat	Agriculture	Chennampalle	Chennampalli (Single kaccha hut kind of)	0.91/NW	14°21'11.82"N	77°19'11.47"E	Chennampalle lake	1.00/SW	Narasampalli RF	12.48/NE
P83		S111_90m	14°18'57.60"N	77°19'24.88"E	flat	Agriculture	Chennampalle	Ayyampalli	1.28/NW	14°19'16.66"N	77°18'47.07"E	Upper Penneru Reservoir	2.71/E	Narasampalli RF	15.27/NE
P84		S111_90m	14°18'51.08"N	77°19'22.64"E	flat	Agriculture	Chennampalle	Ayyampalli	1.33/NW	14°19'16.66"N	77°18'47.07"E	Upper Penneru Reservoir	2.83/E	Narasampalli RF	15.58/NE
P85	T22	S111_90m	14°18'38.51"N	77°19'10.91"E	Flat	Agriculture	Kottakurakulapa	Kamulla shedlu	1.22/E	14°18'42.61"N	77°18'30.14"E	Upper Penneru Reservoir	3.11/W	Narasampalli RF	15.84/NE
P87	T7	S111_90m	14°18'31.76"N	77°19'10.07"E	Flat	Agriculture	Kottakurakulapa	Kamulla shedlu	1.24/NE	14°18'42.61"N	77°18'30.14"E	Upper Penneru Reservoir	3.23/W	Narasampalli RF	15.48/NE
P89	T2	S111_90m	14°18'16.27"N	77°19'17.25"E	Flat	Agriculture	Kottakurakulapa	Kottakurakullapalli	1.45/SE	14°17'50.29"N	77°19'52.63"E	Upper Penneru Reservoir	3.13/NW	Narasampalli RF	15.94/NE
P91	T2	S111_90m	14°18'13.13"N	77°19'12.55"E	Flat	Agriculture	Kottakurakulapa	Kottakurakullapalli	1.39/SE	14°17'50.29"N	77°19'52.63"E	Upper Penneru Reservoir	3.29/NE	Narasampalli RF	16.69/NE
P93	T8	S111_90m	14°18'6.08"N	77°19'11.37"E	Flat	Agriculture	Kottakurakulapa	Kottakurakulapalli	1.33/SW	14°17'52.40"N	77°19'53.95"E	Upper Penneru Reservoir	3.35/NW	Narasampalli RF	16.36/NE
P95	T9	S111_90m	14°17'57.62"N	77°19'11.22"E	Flat	Agriculture	Kottakurakulapa	Kottakurakulapalli	1.27/SW	14°17'51.53"N	77°19'53.50"E	Upper Penneru Reservoir	3.38/NW	Narasampalli RF	17.01/NW
R67	T30	S111_90m	14°23'11.27"N	77°17'35.44"E	undulati	Open Scrublan	Rallapalle	Rallapalle	1.18/E	14°23'15.13"N	77°16'56.29"E	Ralla Anantapuram reservoir	1.73/N	Narasampalli RF	13.45/NE
R68	T20	S111_90m	14°23'4.56"N	77°17'33.07"E	undulati	Open Scrublan	Rallapalle	Rallapalle	1.15/E	14°23'15.13"N	77°16'56.29"E	Ralla Anantapuram reservoir	1.90/N	Narasampalli RF	13.54/NE
R70	T12	S111_90m	14°22'50.88"N	77°17'38.04"E	Flat	Agriculture	Rallapalle	Rallapalle	1.46/NE	14°23'13.38"N	77°16'54.99"E	Ralla Anantapuram reservoir	2.36/N	Narasampalli RF	13.37/NE

R72	T21	S111_90m	14°22'37.27"N	77°17'36.63"E	flat	Open Scrublan	Chennampalle	Rallapalle	1.67/NE	14°23'13.38"N	77°16'54.99"E	Ralla Anantapuram reservoir	2.78/N	Narasampalli RF	13.75/NE
R75	T34	S111_90m	14°22'27.83"N	77°17'40.94"E	undulati	open Scrubland	Chennampalle	Rallapalle	1.96/NE	14°23'13.38"N	77°16'54.99"E	Ralla Anantapuram reservoir	2.98/N	Narasampalli RF	13.62/NE
R77	T4	S111_90m	14°22'20.86"N	77°17'41.50"E	undulati	open Scrubland	Chennampalle	Rallapalle	2.14/NE	14°23'13.38"N	77°16'54.99"E	Ralla Anantapuram reservoir	3.24/N	Narasampalli RF	13.41/NE
R79	T15	S111_90m	14°22'14.13"N	77°17'41.27"E	undulati	open Scrubland	Chennampalle	Rallapalle	2.27/NE	14°23'13.38"N	77°16'54.99"E	Ralla Anantapuram reservoir	3.39/N	Narasampalli RF	13.41/NE
R80		S111_90m	14°22'2.61"N	77°17'31.41"E	undulati	open Scrubland	Chennampalle	Jallipalli	2.33/W	14°22'12.80"N	77°16'14.54"E	Ralla Anantapuram reservoir	3.82/NW	Narasampalli RF	13.81/NE
R81		S111_90m	14°21'56.04"N	77°17'28.54"E	undulati	open Scrubland	Chennampalle	Jallipalli	2.28/W	14°22'12.80"N	77°16'14.54"E	Chennampalle lake	3.49/SE	Narasampalli RF	14.22/NE
R84		S111_90m	14°21'34.90"N	77°17'24.12"E	undulati	open Scrubland	Chennampalle	Jallipalli	2.41/NW	14°22'12.80"N	77°16'14.54"E	Chennampalle lake	3.11/SE	Narasampalli RF	15.02/NE
R86		S111_90m	14°21'28.26"N	77°17'22.22"E	undulati	open Scrubland	Chennampalle	Jallipalli	2.45/NW	14°22'12.80"N	77°16'14.54"E	Chennampalle lake	3.02/SE	Narasampalli RF	14.83/NE
R89		S111_90m	14°21'19.06"N	77°17'18.09"E	undulati	open Scrubland	Chennampalle	Jallipalli	2.53/NW	14°22'12.80"N	77°16'14.54"E	Chennampalle lake	2.97/SE	Narasampalli RF	15.12/NE
P08	T3	S97_120m	14°27'27.53"N	77°23'52.78"E	Flat	Open Scrubland	Vepakunta	Vepakunta	1.08/E	14°27'20.95"N	77°23'18.52"E	Bhadrapuram forest reservoir	3.26/SW	Narasampalli RF	0.14/E
P13	T23	S97_120m	14°27'35.63"N	77°23'49.53"E	Flat	Open Scrubland	Vepakunta	Vepakunta	1.05/SE	14°27'22.06"N	77°23'17.66"E	Bhadrapuram forest reservoir	3.44SW	Narasampalli RF	0.22/E
P15	T11	S97_120m	14°27'19.25"N	77°23'54.69"E	Flat	Open Scrubland	Vepakunta	Vepakunta	1.11/E	14°27'18.88"N	77°23'18.85"E	Bhadrapuram forest reservoir	3.00SW	Narasampalli RF	0.17/E
P16	T1	S97_120m	14°27'42.50"N	77°23'46.03"E	Flat	Open Scrubland	Vepakunta	Vepakunta	1.06/SE	14°27'25.97"N	77°23'16.76"E	Bhadrapuram forest reservoir	3.66/SW	Narasampalli RF	0.09/E
P18	T47	S97_120m	14°25'6.48"N	77°23'45.39"E	undulating	Open Scrubland	Vepakunta	Maddulacheruvu	3.82/NE	14°25'26.79"N	77°21'39.66"E	Bhadrapuram forest reservoir	3.20/NW	Narasampalli RF	1.37/E
P21	T19	S97_120m	14°27'12.48"N	77°23'51.85"E	Flat	Open Scrubland	Vepakunta	Vepakunta	1.00/E	14°27'18.88"N	77°23'18.85"E	Bhadrapuram forest reservoir	2.96/SW	Narasampalli RF	0.31/E
P22	T26	S97_120m	14°24'59.76"N	77°23'44.32"E	undulating	Open Scrubland	Vepakunta	Maddulacheruvu	3.85/E	14°25'26.79"N	77°21'39.66"E	Bhadrapuram forest reservoir	3.34/NW	Narasampalli RF	1.29/E
P23	T96	S97_120m	14°26'32.03"N	77°24'7.17"E	undulating	Open Scrubland	Vepakunta	Vepakunta	1.96/NW	14°27'11.04"N	77°23'17.18"E	Bhadrapuram forest reservoir	2.09/SW	Narasampalli RF	0.15/E
P24		S97_120m	14°28'48.82"N	77°23'45.64"E	Flat	Open Scrubland	Vepakunta	Bhanukota	2.09/W	14°28'47.87"N	77°22'36.31"E	Bhadrapuram forest reservoir	5.56/SE	Narasampalli RF	0.15/E
P25	T96	S97_120m	14°26'38.69"N	77°24'8.14"E	Flat	Open Scrubland	Vepakunta	Bhanukota	1.83/NW	14°27'11.17"N	77°23'17.20"E	Bhadrapuram forest reservoir	2.09/SE	Narasampalli RF	0.07/E
P26	T13	S97_120m	14°27'55.82"N	77°23'40.33"E	Flat	Agriculture	Vepakunta	Vepakunta	1.28/SW	14°27'27.11"N	77°23'16.27"E	Bhadrapuram forest reservoir	4.12SW	Narasampalli RF	0.15/E

P27		S97_120m	14°27'6.56"N	77°24'1.70"E	Flat	Agriculture	Vepakunta	Vepakunta	1.34/W	14°27'11.11"N	77°23'17.08"E	Bhadrapuram forest reservoir	2.68/SE	Narasampalli RF	0.20/E
P28	T13	S97_120m	14°27'55.74"N	77°23'42.10"E	Flat	Agriculture	Vepakunta	Vepakunta	1.17/SW	14°27'26.15"N	77°23'16.69"E	Bhadrapuram forest reservoir	4.41/SE	Narasampalli RF	0.18/E
P30		S97_120m	14°28'41.22"N	77°23'44.45"E	Flat	Agriculture	Vepakunta	Bhanukota	2.05/NW	14°28'47.83"N	77°22'36.38"E	Bhadrapuram forest reservoir	5.29/SE	Narasampalli RF	0.18/E
P31		S97_120m	14°29'3.90"N	77°23'43.90"E	Flat	Open Scrubland	Vepakunta	Bhanukota	2.08/SW	14°28'47.81"N	77°22'36.23"E	Bhadrapuram forest reservoir	5.89/SE	Narasampalli RF	0.13/E
P32	T91	S97_120m	14°26'24.78"N	77°24'6.22"E	undulating	Open Scrubland	Vepakunta	Vepakunta	2.06/NE	14°27'11.23"N	77°23'17.15"E	Bhadrapuram forest reservoir	2.11/SW	Narasampalli RF	0.13/E
P33		S97_120m	14°28'16.42"N	77°23'33.64"E	Flat	Agriculture	Vepakunta	Bhanukota	1.99/NW	14°28'38.29"N	77°22'31.29"E	Bhadrapuram forest reservoir	4.83/SW	Narasampalli RF	0.42/E
P34		S97_120m	14°28'25.86"N	77°23'35.58"E	Flat	Agriculture	Vepakunta	Bhanukota	1.91/NW	14°28'47.91"N	77°22'36.24"E	Bhadrapuram forest reservoir	4.99/SW	Narasampalli RF	0.37/E
P35	T6	S97_120m	14°28'11.27"N	77°23'25.17"E	Flat	Agriculture	Vepakunta	Vepakunta	1.21/SE	14°27'27.59"N	77°23'14.62"E	Bhadrapuram forest reservoir	4.71/SW	Narasampalli RF	0.44/E
P36		S97_120m	14°24'23.07"N	77°21'54.77"E	Flat	Agriculture	Konetinayanipalyam	Shivapuram	1.90/SW	14°23'29.10"N	77°21'23.00"E	Konetinayanipalyam reservoir	2.87/SW	Narasampalli RF	5.02/NE
P37	T74	S97_120m	14°25'43.99"N	77°24'0.51"E	undulating	Open Scrubland	Vepakunta	Vepakunta	2.91/NE	14°27'3.74"N	77°23'8.32"E	Bhadrapuram forest reservoir	2.33/W	Narasampalli RF	0.21/E
P38	T64	S97_120m	14°25'51.71"N	77°24'6.23"E	undulating	Open Scrubland	Vepakunta	Vepakunta	2.81/NE	14°27'4.41"N	77°23'9.86"E	Bhadrapuram forest reservoir	2.08/W	Narasampalli RF	0.28/E
P39	T73	S97_120m	14°25'36.49"N	77°23'59.66"E	undulating	Open Scrubland	Vepakunta	Vepakunta	3.19/NE	14°27'4.34"N	77°23'9.85"E	Bhadrapuram forest reservoir	2.41/NW	Narasampalli RF	0.17/E
P40	T83	S97_120m	14°25'13.37"N	77°23'42.86"E	undulating	Open Scrubland	Vepakunta	Maddulacheruvu	3.72/NE	14°25'26.79"N	77°21'39.66"E	Bhadrapuram forest reservoir	3.18/NW	Narasampalli RF	1.48/E
P41		S97_120m	14°29'29.07"N	77°23'50.04"E	Flat	Open Scrubland	Bhanukota	Bhanukota	2.54/SW	14°28'47.80"N	77°22'36.31"E	Bhadrapuram forest reservoir	6.61/SE	Narasampalli RF	0.60/SE
P42		S97_120m	14°28'34.37"N	77°23'43.68"E	Flat	Open Scrubland	Bhanukota	Bhanukota	2.07/W	14°28'47.82"N	77°22'36.27"E	Bhadrapuram forest reservoir	5.06/SE	Narasampalli RF	0.21/E
P43	T84	S97_120m	14°25'58.88"N	77°24'7.48"E	undulating	Agriculture	Vepakunta	Vepakunta	2.65/NE	14°27'4.41"N	77°23'9.86"E	Bhadrapuram forest reservoir	2.00/W	Narasampalli RF	0.18/E
P44		S97_120m	14°24'15.61"N	77°21'52.46"E	Flat	Agriculture	Konetinayanipalyam	Shivapuram	1.67/SW	14°23'29.09"N	77°21'23.04"E	Konetinayanipalyam reservoir	2.66/SW	Narasampalli RF	5.22/NE
P45	T90	S97_120m	14°26'16.62"N	77°24'5.93"E	undulating	Open Scrubland	Vepakunta	Vepakunta	2.22/NE	14°27'4.41"N	77°23'9.86"E	Bhadrapuram forest reservoir	2.07/SE	Narasampalli RF	0.11/E
P46		S97_120m	14°29'38.73"N	77°23'37.89"E	flat	Open Scrubland	Vepakunta	Bhanukota	2.41/SW	14°28'47.98"N	77°22'36.28"E	Bhadrapuram forest reservoir	6.97/SE	Narasampalli RF	0.65/SE
P47		S97_120m	14°24'32.51"N	77°22'0.44"E	flat	Agriculture	Konetinayanipalyam	Shivapuram	2.24/SW	14°23'29.09"N	77°21'23.04"E	Konetinayanipalyam reservoir	3.05/SW	Narasampalli RF	4.95/NE
P48		S97_120m	14°29'11.58"N	77°23'46.72"E	flat	Open Scrubland	Vepakunta	Bhanukota	2.23/SW	14°28'47.98"N	77°22'36.28"E	Konetinayanipalyam reservoir	6.08/SE	Narasampalli RF	0.18/E
P49	T85	S97_120m	14°26'6.28"N	77°24'8.76"E	undulating	Agriculture	Vepakunta	Vepakunta	2.52/NE	14°27'4.41"N	77°23'9.86"E	Bhadrapuram forest reservoir	1.92/W	Narasampalli RF	0.09/E

P50		S97_120m	14°24'42.57"N	77°22'2.45"E	flat	Agriculture	Konetinayanipalyam	Maddalucheruvu (Single hut)	0.94/NW	14°25'9.13"N	77°21'47.60"E	konetinayanipalyam reservoir	3.30/SW	Narasampalli RF	4.96/NE
P51		S97_120m	14°24'7.22"N	77°21'48.93"E	flat	Agriculture	Konetinayanipalyam	Shivapuram	1.40/SW	14°23'29.09"N	77°21'23.04"E	konetinayanipalyam reservoir	2.31/SW	Narasampalli RF	5.98/NE
P52	T88	S97_120m	14°25'29.36"N	77°23'53.88"E	undulating	Open Scrubland	Vepakunta	Vepakunta	3.23/NE	14°27'4.34"N	77°23'9.85"E	Bhadrapuram forest reservoir	2.64/NW	Narasampalli RF	1.28/E
P54		S97_120m	14°29'45.99"N	77°23'33.47"E	undulating	Open Scrubland	Bhanukota	Bhanukota	2.46/SW	14°28'47.93"N	77°22'36.30"E	Bhadrapuram forest reservoir	7.07/SE	Narasampalli RF	1.22/E
P55		S97_120m	14°29'21.69"N	77°23'47.09"E	flat	Open Scrubland	Bhanukota	Bhanukota	2.47/SW	14°28'47.93"N	77°22'36.30"E	Bhadrapuram forest reservoir	6.34/SE	Narasampalli RF	0.47/E
P56	T89	S97_120m	14°25'21.85"N	77°23'50.36"E	undulating	Open Scrubland	Vepakunta	Vepakunta	3.38/NE	14°27'4.34"N	77°23'9.85"E	Bhadrapuram forest reservoir	2.80/NW	Narasampalli RF	1.40/E
P58		S97_120m	14°23'57.85"N	77°21'43.26"E	flat	Agriculture	Konetinayanipalyam	Shivapuram	1.07/SW	14°23'29.06"N	77°21'23.02"E	konetinayanipalyam reservoir	2.01/SW	Narasampalli RF	5.78/NE
P59		S97_120m	14°23'46.37"N	77°21'36.70"E	flat	Agriculture	Konetinayanipalyam	Shivapuram	0.66/SW	14°23'29.06"N	77°21'23.02"E	konetinayanipalyam reservoir	1.57/SW	Narasampalli RF	6.61/NE
P60		S97_120m	14°23'39.46"N	77°21'34.39"E	flat	Agriculture	Konetinayanipalyam	Shivapuram	0.46/SW	14°23'29.06"N	77°21'23.02"E	konetinayanipalyam reservoir	1.78/SW	Narasampalli RF	6.61/NE
P61		S97_120m	14°28'54.59"N	77°23'34.52"E	flat	Agriculture	Bhanukota	Bhanukota	1.76/W	14°28'47.90"N	77°22'36.32"E	Bhadrapuram forest reservoir	5.64/SE	Narasampalli RF	0.73/E
P62		S97_120m	14°23'6.53"N	77°20'49.87"E	flat	Agriculture	Konetinayanipalyam	Shivapuram	0.96/SE	14°22'56.91"N	77°21'20.69"E	konetinayanipalyam reservoir	0.92/NW	Narasampalli RF	8.63/NE
P63		S97_120m	14°22'57.39"N	77°20'53.24"E	flat	Agriculture	Konetinayanipalyam	shivapuram	0.82/E	14°22'56.85"N	77°21'20.68"E	konetinayanipalyam reservoir	0.89/NW	Narasampalli RF	8.17/NE
P64		S97_120m	14°22'50.73"N	77°20'52.50"E	flat	Agriculture	Konetinayanipalyam	shivapuram	0.87/NE	14°22'56.85"N	77°21'20.68"E	konetinayanipalyam reservoir	1.12/NW	Narasampalli RF	8.96/NE
P65		S97_120m	14°22'41.22"N	77°20'54.27"E	flat	Agriculture	Konetinayanipalyam	shivapuram	0.94/NE	14°22'56.85"N	77°21'20.68"E	konetinayanipalyam reservoir	1.37/NW	Narasampalli RF	8.37/NE
P66		S97_120m	14°22'31.66"N	77°20'56.51"E	flat	Agriculture	Konetinayanipalyam	Shivapuram	1.07/NE	14°22'56.85"N	77°21'20.68"E	konetinayanipalyam reservoir	1.89/NW	Narasampalli RF	8.57/NE
P67		S97_120m	14°22'24.91"N	77°20'55.34"E	flat	Agriculture	Konetinayanipalyam	Kuruguntla	0.98/SE	14°21'53.48"N	77°21'2.59"E	konetinayanipalyam reservoir	2.04/NW	Narasampalli RF	8.68/NE
P68		S97_120m	14°22'14.61"N	77°20'57.40"E	flat	Agriculture	Konetinayanipalyam	Kuruguntla	0.65/SE	14°21'53.48"N	77°21'2.59"E	konetinayanipalyam reservoir	2.19/NW	Narasampalli RF	8.90/NE

Annexure – V (A): Distance between WTG clusters

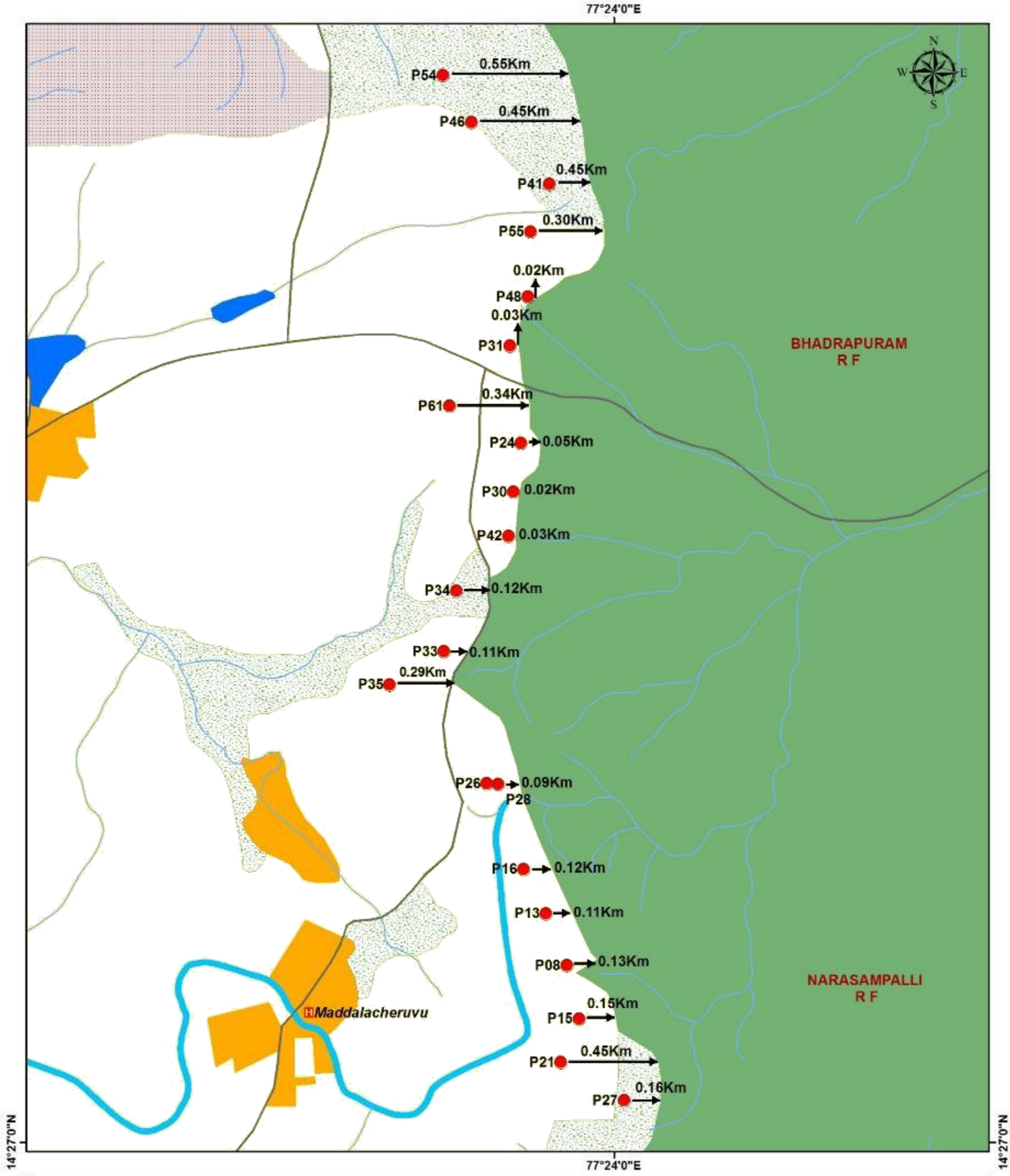


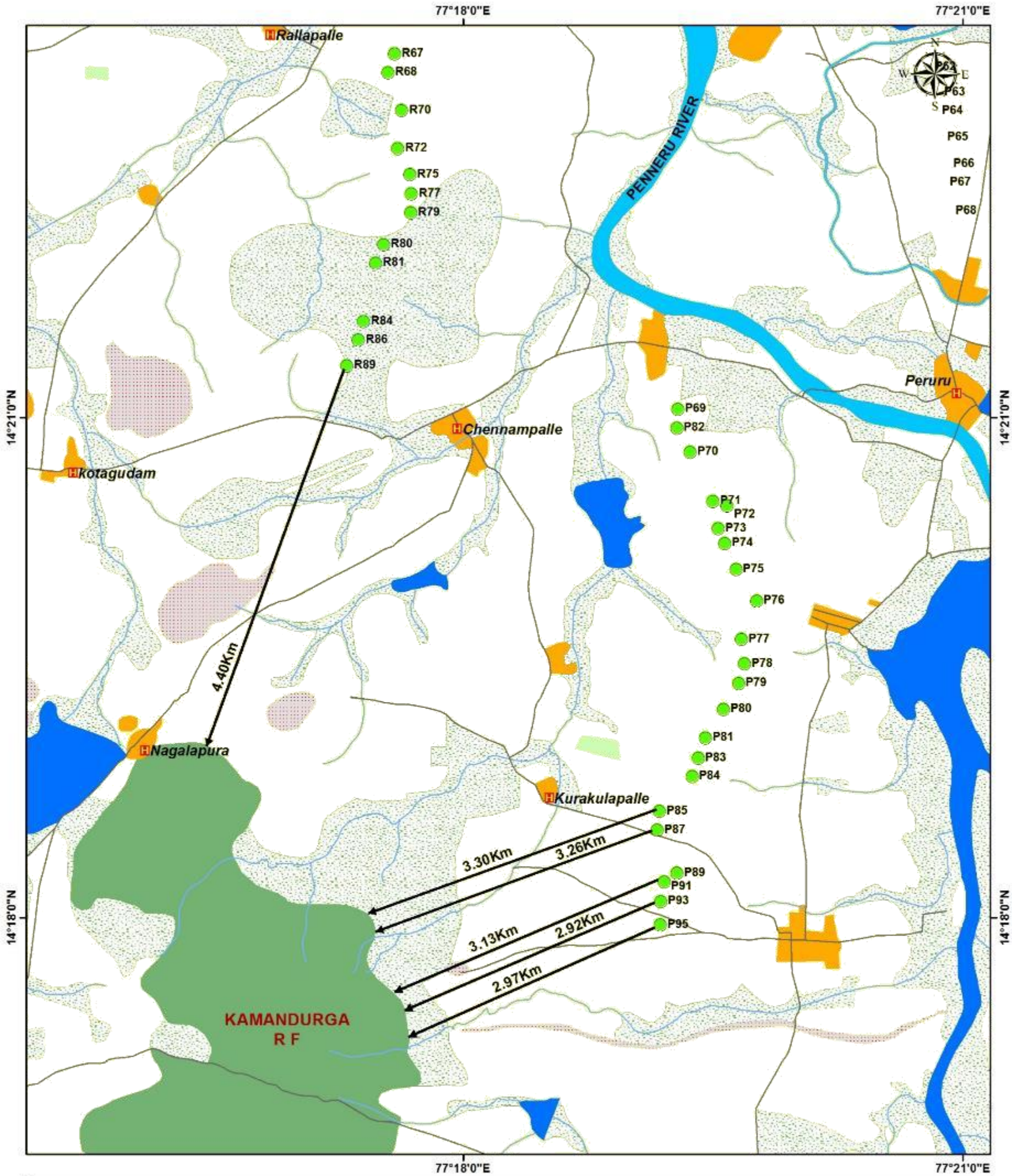
Legend

Settlement	Drainage Channels	Forest Land	River
S 97 WTG	**Landuse Category**	Hills	Settlement
S 111 WTG	Agriculture Land	Open Scrub	Stony Waste
Road Network	Canal	Plantation	Waterbody

PREPARED FOR :	PROJECT :	MAP TITLE :	SCALE :	PREPARED BY :
Ostro	ESIA for 197.4 MW Ralla Wind Power Project in Anantapur District of Andhra Pradesh	Map Showing Distance Between Adjacent WTGs	0 0.75 1.5 3 Kilometers	ARCADIS

Annexure – V (B): Distance between WTGs and Reserved Forest boundary



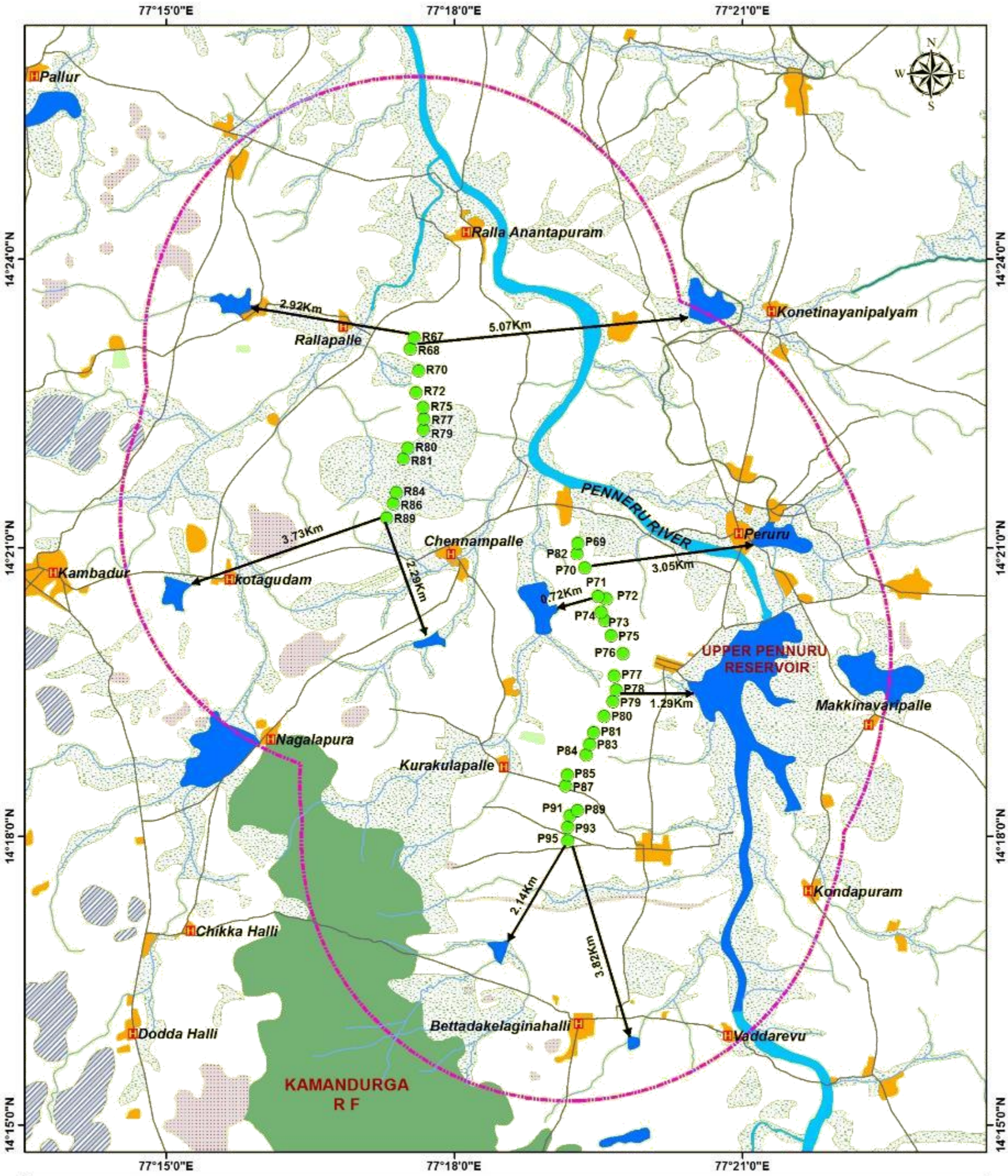


Legend

Settlement	Drainage Channels	Forest Land	River
S 111 WTG	Agriculture Land	Open Scrub	Settlement
Road Network	Canal	Plantation	Stony Waste
			Waterbody

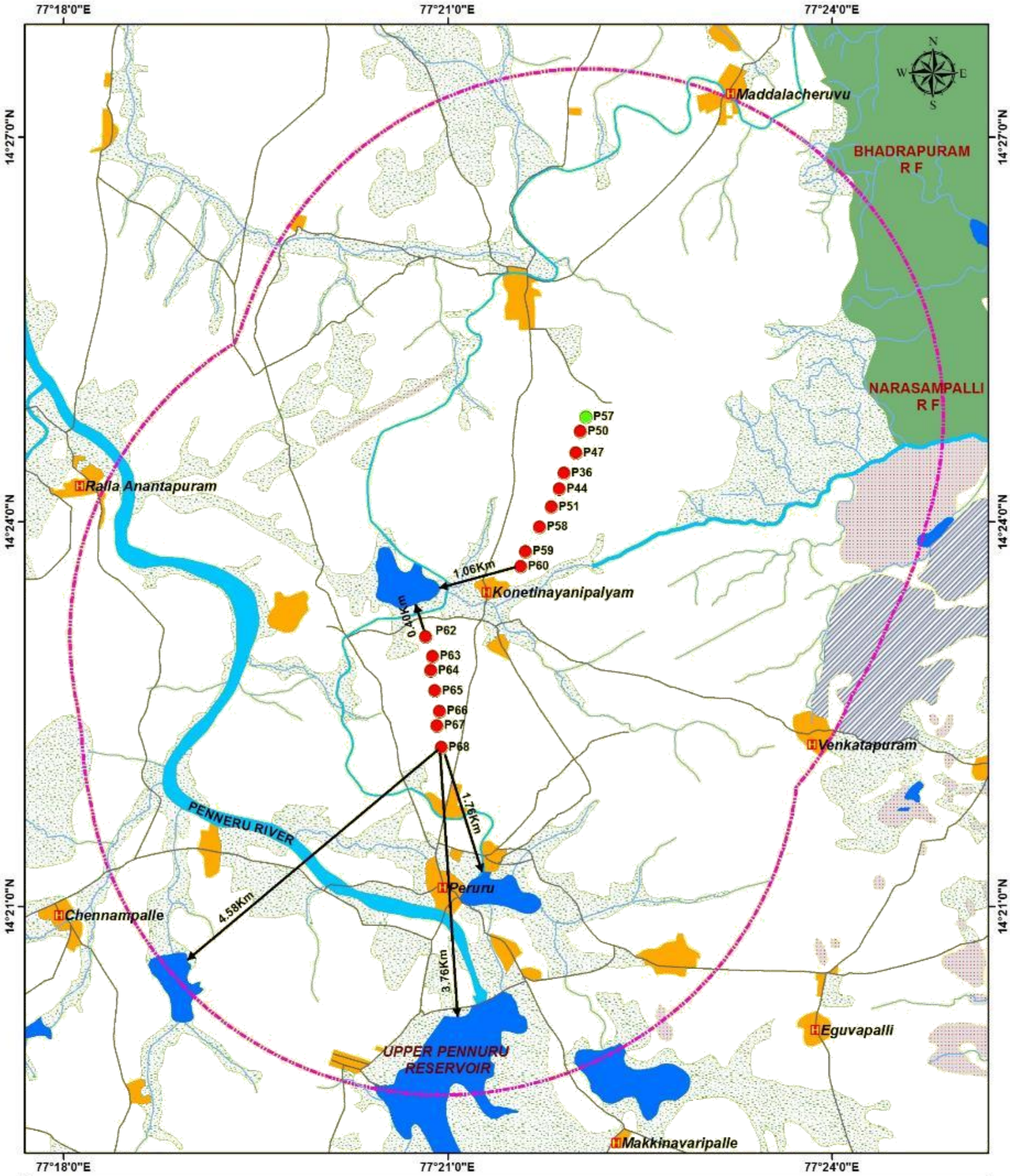
PREPARED FOR:	PROJECT :	MAP TITLE :	SCALE :	PREPARED BY :
Ostro	ESIA for 197.4 MW Ralla Wind Power Project in Anantapur District of Andhra Pradesh	Map Showing Nearby Forest Boundaries and Distance Between Nearest WTG to Forest	0 0.4 0.8 1.6 Kilometers	ARCADIS

Annexure – V (C): Distance between WTGs and Water bodies



Legend			
Settlement	Drainage Channels	Forest Land	River
S 111 WTG	Study Area 5 KM	Hills	Settlement
Road Network	Agriculture Land	Open Scrub	Stony Waste
	Canal	Plantation	Waterbody

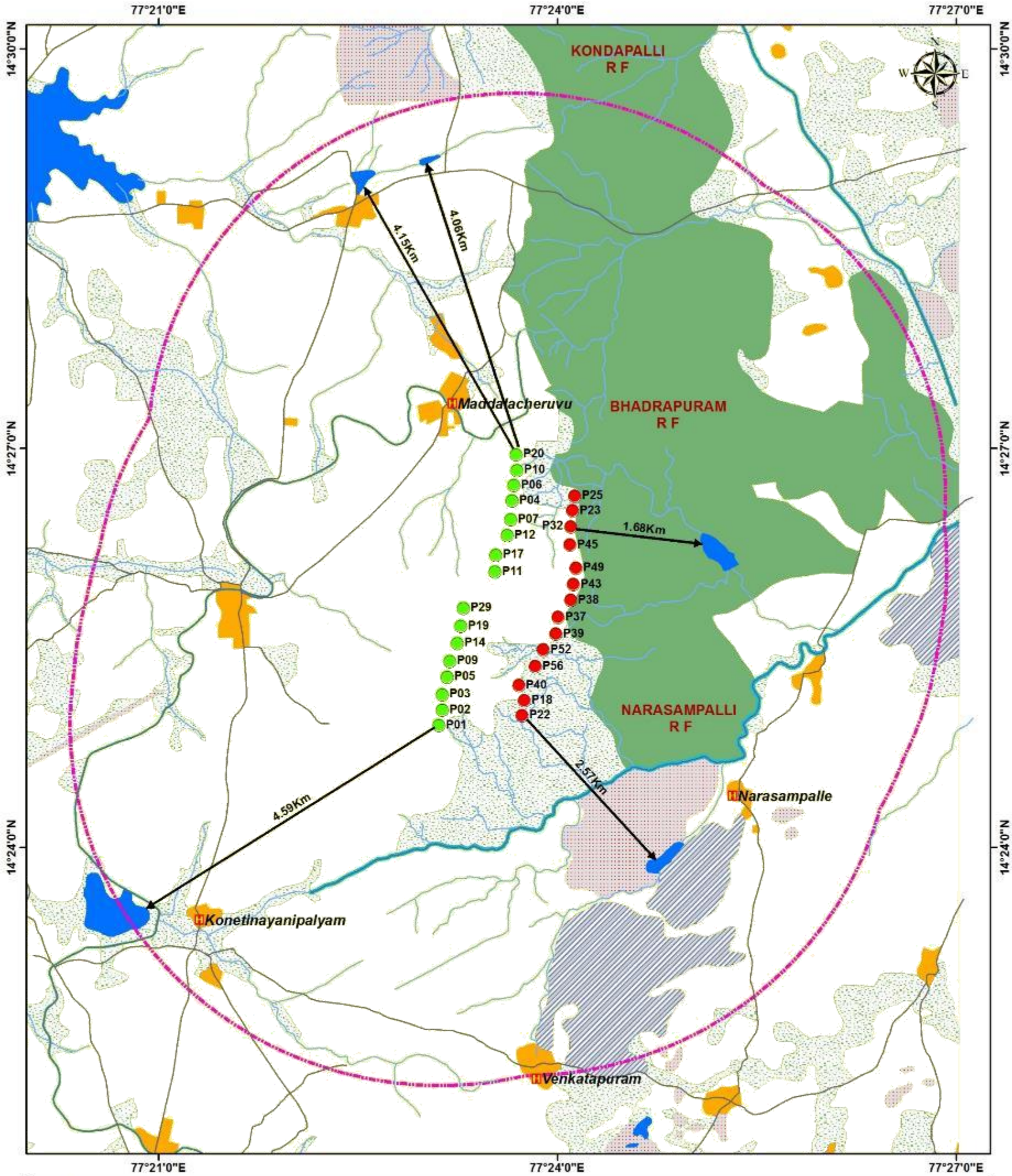
PREPARED FOR:	PROJECT :	MAP TITLE :	SCALE :	PREPARED BY :
Ostro	ESIA for 197.4 MW Ralla Wind Power Project in Anantapur District of Andhra Pradesh	Map Showing Distance Between WTG and Nearest Waterbody	0 0.75 1.5 3 Kilometers	ARCADIS



Legend

Settlement	Drainage Channels	Forest Land	River
S 97 WTG	Study Area 5 KM	Hills	Settlement
S 111 WTG	Agriculture Land	Open Scrub	Stony Waste
Road Network	Canal	Plantation	Waterbody

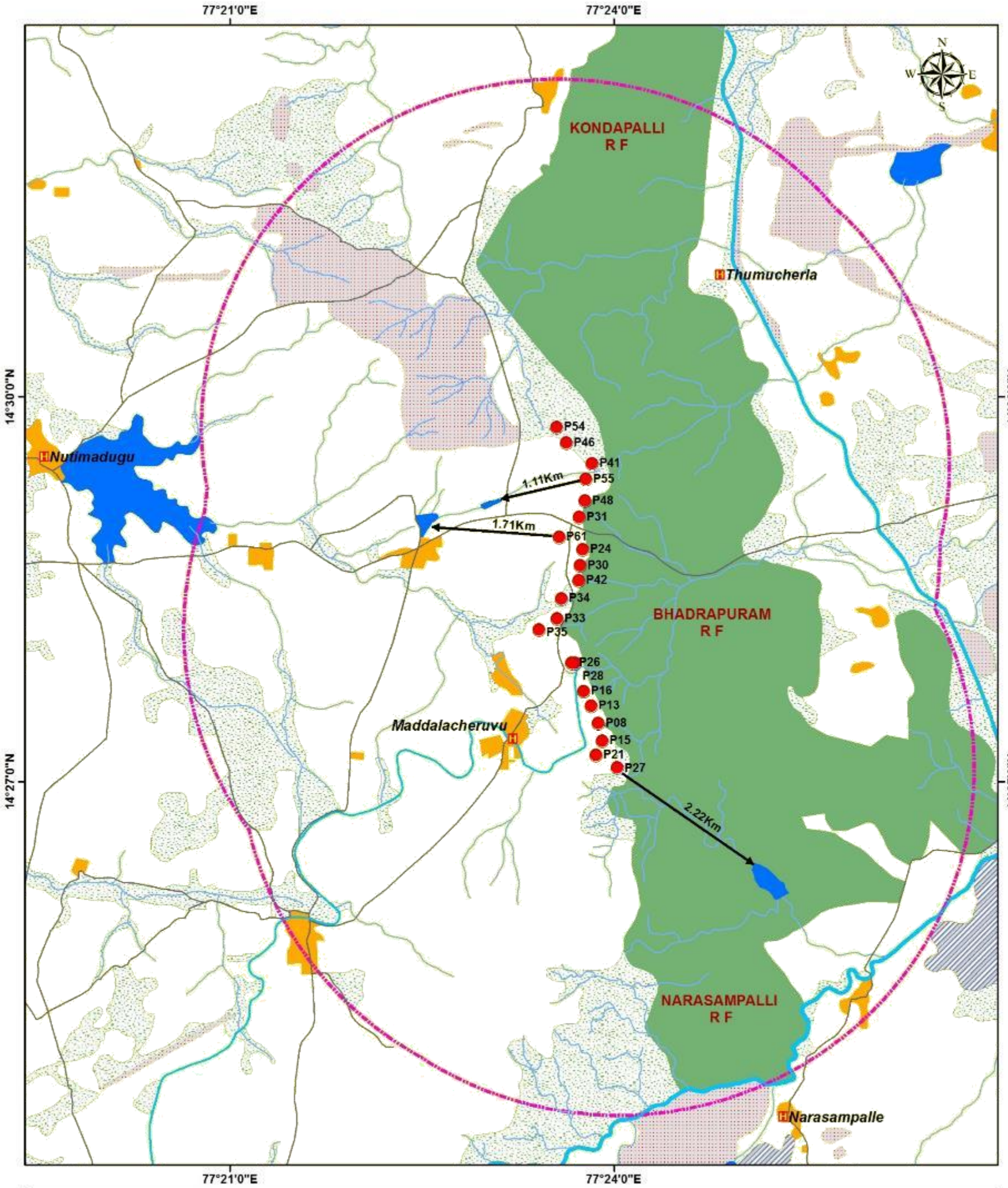
PREPARED FOR:	PROJECT :	MAP TITLE :	SCALE :	PREPARED BY :
Ostro	ESIA for 197.4 MW Ralla Wind Power Project in Anantapur District of Andhra Pradesh	Map Showing Distance Between WTG and Nearest Waterbody	0 0.5 1 2 Kilometers	ARCADIS



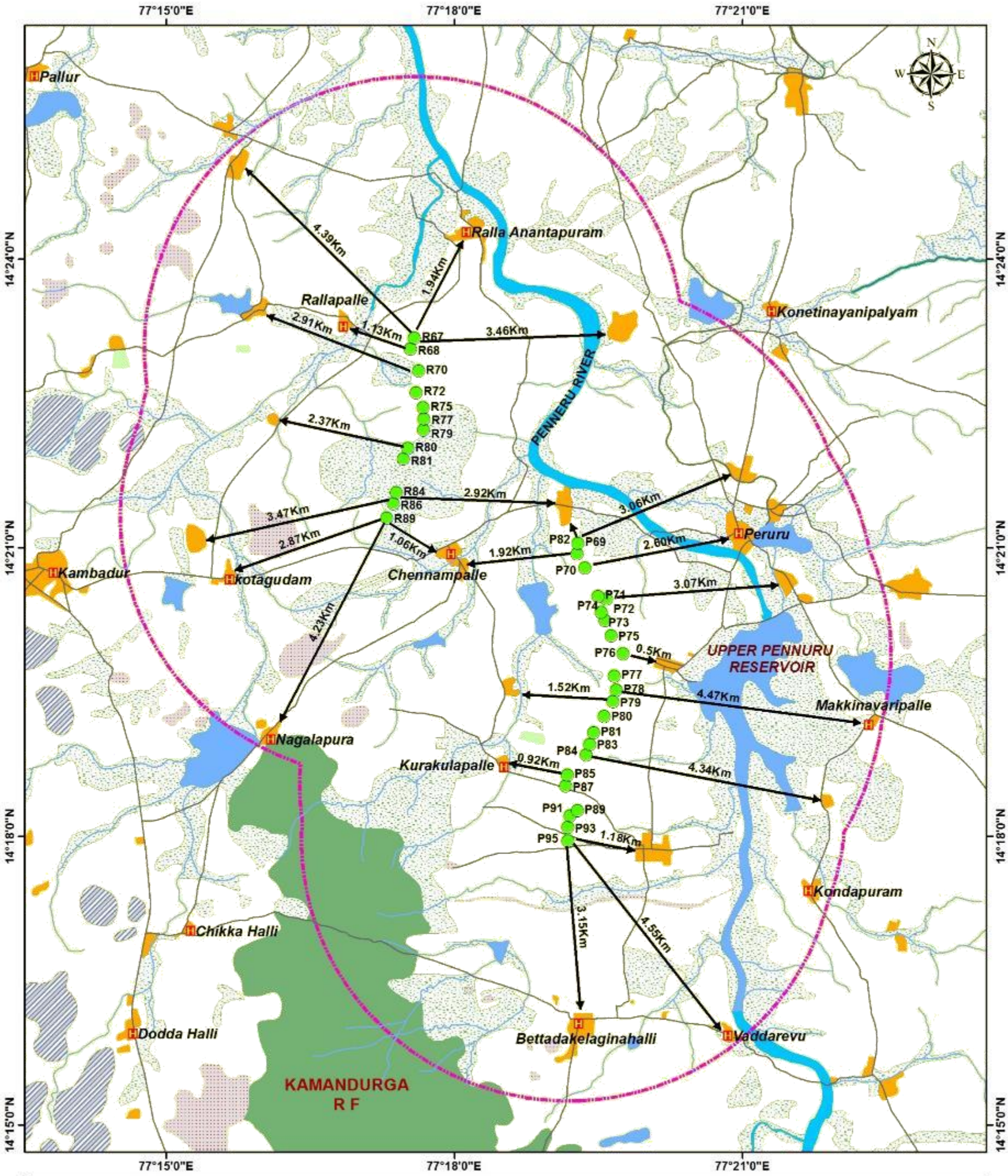
Legend

Settlement	Drainage Channels	Forest Land	River
S 97 WTG	Study Area 5 KM	Hills	Settlement
S 111 WTG	Agriculture Land	Open Scrub	Stony Waste
Road Network	Canal	Plantation	Waterbody

PREPARED FOR:	PROJECT :	MAP TITLE :	SCALE :	PREPARED BY :
Ostro	ESIA for 197.4 MW Ralla Wind Power Project in Anantapur District of Andhra Pradesh	Map Showing Distance Between WTG and Nearest Waterbody	0 0.5 1 2 Kilometers	ARCADIS

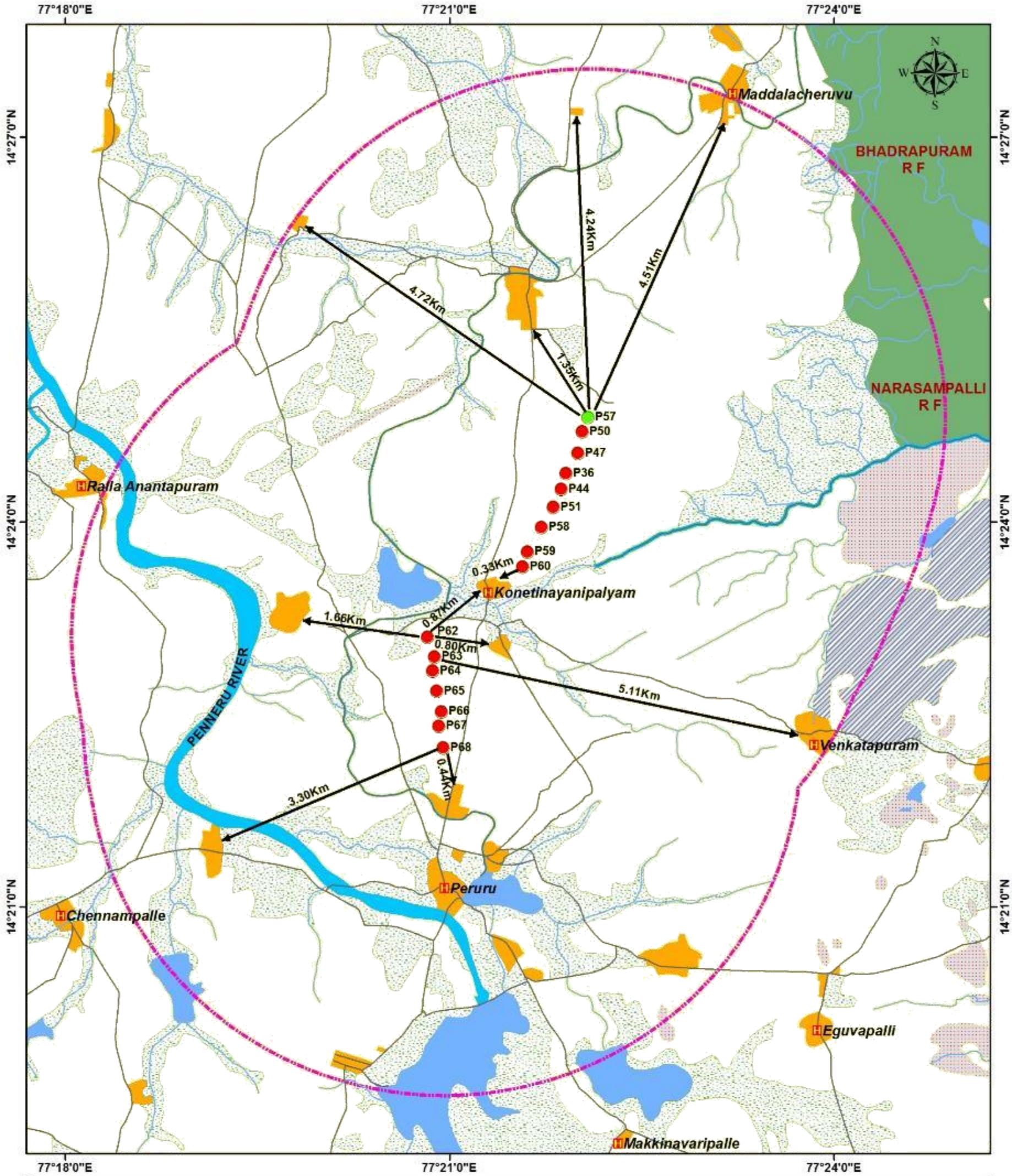

77°21'0"E
77°24'0"E
14°30'0"N
14°27'0"N
N
W
E
S
KONDAPALLI
R F
Thumucherla
Nutimadugu
P54
P46
P41
P55
1.11Km
P48
P31
1.71Km
P61
P24
P30
P42
P34
P33
P35
BHADRAPURAM
R F
P26
P28
P16
P13
P08
P15
P21
P27
Maddalacheruvu
2.22Km
NARASAMPALLI
R F
Narasampalle
Legend
Settlement
S 97 WTG
Road Network
Drainage Channels
Study Area 5 KM
Agriculture Land
Canal
Forest Land
Hills
Open Scrub
Plantation
River
Settlement
Stony Waste
Waterbody
PREPARED FOR:
Ostro
PROJECT :
ESIA for 197.4 MW Ralla Wind Power Project in Anantapur District of Andhra Pradesh
MAP TITLE :
Map Showing Distance Between WTG and Nearest Waterbody
SCALE :
0 0.5 1 2
Kilometers
PREPARED BY :
ARCADIS

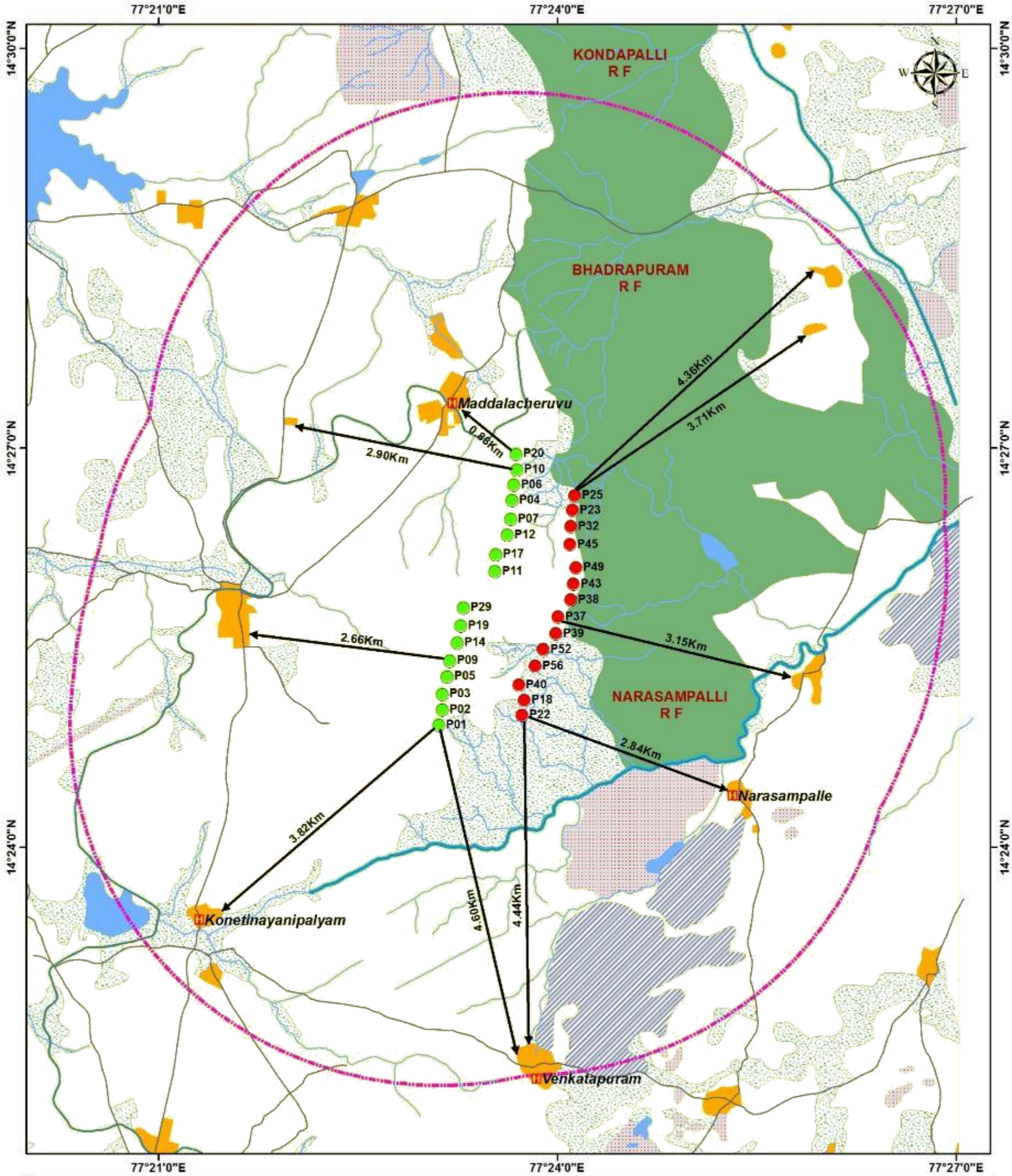
Annexure – V (D): Distance between WTGs and Nearest Settlements



Legend			
Settlement	Drainage Channels	Forest Land	River
S 111 WTG	Study Area 5 KM	Hills	Settlement
Road Network	Agriculture Land	Open Scrub	Stony Waste
	Canal	Plantation	Waterbody

PREPARED FOR:	PROJECT :	MAP TITLE :	SCALE :	PREPARED BY :
Ostro	ESIA for 197.4 MW Ralla Wind Power Project in Anantapur District of Andhra Pradesh	Map Showing Distance Between WTG and Nearest Settlement	0 0.75 1.5 3 Kilometers	ARCADIS

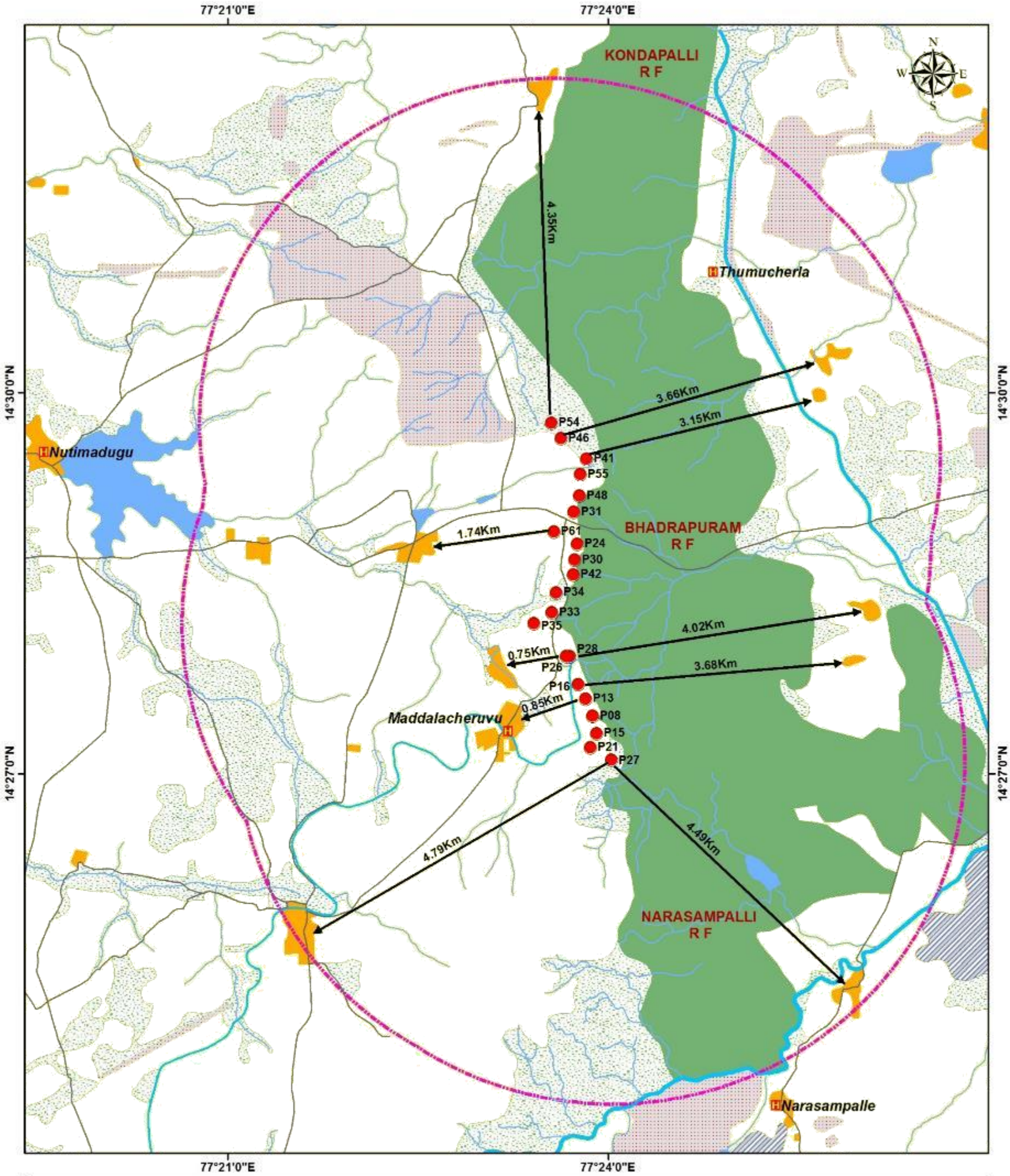

77°18'0"E
77°21'0"E
77°24'0"E
14°27'0"N
14°24'0"N
14°21'0"N
N
W
E
S
Maddalacheruvu
BHADRAPURAM R F
NARASAMPALLI R F
4.24Km
4.51Km
4.72Km
1.35Km
P57
P50
P47
P36
P44
P51
P58
P59
P60
0.38Km
Konetinayanipalyam
Ralla Anantapuram
1.66Km
0.87Km
P62
0.80Km
P63
P64
P65
P66
P67
P68
5.11Km
Venkatapuram
PENNERU RIVER
0.44Km
3.30Km
Peruru
Chennampalle
Eguvapalli
Makkinavaripalle
Legend
Settlement
S 97 WTG
S 111 WTG
Road Network
Drainage Channels
Study Area 5 KM
Agriculture Land
Canal
Forest Land
Hills
Open Scrub
Plantation
River
Settlement
Stony Waste
Waterbody
PREPARED FOR:
Ostro
PROJECT :
ESIA for 197.4 MW Ralla Wind Power Project in Anantapur District of Andhra Pradesh
MAP TITLE :
Map Showing Distance Between WTG and Nearest Settlement
SCALE :
0 0.5 1 2
Kilometers
PREPARED BY :
ARCADIS



Legend

Settlement	Drainage Channels	Forest Land	River
S 97 WTG	Study Area 5 KM	Hills	Settlement
S 111 WTG	Agriculture Land	Open Scrub	Stony Waste
Road Network	Canal	Plantation	Waterbody

PREPARED FOR:	PROJECT :	MAP TITLE :	SCALE :	PREPARED BY :
Ostro	ESIA for 197.4 MW Ralla Wind Power Project in Anantapur District of Andhra Pradesh	Map Showing Distance Between WTG and Nearest Settlement	0 0.5 1 2 Kilometers	ARCADIS


77°21'0"E
77°24'0"E
14°30'0"N
14°27'0"N
KONDAPALLI R F
BHADRAPURAM R F
NARASAMPALLI R F
Thumucherla
Nutimadugu
Maddalacheruvu
Narasampalle
N
S
E
W
4.35Km
3.66Km
3.15Km
1.74Km
4.02Km
0.75Km
3.68Km
0.85Km
4.79Km
4.49Km
P54
P46
P41
P55
P48
P31
P61
P24
P30
P42
P34
P33
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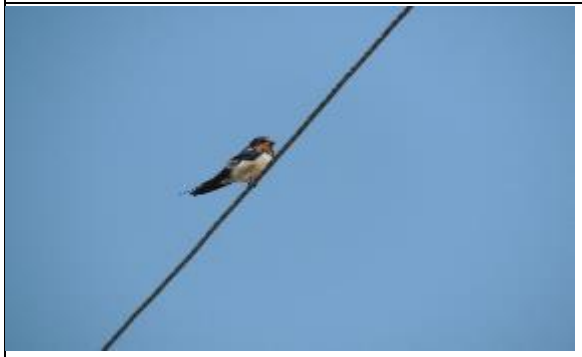
P28
P26
P16
P13
P08
P15
P21
P27
Legend
Settlement
S 97 WTG
Road Network
Drainage Channels
Study Area 5 KM
Agriculture Land
Canal
Forest Land
Hills
Open Scrub
Plantation
River
Settlement
Stony Waste
Waterbody
PREPARED FOR:
Ostro
PROJECT :
ESIA for 197.4 MW Ralla Wind Power Project in Anantapur District of Andhra Pradesh
MAP TITLE :
Map Showing Distance Between WTG and Nearest Settlement
SCALE :
0 0.5 1 2
Kilometers
PREPARED BY :
ARCADIS

Annexure - VI: Photo Documentation- Birds

		
Common Coot	Clamorous Red Warbler	Black Headed Ibis
		
Brahminy Starling	Booted Warbler	Blue Tailed Bee Eater

		
Black Winged Stilt	Black Drongo	Bay Backed Shrike
		
Barn Swallow	Ashy Wood Sparrow Lark	Black Winged Kite

 Common Moorhen	 Common Hoopoe	 Cattle Egret
 Asian Koel	 Common Myna	 Great Egret
 Cotton Pgymy Gooso	 Eurasian Collared Dove	 Eurasian Wigeon

 Green Bee Eater	 Grey Francolin	 Grey Heron
 House Crow	 House Sparrow	 Indian Robin
 Indian Silver bill	 Indian Roller	 Jerdon's Bush Lark

Large Grey Babbler

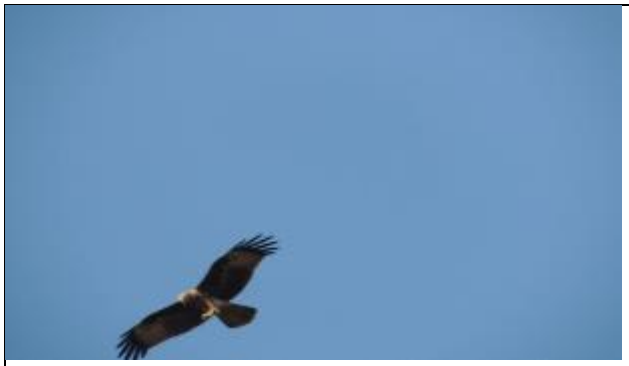
Jungle Crow

Intermediate Egret

Laughing Dove

Little Cormorant

Little Grebe

 Marsh Harrier	 Montague's Harrier	 Northern Pintail
 Paddy Field Pipit	 Purple Rumped Sunbird	 Pied Bush chat

Pallid Harrier

Red Rummed Swallow

Pond Heron

Red Vented Bulbul

Rock Pigeon

Rose Ringed Parakeet

Yellow Billed Babbler

Rosy Starling  Short Toed Snake Eagle	Scaly Breasted Munia  Wood Sandpiper	 White Throated Kingfisher
 White Browed Wagtail	 Southern Coucal	 Siberian Stone Chat

 Whiskered Tern	 Lesser Wheat Throat	 Oriental Magpie Robin
 Purple Rumped Sunbird	 Shikra	 Spot Billed Duck

		
Brahminy Kite	Tailor Bird	Indian Peafowl

Annexure - VII: Economic Survey sample 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 - VIII: 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	Anantapur	968160	4081148	4.2	2064495	50.59	2016653	49.41	977
B	**Tehsil/Mandal/Block level**								
1	Kambadur	11668	50799	4.4	25972	51.13	24827	48.87	956
2	Kanaganapalle	9481	39673	4.2	20529	51.75	19144	48.25	933
3	Ramagiri	8063	34001	4.2	17364	51.07	16637	48.93	958
C	**Study area villages**								
1	Chennampalle	602	2521	4.2	1275	50.58	1246	49.42	977
2	Ralla Anantapuram	501	2147	4.3	1089	50.72	1058	49.28	972
3	Rallapalle	307	1283	4.2	660	51.44	623	48.56	944
4	Kurakulapalle	678	2838	4.2	1502	52.92	1336	47.08	889
5	Maddalacheruvu	1497	6426	4.3	3280	51.04	3146	48.96	959
6	Konetinayanipalyam	683	2820	4.1	1478	52.41	1342	47.59	908
7	Vepakunta	600	2000	3.3	1055	52.75	945	47.25	896
8	Perur	1752	7234	4.1	3652	50.48	3582	49.52	981

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

S. No	Particular	Total Population	SC Population	% SC	ST Population	% ST
A	**District level**					
1	Anantapur	4081148	583135	14.29	154127	3.78
B	**Tehsil/Mandal/Block level**					
1	Kambadur	50799	12286	24.19	3232	6.36
2	Kanaganapalle	39673	6916	17.43	1688	4.25
3	Ramagiri	34001	6945	20.43	1048	3.08
C	**Study area villages**					
1	Chennampalle	2521	523	20.75	28	1.11
2	Ralla Anantapuram	2147	312	14.53	2	0.09
3	Rallapalle	1283	368	28.68	209	16.29
4	Kurakulapalle	2838	459	16.17	5	0.18
5	Maddalacheruvu	6426	1397	21.74	557	8.67
6	Konetinayanipalyam	2820	481	17.06	29	1.03
7	Vepakunta*	2000	0	0.00	0	0.00
8	Perur	7234	1205	16.66	31	0.43

Source- census 2011

Annexure - X: Literacy rates of Study area

S. No	Particular	Total Literate	%	Male Literate	% M	Female Literate	% F
A	**District level**						
1	Anantapur	2310960	63.57	1338474	73.02	972486	53.97
B	**Tehsil/Block level**						
1	Kambadur	27349	60.48	15910	69.02	11439	51.60
2	Kanaganapalle	21130	59.66	12605	69.02	8525	49.69
3	Ramagiri	18091	59.59	10740	69.56	7351	49.28
C	**Study Area Villages**						
1	Chennampalle	1335	59.33	781	68.69	554	49.78
2	Ralla Anantapuram	1039	55.50	611	63.85	428	46.78
3	Rallapalle	590	52.21	367	62.95	223	40.77
4	Kurakulapalle	1430	56.45	876	64.99	554	46.75
5	Maddalacheruvu	3326	57.56	1938	66.12	1388	48.75
6	Konetinayanipalyam	1565	61.76	932	70.34	633	52.36
7	Vepakunta*	0	0.00	0	0.00	0	0.00
8	Perur	3922	61.40	2276	70.82	1646	51.86

Source- census 2011

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

Particular	Total Worker	Work Participation Rate	% Cultivator	% Agriculture Labour	% Household Worker	% Other Worker
District level						
Anantapur	2036166	49.89	18.53	32.08	4.28	27.61
Tehsil/Mandal/Block level						
Kambadur	26729	52.62	25.87	34.86	1.29	11.93
Kanaganapalle	21919	55.25	30.09	35.32	1.41	10.62
Ramagiri	18124	53.30	29.30	36.22	1.24	12.33
Study area villages						
Chennampalle	1404	55.69	25.07	3.49	0.85	8.05
Ralla Anantapuram	1006	46.86	38.27	44.14	0.99	10.44
Rallapalle	637	49.65	37.68	59.50	0.16	2.04
Kurakulapalle	1635	57.61	30.09	25.57	0.80	15.11
Maddalacheruvu	3669	57.10	18.29	47.04	0.57	6.24
Konetinayanipalyam	1312	46.52	40.32	49.54	2.74	6.02
Vepakunta*	0	0.00	0.00	0.00	0.00	0.00
Perur	3710	51.29	24.96	44.23	1.27	19.60

Source- census 2011

Vepakunta*- PCA-2011 and amenities as per district handbook are not available for the Vepakunta village.

Annexure - XII: Village wise Information of Infrastructure in Study Area

Sr. No.	Village	Educational Institution	Health Facilities	Drinking water supply	Communication (PO&PH)	Transportation (Bus & Rail)	Approach Road	Power Supply
District: ***Anantapur***								
Tehsil/Mandal: ***Kambadur, Kanaganapalle, Ramagiri***								
1	Chennampalle	P(2), M(1)	HSC (1)	HP, TPW, TW	PO, PH-A	BS	APR, AMR	ED, EA
2	Ralla Anantapuram	P(1), M(1)	HSC (1)	HP, TPW, TW	PH-A	BS	APR, AMR	ED, EA
3	Rallapalle	P(2)	-	HP, TW	PH-A		APR, AMR	ED, EA
4	Kurakulapalle	P(3), M(1), SS(1)	HSC (1)	HP, TPW, TW	PO, PH-A	BS	APR, AMR	ED, EA
5	Maddalacheruvu	P(5) , M(1), SS (2)	HSC (1)	HP, TPW	PO, PH-A	BS	APR, AMR	ED, EA
6	Konetinayanipalyam	P(3) , M(1)	HSC (1)	HP, TPW	PO, PH-A	BS	APR, AMR	ED, EA
7	Vepakunta*	P(3), H (1)	-	HP, TPW, TW	PH-A	BS	APR, AMR	ED, EA
8	Perur	P(8) , M(4), SS (2)	PHC (1)	HP, TPW, TW	PO, PH-A	BS	APR, AMR	ED, EA

Source – District Census Handbook, 2011/primary consultation

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 - XIII: Protected Monuments in Anantapur District

PROTECTED MONUMENTS
IN
ANANTHAPUR DISTRICT UNDER THE **A.P. ANCIENT AND HISTORICAL MONUMENTS AND ARCHAEOLOGICAL SITES AND REMAINS ACT (VII OF 1960)**

S.No	Name of the Monument	Village	Mandal	Period	G.O. Ms. No.	R. Dis No.
1.	Sri Ranganayani Fort (Belongs to Renati chola period)	Patnam	Kadiri	10th C.A.D	986 03-05-1968	3490/67
2.	Gaganmahal (Summer palace of Vijayanagara Raja's)	Penukonda	Penukonda	15th C.A.D	De-protected by A.S.I.	H1/746/64
3.	Hill fort known as Pallikonda Kambam Narasimhaswamy Konda, Rallagutta	Konakondla	Vajrakaruru	15th – 16th C.A.D.	1155 07-07-1972	E1/4890/66
4.	Jaina temple	Kambadur	Kambadur	16th C.A.D	456 15-04-1976	H1/4556/75
5.	Sri Kona Ranganatha swamy temple	Allurkona	Tadipatri	16th C.A.D	980 04-06-1976	H1/2920/73
6.	Sri Chennakesava swamy temple	Chukkaluru	Tadipatri	16th C.A.D	980 04-06-1976	H1/2920/73
7.	Sri Chennakesava swamy temple	Patnam	Kadiri	16th C.A.D	980 04-06-1976	H1/2920/73
8.	Akkammavarigudi	Kambaduru	Kambaduru	16th C.A.D	1728/76 12-10-1976	E1/5516/74 or E1/5515/74
9.	Laxminarasimha swamy temple	Kadiri	Kadiri	16th C.A.D	2068 17-12-1976	7218/75
10.	Pasupathinatha temple	Chadam (Bondakal)	Rayadurg	16th C.A.D	1768 02-12-1977	E1/9536/75
11	Jain Basadi temple	Amarapuram	Amarapuram	6th C.A.D.	480 31-03-1978	E1/10042/76

S.No	Name of the Monument	Village	Mandal	Period	G.O. Ms. No.	R. Dis No.
12	Chennakesava swamy temple	Kodavakallu	Putluru	16th C.A.D	484 30-03-1978	E1/2879/76
13	Maheswaraswamy temple	Sivaram	Amarapuram	16th C.A.D	479 30-03-1978	E1/9308/73 or 79
14	Kundurpi Fort	Kundurpi	Kundurpi	13th C.A.D	112 27-01-1979	E1/9308/73
15	Bheemalingeswara swamy temple	Gadekallu	Vidapanakallu	16th C.A.D	1210 24-07-1979	
16	Ancient Well	Nittur	Yadiki	16th C.A.D.	1739 12-11-1979	555/78
17	Chennakesava swamy temple	Kummeta	Peddapappuru	16th C.A.D	1891 27-12-1977	E1/9308/73
18	Sri Lakshmi Narsimha swamy temple	Penna Ahobilam	Uravakonda	16th C.A.D	112 or 117 27-01-1979	E1/9050/77
19	Kodandarama swamy temple	Kundurpi	Kundurpi	13th C.A.D	112 27-01-1979	E1/9308/73
20	Narsimha swamy temple	Kundurpi	Kundurpi	13th C.A.D	112 27-01-1979	E1/9308/73
21	Veerabhadra swamy temple	Kundurpi	Kundurpi	16th C.A.D	112 27-01-1979	E1/9308/73
22	Anjaneyaswamy temple	Kundurpi	Kundurpi	16th C.A.D	112 27-01-1979	E1/9308/73
23	Ballepalli matam and Kundurpi Fort	Kundurpi	Kundurpi	16th C.A.D.	112 27-01-1979	E1/9308/73
24	Lakshmichennakesava swamy temple	Yadiki	Yadiki	16th C.A.D	512 03-04-1978	

S.No	Name of the Monument	Village	Mandal	Period	G.O. Ms. No.	R. Dis No.
25	Anjaneya swamy temple	Budvagavi	Uravakonda	16th C.A.D	80 17-01-1978	E1/9308/73
26	Jaina Matha temple	Ratnagiri	Rolla	16th C.A.D	1300 20-08-1981	H1/9995/78
27	Sri Kodanda Rama swamy temple	Singanamala	Singanamala	16th C.A.D	1296 20-08-1981	5691/80
28	Ash mounds	Budidgaddapalli	Gorantla	25th C.B.C	739 27-04-1985	H1/401/80
29	Malle Obula Narsimha swamy temple	Pampanuru	Atmakuru	16th C.A.D	941 05-06-1985	H1/2183/84
30	Mallappakonda Site	Hulikallu	Kalyandurg	25th C.B.C.	736 27-04-1985	
31	Patigadda Site (Early Historic site)	Sasanikota	Paragi	10th C.B.C.	854 08-06-1984	H1/8007/80
32	Megalithic cist burials	Mudgal	Kalyandurg	10th C.B.C.	484 15-04-1988	H1/997/80
33	Samadhi of Yogi Vemana (The great poet Yogi)	Katarupalli	Gandlapenta	18th C.A.D.	80 27-01-1995	H1/309/90
34	Gangaraju Kota (Gootibayalu) (Built by Sri Gangaraju Palegar of Vijayanagara)	Thimammamarrimanu	Nambulapulakunta	16th C.A.D.	545 15-04-1995	H1/600/91
35	Sri Ranganatha swamy temple	Vepulaparthi	Brahmasamudram	16th C.A.D	291 18-02-1978	
36	Rasasiddula Gutta	Konakondla	Vajrakaruru	6th C.B.C.	1155 07-07-1972	
37	Kambhjam Narsimha swamy konda	Konakondla	Vajrakaruru	16th C.A.D.	1155 07-07-1972	

S.No	Name of the Monument	Village	Mandal	Period	G.O. Ms. No.	R. Dis No.
38	Sri Ramalingeswara swamy temple	Budagavi	Uravakonda	16th C.A.D	80 17-01-1978	E1/9308/73
39	Ancient Hill (Neolithic Rock Paintings)	Budagavi	Uravakonda	25th C.B.C.	80 17-01-1978	E1/9308/73
40	Sri Varagiri Venkata Ramana Swamy temple	Bukkapatnam	Bukkapatnam	15th -16th C.A.D	31 21-02-2012	
41	Sri Chennakesava Swamy temple	Komali	Tadipatri	14th-15th C.A.D	38 23-02-2012	
42	Sri Ranganatha Swamy temple	Srirangapuram	Beluguppa	16th C.A.D	28 16-02-2012	
43	Sri Chennakeseva Swamy temple	Pullalarevu	Raptadu	18th C.A.D	41 05-03-2012	
44	Sri Chennakesava Swamy temple	Kallumadi	Singanamala	16th C.A.D.	26 26-02-2013	
45	Sri Sangameswara Swamy temple	Chennarayapatnam	Bathalapalli	16th C.A.D.	28 27-02-2013	
46	Sri Chenna Kesava Swamy Temple	85 Nittoor	Yellanuru		47 13-8-2013	

Annexure - XIV: Stakeholders Participants List

Sr. No	Person Name	Gender M/F	Designation	Village/township/local govt. institution	Date
1	Chinnaraju [illegible] Mutyalonja	M M	Sarpanch Farmer	Vepakunta Vepakunta	15/10/15
2	Narayana	M	Farmer	Vepa Kunta	15/10/15
3	Bogapu Reddy	M	Farmer	Vepakunta	15/10/15
4	Sridevi Narasimhulu	F	Sarpanch	Chenampalli Kondapalepura	15/10/15
5	Dharmendas	M	farmer	Chenampalle	15/10/15
6	Damodar	M	farmer	Chenampalli	15/10/15
7	Akulappa	M	farmer / labor	Chinnampalli	15/10/15
8	Ganesh	M	labour	Chennampalli	15/10/15
9	Narasimhulu	M	labour	Chinnampalli	15/10/15
10	Damodar	M	labour	Chennampalli	15/10/15
11	Obeyya	M	Labor	Chennampalle	15/10/15
12	Subbireddy	M	farmer	Chennampalle	15/10/15
13	Mutyalu	M	farmer	Chennampalli	15/10/15
14	Lachanna	M	Farmer	Chennapalli	15/10/15
15	Ashok	M	Labours	Chennampalli	15/10/15
16	Oleppa	M	Labour	Chennampalli	15/10/15
17	Jayaprakash	M	Sarpanch	Karakellapalli	15/10/15
18	Ramanna	M	farmer	Karakellapalli	15/10/15
19	Narasimhulu	M	farmer	Karakellapalli	15/10/15
20	Oblesh	M	Farmer	Karakellapalli	15/10/15
21	Jayachandra B	M	Farmer	Karakellapalli	15/10/15
22	Hemanth chowdary	M	Farmer	Karakellapalli	15/10/15
23	Chinna Narasimhulu	M	Farmer	Karakellapalli	15/10/15
24	Krishnamma	F	Farmer	Karakellapalli	15/10/15

Sr. No	Person Name	Gender M/F	Designation	Village/township/local govt. institution	Date
25	Ayappa	M	Surpanch	Rallapalli	15/10/15
26	Venkat Ramireddy	M	Farmer	Rallapalli	15/10/15
27	Nag Reddy	M	Farmer	Rallapalli	15/10/15
28	vedhara	M	Labour	Rallapalli	15/10/15
29	Ramurapa	M	Labour	Rallapalli	15/10/15
30	Shavarappa	M	Farmer	Rallapalli	15/10/15
31	Subbanadu	M	Farmer	Rallapalli	15/10/15
32	S.T Addipa	M	Surpanch	Rallaanantapur	15/10/15
33	Ramaiah	M	Farmer	Ralla Anantapur	15/10/15
34	Tippana	M	Farmer	Ralla Anantapur	15/10/15
35	Keshawa	M	Labour	Ralla Anantapur	15/10/15
36	Mutyala	M	Labour	Ralla Anantapur	15/10/15
37	Hari	M	Labour	Ralla Anantapur	15/10/15
38	mohammed	M	Farmer	Ralla Anantapur	15/10/15
39	Abullapa	M	Farmer	Ralla Anantapur	15/10/15
40	Hanumanthai	M	Farmer	Ralla Anantpur	15/10/15
41	Narsimlu	M	Farmer	Ralla Anantpur	15/10/15
42	Harish	M	Sheepkeeper	Ralla Anantpur	15/10/15
43	Rajesh	M	Husband · Sarpanch	Perur	15/10/15
44	Saraswathi	F	Sarpanch	Perur	15/10/15
45	Baraya	M	Panchayat member	Perur	15/10/15
46	Nagaraju	M	Panchayat member	Perur	15/10/15
47	Mallyalamma	M	Panchayat member	Perur	15/10/15

Sr. No.	Person Name	Gender M/F	Designation	Village/township/local govt. institution	Date
48)	Subramanyam	M	Surpanch	Madilacheru	15/10/2015
49)	J. Narasimlu	M	Farmer	Madilacheru	15/10/15
50)	J. Rani	M	Farmer	Madilacheru	15/10/15
51)	venkatesh	M	Farmer	Madilacheru	15/10/15
52)	Raju	M	farmer	Madilacheru	15/10/15
53)	venkateshwar	M	Farmer	Madilacheru	15/10/15
54)	N. Pilo M	M	Farmer	Madilacheru	15/10/15
55)	G. Mudyalu	M	Farmer	Madilacheru	15/10/15
56)	K. Pilak	M	Labour	Madilacheru	15/10/15
57)	Mudyalaya	M	Farmer	Madilacheru	15/10/15
58)	Hanumanthu	M	farmer	Madilacheru	15/10/15
59)	Gangamma	M	Labour	Madilacheru	15/10/15
60)	Ramappa Narasimulu		Surpanch	Konetipalayam	15/10/15
61	Narayanappa		Farmer	Konetipalayam	15/10/15
62	chandrabe Rao		Farmer	Konetipalayam	15/10/15
63	Sri Ram Reddy		Farmer	Konetipalayam	15/10/15
64	Surinarayana Reddy		Farmer	Konetipalayam	15/10/15
65	Ramu		Farmer	Konetipalayam	15/10/15
66	Janardhana		Farmer	Konetipalayam	15/10/15
67	Linganaiah		Farmer	Konetipalayam	15/10/15
68	Sivareddy		Labour	Konetipalayam	15/10/15
	N				

Sr. No	Person Name	Gender M/F	Designation	Village/township/local govt. institution	Date
69	K. Radha Raman	M	Sub-Registrar office	Kalyandurg	16/10/15
70	P. Narayanayan	M	Jr. Asst-SRO	Kalyandurg	16/10/15
71	Shaik Shawanga	M	Forest range officer	Kalyandurg	16/10/15
72	M. Janardhan	M	Deputy Executive	Kalyandurg	16/10/15
73	Manchaw Ferrer	M	Project director	RDT	16/10/15
74	Naresh	M	Land Team	Ecoren	16/10/15
75	Venkat	M	Land Team	Ecoren	16/10/15
76	Srinivash	M	Land team	Ecoren	16/10/15
77	Chetan Mathram	M	ESG Head	Ostro	16/10/15
78	Sumit Bansal	M	Associate Director	ARCADIS	16/10/15
79	Dhirendra Singh	M	Social Expert	ARCADIS	16/10/15
80	Sugandha Rastogi	F	Environmentalist	ARCADIS	16/10/15
81	D. Surya	F	Environmentalist	ARCADIS	16/10/15

Annexure - XV: Minutes of Meeting with Stakeholders

Minutes of Meeting

Date: 16/10/15 Time: 12:30 PM- 1:00 PM

Venue: Sub Registar office-Kalyandurga Mandal

List of Participant:

1. K Radha raman Sub registrar officer,
2. P. Sivanarayana Jr. Assistant, Sub registrar officer

ARCADIS

3. Sumit Barat Associate Director
4. D. Swega - Environmentalist
5. Mr. Dhirendra p. Singh Sociologist

The primary agenda of the meeting was to: To be collected information about village wise Govt. circle rate of land in study area. II) Procedure for government land acquisition

The important issues which were discussed include

- The circle rate of 8 villages for 1 acre for agricultural land is 1 lakh (Vepakunta, Perur, Madalachervu, Koneti Naina Palem, Chinnampalii, Kurakulapalle, Rallapalle, Ralla Anantapur) which comes under Anantapur District
- Average land holding Size of villagers is 2-3 Acres in the study area villages
- The land acquisition for government lands for D-patta Land is getting NOC from Collector
- The Government assigned lands could not be sold
- Market rate is based on negation with farmer

Conclusion: Circle rate is same for all project affected villages

MINUTES OF MEETING WITH STAKEHOLDERS

Date: 16/10/15 Time: 1:15 PM- 2:00 PM

Venue: Forest range office, Kalyandurga, Anantapur

List of Participant:

1. Shaik shawanga Forest range Officer

ARCADIS

1. Sumit Barat Associate Director
2. D. Swega - Environmentalist
3. Mr. Dhirendra p. Singh Sociologist

The primary agenda of the meeting was to: i) To collected information about wild life animals

The important issues which were discussed include

- Black Bugs are available in Mudianpalle Resserved Forest
- Percolation tanks are constructed in Mudianpalle
- 5 Soccer pits were constructed in Mudianpalle & Kulikad
- Forest department confirmed that Beers are available in Chennampalle & raptors, eagles & vultures are not available in Forest
- Migratory birds are not available in R.F
- 40-50 leopards are available in Rayadurd & kalyanamandal
- Schedule I-range Birds are available in Peacocks
- Siberian Bird are available in Hindpur which is 110km
- 34 blocks are available in Kalyan Durg R.F
- Total Forest Land is 24352.03 Acres
- Some of the R.F acquired in Anantapur District are Mudianpalle, Kalyandurg, Pillapalle, Chetturu, Kairevu

MINUTES OF MEETING WITH STAKEHOLDERS

Date: 16/10/15 Time: 4:00 PM- 5:30 PM

Venue: Minor irrigation Department, kalyandurg, Anantapur

List of Participant:

1. M. Janardhan Deputy Executive, Minor irrigation, Kalyandurga

ARCADIS

1. Sumit Barat Associate Director
2. D. Swega - Environmentalist
3. Mr. Dhirendra p. Singh Sociologist

The primary agenda of the meeting was to: i) to collect information about schemes conducting in nearby villages

The important issues which were discussed include:-

- This Department Is Only The Responsible For Repairs And Renovation Of Existing Structure Which Are Constructed By Minor Irrigation Departments, Anantapur
- Tank implementation is conducted & maintenance of piping of M.I tanks & P.R. tanks as following table

No.s Mandal	MI Tanks	PR tanks	Total
Kalyandurg	4	7	11
Kambadur	6	10	16

- It was confirmed that, minor irrigation schemes ongoing in the area. However, project affected villages are not under the cover
- Around 80-90% subsidy available on drip irrigation facility for the farmers

Conclusion: minor irrigation schemes existing in the area

MINUTES OF MEETING WITH STAKEHOLDERS

Date: 16/10/15 Time: 4:00 PM- 5:30 PM

Venue: Rural Development Tust , Anantapur

List of Participant:

1. Manchow Ferrar Project Director

ARCADIS

4. Sumit Barat Associate Director
5. D. Swega - Environmentalist
6. Mr. Dhirendra p. Singh Sociologist

The primary agenda of the meeting was to: i)-to collect information about programmes conducting in nearby villages

The important issues which were discussed include

- RDT conducts development programmes such as health , sanitation, education, improving livelihoods in the project areas
- RDT support 40,000 sanitation with collaboration with Government under Bharat Swach Mission
- RDT supports for Physically Handicapped persons
- RDT focus on Social issues such as House site, livelistock
- Anantapur District is biggest milk production in State back at 8 years
- Recurring droughts has declined the livestock population
- Due to lack of Water scarcity there is a problem for Sanitation
- One of initiative taken by RDT is to support CSR
- RDT also implements the Government programmes as well as RDT has own project implementing

Annexure - XVI: Landowner Consultation

Consultation with land owners for 170 MW Ostro wind project, Ralla Anantapur

Venue: At open field outside of Vepakunta village and Pvt. High School, Perur village

Participants: stakeholder consultation has conducted with total 17 landowners out of 26, which was ATS completed.

Date: 24th Nov'15

Sl. No.	Land Owner Name	Survey No.	WTG No.	Village	Key findings	Photo Documents
1	Narrayanna	179	T19	Vepakunta	***Total family members:*** *9* ***Earning members:*** *2* ***Livelihood source:*** agriculture and drving JCB machine ***Annual income(INR):*** *10,000* ***How many Sold land to Ecoren (in Acr):*** 3 ***Remaining land after sale (in Acr):*** *4* ***Utilization plan of compensate amount:*** *to purchase another agriculture land* ***Awareness about the project:*** *land aggregator has informed to land owner about the purpose of land acquisition during one to one meeting* ***Activities on sold land:*** *cultivated crops only during rainy season*	

Sl. No.	Land Owner Name	Survey No.	WTG No.	Village	Key findings	Photo Documents
2	Narrayan Reddy	441	T73	Vepakunta	***Total family members:*** *4* ***Earning members:*** *1* ***Livelihood source:*** *agriculture and coolli* ***Annual income(INR):****10,000-12,000* ***How many Sold land to Ecoren (in Acr):*** *3* ***Remaining land after sale (in Acr):*** *3* ***Utilization plan of compensate amount: :*** *to purchase another agriculture land* ***Awareness about the project:*** *land aggregator has informed to land owner about the purpose of land acquisition during one to one meeting* ***Activities on sold land:*** *cultivated crops only during rainy season*	
3	Loknath Reddy	178/2B	T35	Vepakunta	***Total family members:*** *4* ***Earning members:*** *1* ***Livelihood source:*** *agriculture (crops growing- Ground nuts and) and coolli* ***Annual income(INR):*** *10,000-12,000* ***How many Sold land to Ecoren (in Acr):*** *3* ***Remaining land after sale (in Acr):*** *3* ***Utilization plan of compensate amount:*** *to purchase another agriculture land* ***Awareness about the project:*** *land aggregator has informed to land owner about the purpose of land acquisition during one to one meeting*	

Sl. No.	Land Owner Name	Survey No.	WTG No.	Village	Key findings	Photo Documents
					Activities on sold land: *cultivated crops only during rainy season*	
4	Pothi Reddy	173	T11	Vepakunta	***Total family members:*** *10* ***Earning members:*** *3* ***Livelihood source:*** *agriculture and coolli job at bangalore* ***Annual income(INR):*** *10,000-15,000* ***How many Sold land to Ecoren (in Acr):*** *3.3* ***Remaining land after sale (in Acr):*** *8* ***Utilization plan of compensate amount:*** *to paid bank loan and purchase another agriculture land* ***Awareness about the project:*** *land aggregator has informed to land owner about the purpose of land acquisition during one to one meeting* ***Activities on sold land:*** *cultivated crops only during rainy season*	
5	Laxmi Devi W/O Narrayanappa	169	T35	Vepakunta	***Total family members:*** *4* ***Earning members:****1* ***Livelihood source:*** *agriculture (crops-ground nut and gramm) and coolli work in NRGES at village level* ***Annual income(INR):*** *10,000 -12,000* ***How many Sold land to Ecoren (in Acr):*** *3.3* ***Remaining land after sale (in Acr):*** *3* ***Utilization plan of compensate amount:*** *to paid bank loan and education loan*	

Sl. No.	Land Owner Name	Survey No.	WTG No.	Village	Key findings	Photo Documents
					Awareness about the project: *land aggregator has informed to land owner about the purpose of land acquisition during one to one meeting* ***Activities on sold land:*** *cultivated crops only during rainy season*	
6	N. Saraswati W/O Govind Reddy	392	S24	Vepakunta	***Total family members:*** *4* ***Earning members:*** *1* ***Livelihood source:*** *agriculture and coolli (labour) work in NRGES at village level* ***Annual income(INR):*** *10,000 -12,000* ***How many Sold land to Ecoren (in Acr):*** *3.3* ***Remaining land after sale (in Acr):*** *4* ***Utilization plan of compensate amount:*** *to paid bank loan and purchase another agriculture land* ***Awareness about the project:*** *land aggregator has informed to land owner about the purpose of land acquisition during one to one meeting* ***Activities on sold land:*** *cultivated crops only during rainy season*	

Sl. No.	Land Owner Name	Survey No.	WTG No.	Village	Key findings	Photo Documents
7	D. Nagamma W/O Sriramallu	431	T85	Vepakunta	***Total family members:*** *5* ***Earning members:****1* ***Livelihood source:*** *Agriculture* ***Annual income(INR):*** *10,000-12,000* ***How many Sold land to Ecoren (in Acr):*** *3.3* ***Remaining land after sale (in Acr):*** *4* ***Utilization plan of compensate amount:*** *to paid educational loan of his children(his son doing b-tech) and purchase another agriculture land* ***Awareness about the project:*** *land aggregator has informed to land owner about the purpose of land acquisition during one to one meeting* ***Activities on sold land:*** *cultivated crops only during rainy season*	
8	D Eswaraiah S/O Muthalappa	436	T64	Vepakunta	***Total family members:*** *6* ***Livelihood source:*** *Agriculture (rain-fed agriculture)and labour work in NRGES at village level and work out side like Bangalore* ***Annual income(INR):*** *15,000* ***How many Sold land to Ecoren (in Acr):*** *3.3* ***Remaining land after sale (in Acr):*** *5* ***Utilization plan of compensate amount:*** *to paid agriculturalloan and educational loan which he taken for his son*	

Sl. No.	Land Owner Name	Survey No.	WTG No.	Village	Key findings	Photo Documents
					Awareness about the project: *land aggregator has informed to land owner about the purpose of land acquisition during one to one meeting* ***Activities on sold land:*** *cultivated crops only during rainy season*	
9	A.Narrayanannna	179	T19	Vepakunta	***Total family members: 3*** ***Livelihood source:*** *Agriculture (rain-fed)and labour work in NRGES at village level and work out side like Bangalore and Chennai* ***Annual income(INR):*** *10,000-12,000* ***How many Sold land to Ecoren (in Acr):*** *2* ***Remaining land after sale (in Acr):*** *5* ***Utilization plan of compensate amount:*** *to purchase another agriculture land* ***Awareness about the project:*** *land aggregator has informed to land owner about the purpose of land acquisition during one to one meeting* ***Activities on sold land:*** *cultivated crops only during rainy season*	

Sl. No.	Land Owner Name	Survey No.	WTG No.	Village	Key findings	Photo Documents
10	Govindappa	213	S26	Vepakunta	***Total family members: 9*** ***Livelihood source:*** *Agriculture (rain-fed, crops- Ground nut, caster and redgramm)and labour work in NRGES at village level* ***Annual income(INR):*** *10,000-12,000* ***How many Sold land to Ecoren (in Acr):****2* ***Remaining land after sale (in Acr):*** *3* ***Utilization plan of compensate amount: :*** *to purchase another agriculture land* ***Awareness about the project:*** *land aggregator has informed to land owner about the purpose of land acquisition during one to one meeting* ***Activities on sold land:*** *cultivated crops only during rainy season* ***Remarks:*** *he belongs to ST community*	
11	K. Konaiah	399	S11	Vepakunta	***Total family members: 5*** ***Earning members:1*** ***Livelihood source:*** *Agriculture and labour work in NRGES at village level* ***Annual income(INR):*** *10,000-12,000* ***How many Sold land to Ecoren (in Acr):*** *3.3* ***Remaining land after sale (in Acr):*** *5* ***Utilization plan of compensate amount:*** *to paid agriculture loan and purchase another agriculture land*	

Sl. No.	Land Owner Name	Survey No.	WTG No.	Village	Key findings	Photo Documents
					Awareness about the project: *land aggregator has informed to land owner about the purpose of land acquisition during one to one meeting* ***Activities on sold land:*** *cultivated crops only during rainy season*	
12	k. Narrayanppa S/O Narassaish	53/1A/1	T75	Perur	***Total family members:*** *3* ***Earning members:****1* ***Livelihood source:*** *Agriculture* ***Annual income(INR):*** *10,000-12,000* ***How many Sold land to Ecoren (in Acr):*** *3* ***Remaining land after sale (in Acr):*** *2* ***Utilization plan of compensate amount:*** *to purchase another agriculture land* ***Awareness about the project:*** *land aggregator has informed to land owner about the purpose of land acquisition during one to one meeting* ***Activities on sold land:*** *cultivated crops only during rainy season* ***Remark:*** *he lives in Konetinayanipalyam village but his land comes under Perur village*	

Sl. No.	Land Owner Name	Survey No.	WTG No.	Village	Key findings	Photo Documents
13	Anji W/O G. Thippakka	152/1	T76	Konetinayanipalyam	***Total family members:*** *5* ***Earning members:*** *1* ***Livelihood source:*** *Agriculture and labour work in NRGES at village level* ***Annual income(INR):*** *10,000-12,000* ***How many Sold land to Ecoren (in Acr):*** *1.5* ***Remaining land after sale (in Acr):*** *2* ***Utilization plan of compensate amount:*** *to purchase another agriculture land and paid bank loan which he taken for agricultural ppurpose* ***Awareness about the project:*** *land aggregator has informed to land owner about the purpose of land acquisition during one to one meeting* ***Activities on sold land:*** *cultivated crops only during rainy season*	
14	Muthyalamma W/O Ramanzaneyulu	152/1	T76	Konetinayanipalyam	***Total family members:*** *2* ***Earning members:*** *1* ***Livelihood source:*** *Agriculture and labour work in NRGES at village level* ***Annual income(INR):*** *10,000* ***How many Sold land to Ecoren (in Acr):*** *1.5* ***Remaining land after sale (in Acr):*** *2* ***Utilization plan of compensate amount:*** *to purchase another agriculture land and paid bank loan which he has taken for agricultural ppurpose*	

Sl. No.	Land Owner Name	Survey No.	WTG No.	Village	Key findings	Photo Documents
					Awareness about the project: *land aggregator has informed to land owner about the purpose of land acquisition during one to one meeting* ***Activities on sold land:*** *cultivated crops only during rainy season*	
15	Middi Gangappa	28/2A	T95	Perur	***Total family members:*** *4* ***Earning members:*** *1* ***Livelihood source:*** *Agriculture and labour work in NRGES at village level and work out side like Bangalore and Hyderabad* ***Annual income(INR):*** *10,000-12,000* ***How many Sold land to Ecoren (in Acr):*** *1* ***Remaining land after sale (in Acr):*** *3* ***Utilization plan of compensate amount:*** *to purchase another agriculture land and paid bank loan which he has taken for agricultural ppurpose* ***Awareness about the project:*** *land aggregator has informed to land owner about the purpose of land acquisition during one to one meeting* ***Activities on sold land:*** *cultivated crops only during rainy season*	

Sl. No.	Land Owner Name	Survey No.	WTG No.	Village	Key findings	Photo Documents
16	Gouni Jhasni W/O Bhasker	71	T97	Konetinayanipalyam	***Total family members:*** *4* ***Livelihood source:*** *Agriculture and labour work in NRGES at village level* ***Annual income(INR):*** *10,000-12,000* ***How many Sold land to Ecoren (in Acr):*** *3* ***Remaining land after sale (in Acr):*** *1/2* ***Utilization plan of compensate amount:*** *to purchase another agriculture land and paid bank loan which he has taken for agricultural ppurpose* ***Awareness about the project:*** *land aggregator has informed to land owner about the purpose of land acquisition during one to one meeting* ***Activities on sold land:*** *cultivated crops only during rainy season*	
17	Dali chinnakka W/O Mutyallappa	53	T61	Perur	***Total family members:*** *5 (including 3 chilren)* ***Livelihood source:*** *Agriculture and labour work* ***Annual income(INR):*** *15,000* ***How many Sold land to Ecoren (in Acr):*** *3* ***Remaining land after sale (in Acr):*** *1.5* ***Utilization plan of compensate amount:*** *to paid bank loan which she has taken for agricultural purpose*	

Sl. No.	Land Owner Name	Survey No.	WTG No.	Village	Key findings	Photo Documents
					Awareness about the project: *land aggregator has informed to land owner about the purpose of land acquisition during one to one meeting* ***Activities on sold land:*** *cultivated crops ground nut, pulses, and red-gramm* ***Remarks:*** *women headed household and Dali chinnakka she is wodow and living with her douther*	

Annexure - XVII: Photo Documentation of Stakeholder's Consultation

	
Consultation with villagers, Vepakunta village	*Consultation with villagers, Maddalacheruvu village*
	
Consultation with villagers, Chennampalle village	*Consultation with villagers, Ralla Anantapur village*
	
Consultation with Ex. President, Kurakulapalle village	*Consultation with villagers, Rallapalle village*

Consultation with villagers, Konetinayanipalyam village

Consultation with President, Perur village

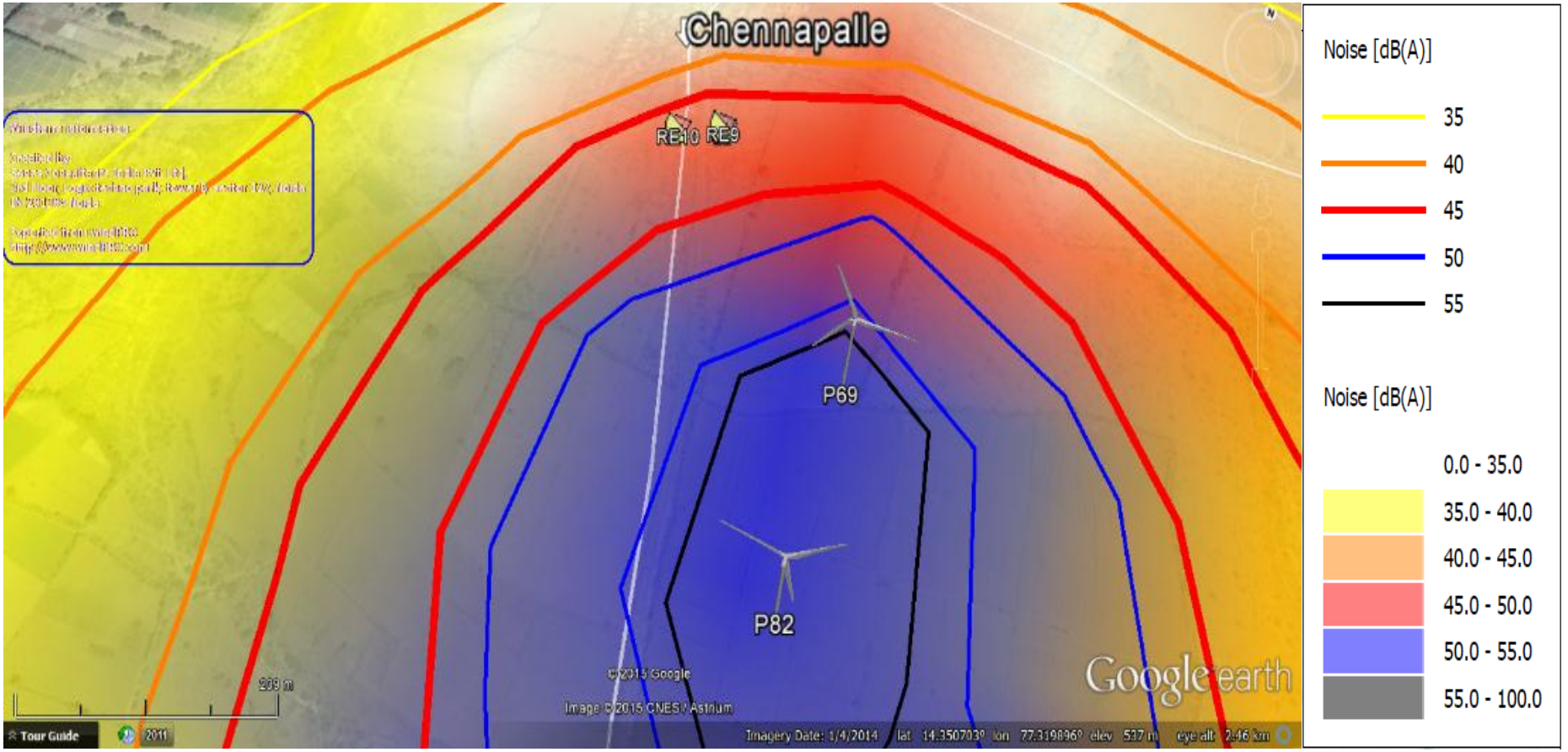
Consultation with staff Sub-Registrar office, Kalyandurga Mandal, Anantapur

ARCADIS team visit at Forest range office, *Kalyandurga*

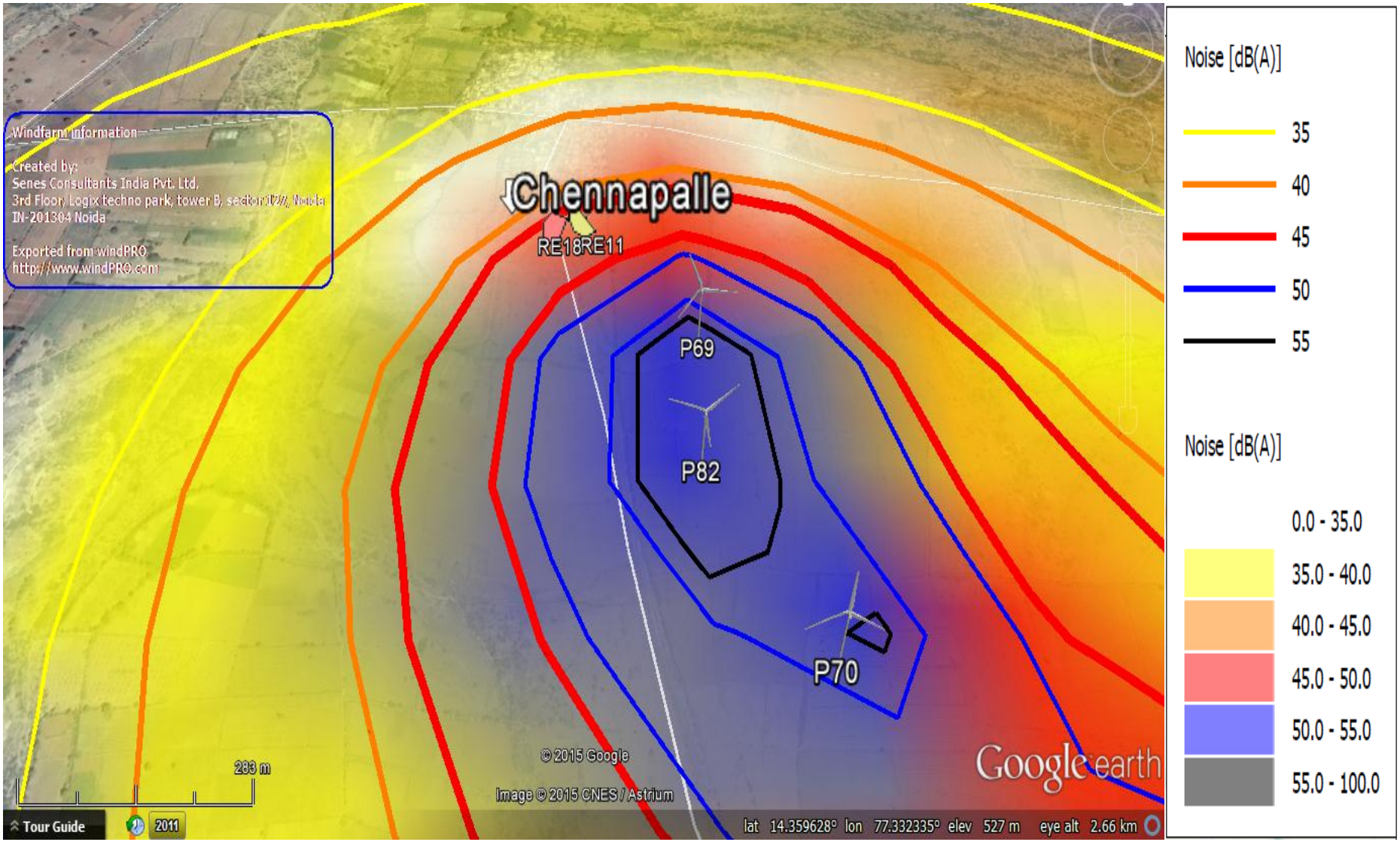
ARCADIS team visit at Minor irrigation department, kalyandurga

Annexure - XVIII: Noise modelling Results

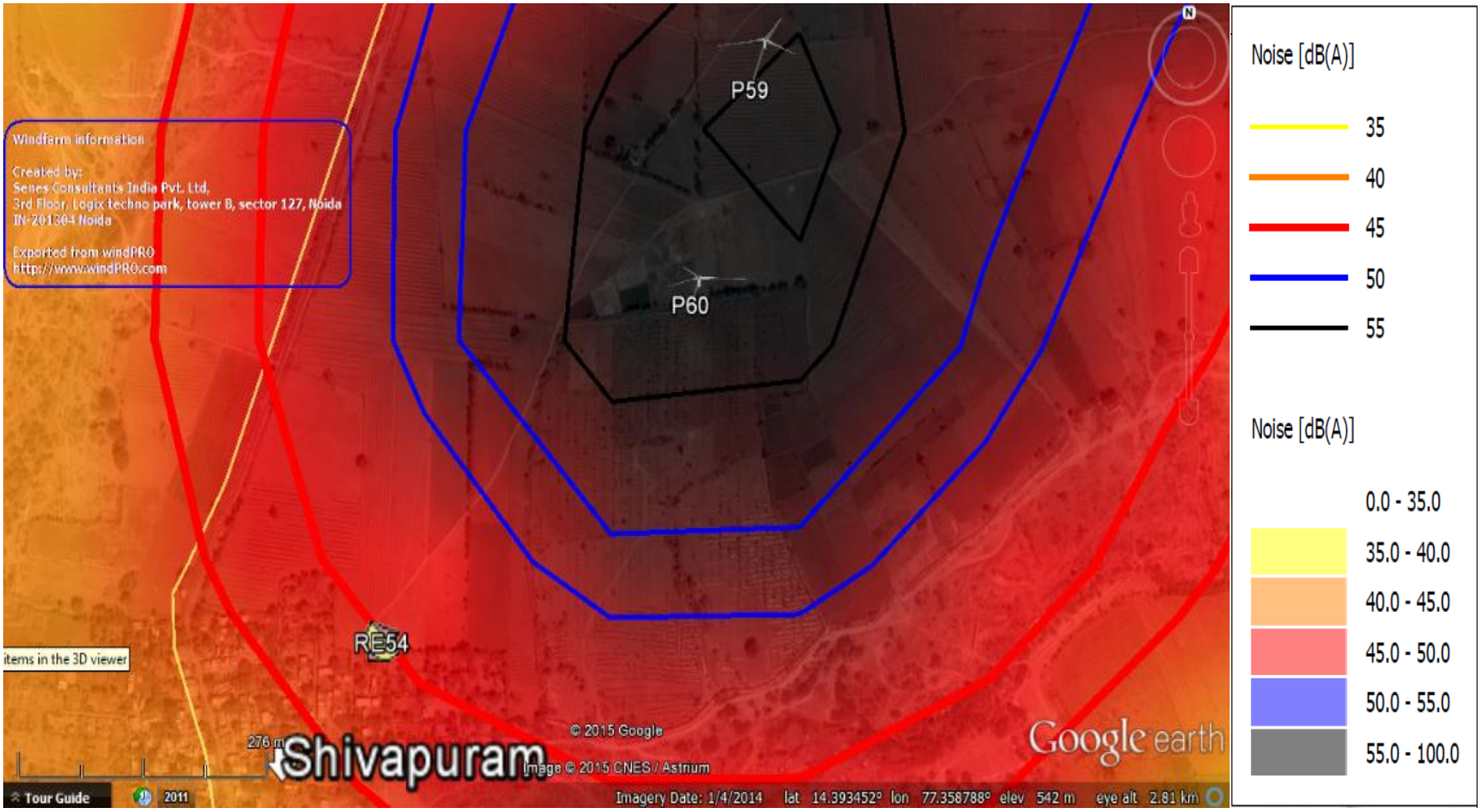
NOISE MODELLING RESULTS (RE 9 & 10)



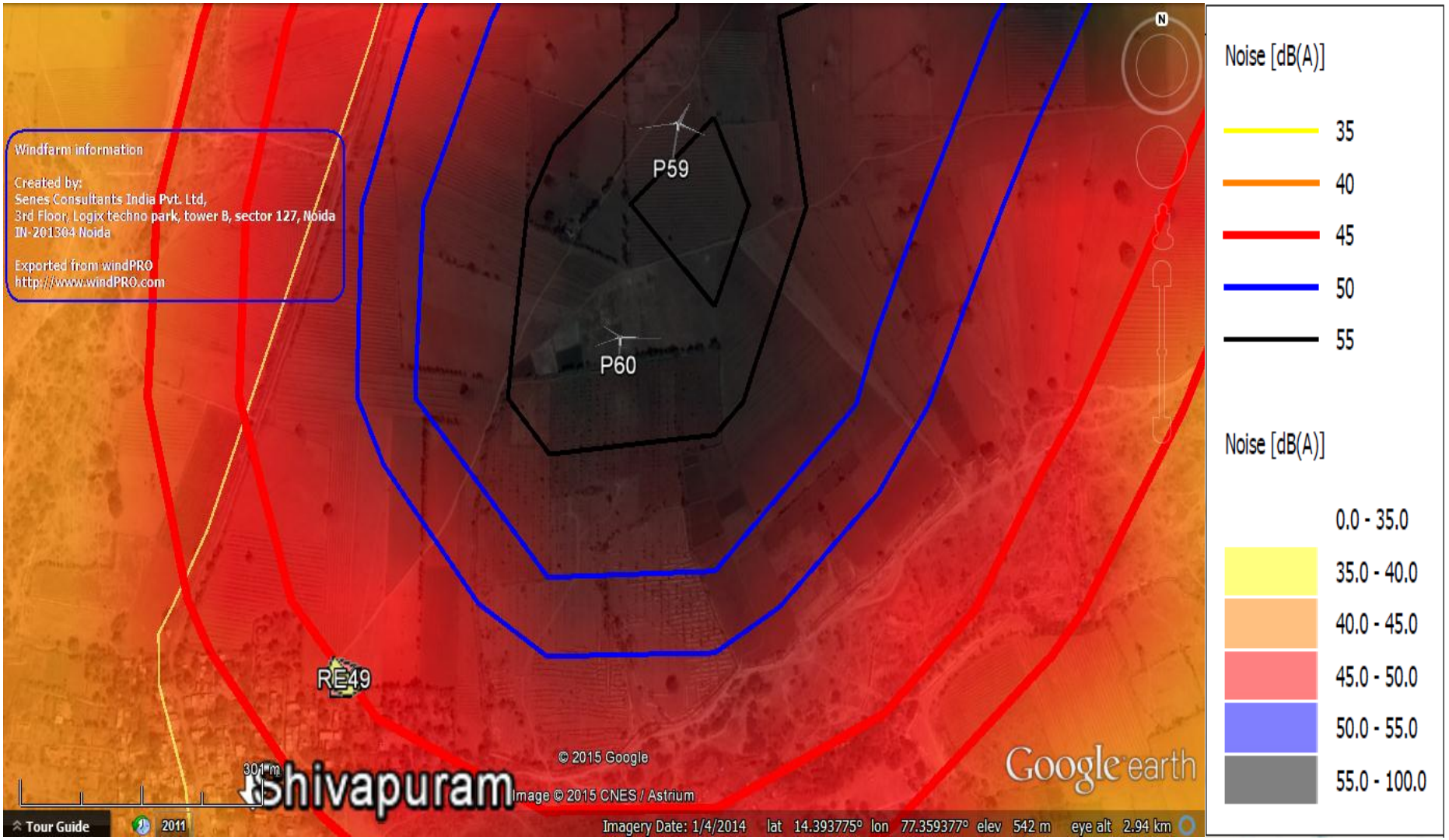
NOISE MODELLING RESULTS (RE 11 & 18)



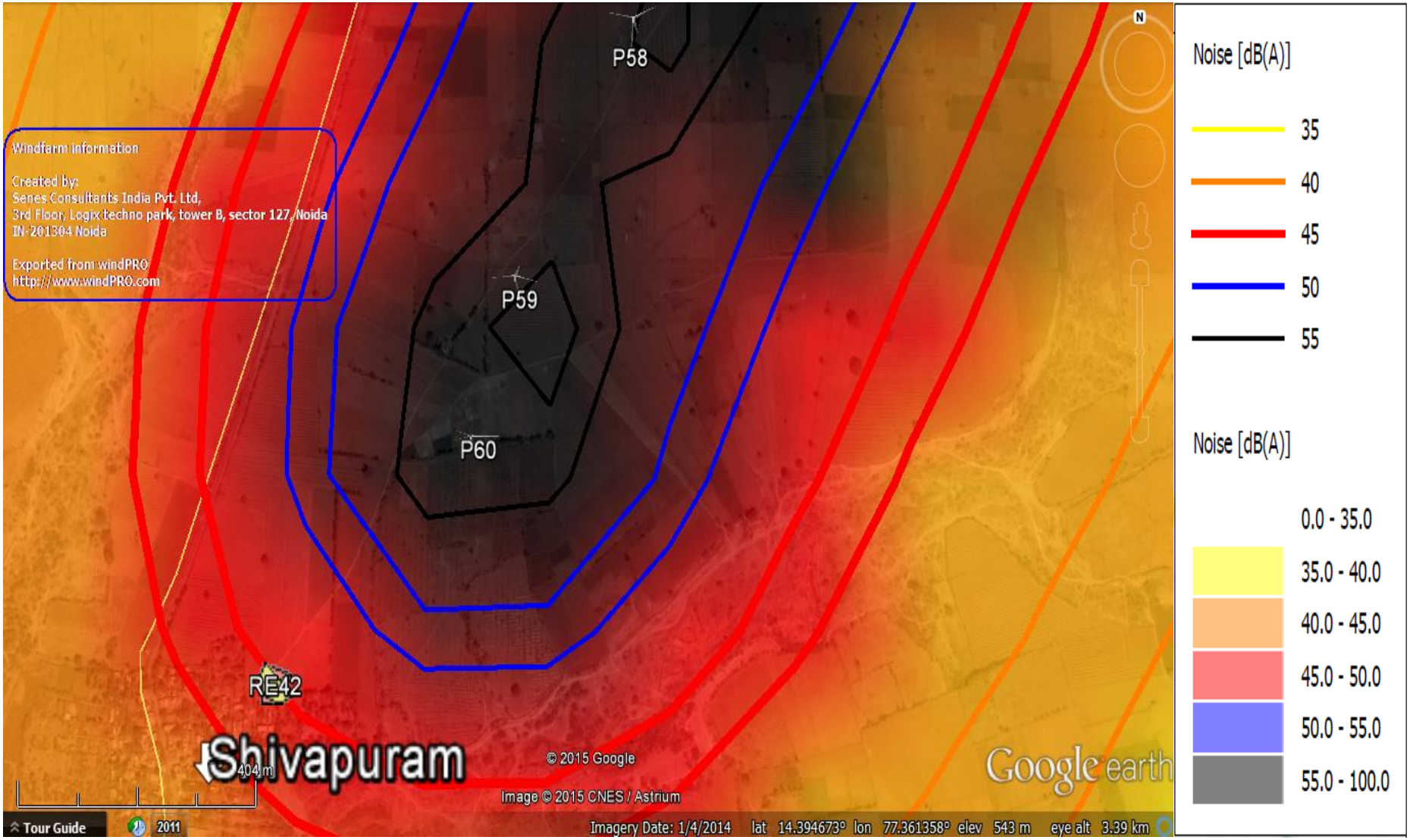
NOISE MODELLING RESULTS (RE 54)



NOISE MODELLING RESULTS (RE 49)



NOISE MODELLING RESULTS (RE 42)

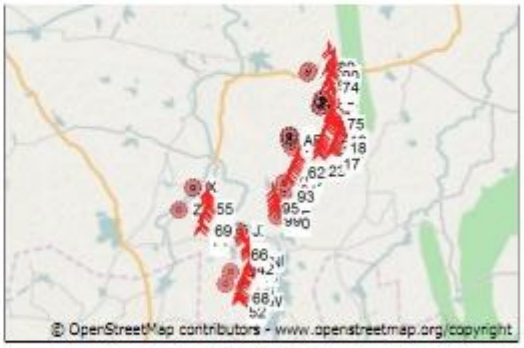


Senes Consultants India Pvt. Ltd,
3rd Floor, Logix techno park, tower B, sector 127, Noida
IN-201304 Noida
01204368426

Calculated:
12/4/2015 5:15 PM/3.0.619

DECIBEL - Main Result

Noise calculation model:
ISO 9613-2 General
Wind speed:
4.0 m/s - 15.0 m/s, step 1.0 m/s
Ground attenuation:
Alternative
Meteorological coefficient, C0:
0.0 dB
Type of demand in calculation:
1: WTG noise is compared to demand (DK, DE, SE, NL etc.)
Noise values in calculation:
All noise values are mean values (Lwa) (Normal)
Pure tones:
Pure and Impulse tone penalty are added to WTG source noise
Height above ground level, when no value in NSA object:
0.0 m Don't allow override of model height with height from NSA object
Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:
0.0 dB(A)



Scale 1:500,000
New WTG
Noise sensitive area

WTGs

	Easting	Northing	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Noise data Creator	Name	First wind speed	LwaRef	Last wind speed	LwaRef	Pure tones
			[m]					[kW]	[m]	[m]			[m/s]	[dB(A)]	[m/s]	[dB(A)]	
1	758,544	1,599,702	533.4	Suzlon S97 2100 97.0 IO! hub...	Yes	Suzlon	S97-2,100	2,100	97.0	120.0	USER	Level 0 - - S97OPIG 2100kW - 11-2011	4.0	100.5	15.0	107.4	No g
2	758,472	1,599,538	533.7	Suzlon S97 2100 97.0 IO! hub...	Yes	Suzlon	S97-2,100	2,100	97.0	120.0	USER	Level 0 - - S97OPIG 2100kW - 11-2011	4.0	100.5	15.0	107.4	No g
3	758,631	1,599,474	531.2	Suzlon S97 2100 97.0 IO! hub...	Yes	Suzlon	S97-2,100	2,100	97.0	120.0	USER	Level 0 - - S97OPIG 2100kW - 11-2011	4.0	100.5	15.0	107.4	No g
4	758,300	1,600,150	529.8	Suzlon S97 2100 97.0 IO! hub...	Yes	Suzlon	S97-2,100	2,100	97.0	120.0	USER	Level 0 - - S97OPIG 2100kW - 11-2011	4.0	100.5	15.0	107.4	No g
5	758,359	1,598,342	551.2	Suzlon S97 2100 97.0 IO! hub...	Yes	Suzlon	S97-2,100	2,100	97.0	120.0	USER	Level 0 - - S97OPIG 2100kW - 11-2011	4.0	100.5	15.0	107.4	No g
6	758,615	1,599,267	533.9	Suzlon S97 2100 97.0 IO! hub...	Yes	Suzlon	S97-2,100	2,100	97.0	120.0	USER	Level 0 - - S97OPIG 2100kW - 11-2011	4.0	100.5	15.0	107.4	No g
7	758,316	1,598,120	551.2	Suzlon S97 2100 97.0 IO! hub...	Yes	Suzlon	S97-2,100	2,100	97.0	120.0	USER	Level 0 - - S97OPIG 2100kW - 11-2011	4.0	100.5	15.0	107.4	No g
8	758,994	1,597,986	533.3	Suzlon S97 2100 97.0 IO! hub...	Yes	Suzlon	S97-2,100	2,100	97.0	120.0	USER	Level 0 - - S97OPIG 2100kW - 11-2011	4.0	100.5	15.0	107.4	No g
9	758,983	1,598,195	529.8	Suzlon S97 2100 97.0 IO! hub...	Yes	Suzlon	S97-2,100	2,100	97.0	120.0	USER	Level 0 - - S97OPIG 2100kW - 11-2011	4.0	100.5	15.0	107.4	No g
10	758,103	1,600,763	530.0	Suzlon S97 2100 97.0 IO! hub...	Yes	Suzlon	S97-2,100	2,100	97.0	120.0	USER	Level 0 - - S97OPIG 2100kW - 11-2011	4.0	100.5	15.0	107.4	No g
11	758,178	1,600,555	527.2	Suzlon S97 2100 97.0 IO! hub...	Yes	Suzlon	S97-2,100	2,100	97.0	120.0	USER	Level 0 - - S97OPIG 2100kW - 11-2011	4.0	100.5	15.0	107.4	No g
12	758,974	1,597,757	534.6	Suzlon S97 2100 97.0 IO! hub...	Yes	Suzlon	S97-2,100	2,100	97.0	120.0	USER	Level 0 - - S97OPIG 2100kW - 11-2011	4.0	100.5	15.0	107.4	No g
13	757,798	1,600,937	521.9	Suzlon S97 2100 97.0 IO! hub...	Yes	Suzlon	S97-2,100	2,100	97.0	120.0	USER	Level 0 - - S97OPIG 2100kW - 11-2011	4.0	100.5	15.0	107.4	No g
14	758,841	1,596,512	543.6	Suzlon S97 2100 97.0 IO! hub...	Yes	Suzlon	S97-2,100	2,100	97.0	120.0	USER	Level 0 - - S97OPIG 2100kW - 11-2011	4.0	100.5	15.0	107.4	No g
15	758,967	1,596,750	544.0	Suzlon S97 2100 97.0 IO! hub...	Yes	Suzlon	S97-2,100	2,100	97.0	120.0	USER	Level 0 - - S97OPIG 2100kW - 11-2011	4.0	100.5	15.0	107.4	No g
16	758,731	1,596,355	545.3	Suzlon S97 2100 97.0 IO! hub...	Yes	Suzlon	S97-2,100	2,100	97.0	120.0	USER	Level 0 - - S97OPIG 2100kW - 11-2011	4.0	100.5	15.0	107.4	No g
17	758,399	1,595,568	547.3	Suzlon S97 2100 97.0 IO! hub...	Yes	Suzlon	S97-2,100	2,100	97.0	120.0	USER	Level 0 - - S97OPIG 2100kW - 11-2011	4.0	100.5	15.0	107.4	No g
18	758,976	1,596,971	543.8	Suzlon S97 2100 97.0 IO! hub...	Yes	Suzlon	S97-2,100	2,100	97.0	120.0	USER	Level 0 - - S97OPIG 2100kW - 11-2011	4.0	100.5	15.0	107.4	No g
19	758,668	1,597,808	538.7	Suzlon S97 2100 97.0 IO! hub...	Yes	Suzlon	S97-2,100	2,100	97.0	120.0	USER	Level 0 - - S97OPIG 2100kW - 11-2011	4.0	100.5	15.0	107.4	No g
20	759,033	1,597,193	541.4	Suzlon S97 2100 97.0 IO! hub...	Yes	Suzlon	S97-2,100	2,100	97.0	120.0	USER	Level 0 - - S97OPIG 2100kW - 11-2011	4.0	100.5	15.0	107.4	No g
21	758,628	1,596,240	543.2	Suzlon S97 2100 97.0 IO! hub...	Yes	Suzlon	S97-2,100	2,100	97.0	120.0	USER	Level 0 - - S97OPIG 2100kW - 11-2011	4.0	100.5	15.0	107.4	No g
22	758,505	1,595,798	545.6	Suzlon S97 2100 97.0 IO! hub...	Yes	Suzlon	S97-2,100	2,100	97.0	120.0	USER	Level 0 - - S97OPIG 2100kW - 11-2011	4.0	100.5	15.0	107.4	No g
23	757,134	1,594,917	560.8	Suzlon S111 2100 111.8 IO! h...	Yes	Suzlon	S111-2,100	2,100	111.8	90.0	USER	Level 0 - - S97OPIG 2100kW - 11-2011	4.0	98.0	15.0	100.7	No
24	757,194	1,595,125	561.5	Suzlon S111 2100 111.8 IO! h...	Yes	Suzlon	S111-2,100	2,100	111.8	90.0	USER	Level 0 - - S97OPIG 2100kW - 11-2011	4.0	98.0	15.0	100.7	No
25	757,219	1,595,428	561.1	Suzlon S111 2100 111.8 IO! h...	Yes	Suzlon	S111-2,100	2,100	111.8	90.0	USER	Level 0 - - S97OPIG 2100kW - 11-2011	4.0	98.0	15.0	100.7	No
26	758,133	1,598,123	539.9	Suzlon S111 2100 111.8 IO! h...	Yes	Suzlon	S111-2,100	2,100	111.8	90.0	USER	Level 0 - - S97OPIG 2100kW - 11-2011	4.0	98.0	15.0	100.7	No
27	757,280	1,595,671	561.4	Suzlon S111 2100 111.8 IO! h...	Yes	Suzlon	S111-2,100	2,100	111.8	90.0	USER	Level 0 - - S97OPIG 2100kW - 11-2011	4.0	98.0	15.0	100.7	No
28	758,158	1,598,336	538.9	Suzlon S111 2100 111.8 IO! h...	Yes	Suzlon	S111-2,100	2,100	111.8	90.0	USER	Level 0 - - S97OPIG 2100kW - 11-2011	4.0	98.0	15.0	100.7	No
29	758,118	1,597,860	540.9	Suzlon S111 2100 111.8 IO! h...	Yes	Suzlon	S111-2,100	2,100	111.8	90.0	USER	Level 0 - - S97OPIG 2100kW - 11-2011	4.0	98.0	15.0	100.7	No
30	757,317	1,595,890	560.6	Suzlon S111 2100 111.8 IO! h...	Yes	Suzlon	S111-2,100	2,100	111.8	90.0	USER	Level 0 - - S97OPIG 2100kW - 11-2011	4.0	98.0	15.0	100.7	No
31	758,194	1,596,545	537.5	Suzlon S111 2100 111.8 IO! h...	Yes	Suzlon	S111-2,100	2,100	111.8	90.0	USER	Level 0 - - S97OPIG 2100kW - 11-2011	4.0	98.0	15.0	100.7	No
32	757,853	1,597,147	551.9	Suzlon S111 2100 111.8 IO! h...	Yes	Suzlon	S111-2,100	2,100	111.8	90.0	USER	Level 0 - - S97OPIG 2100kW - 11-2011	4.0	98.0	15.0	100.7	No
33	758,075	1,597,641	543.0	Suzlon S111 2100 111.8 IO! h...	Yes	Suzlon	S111-2,100	2,100	111.8	90.0	USER	Level 0 - - S97OPIG 2100kW - 11-2011	4.0	98.0	15.0	100.7	No
34	757,414	1,596,142	559.6	Suzlon S111 2100 111.8 IO! h...	Yes	Suzlon	S111-2,100	2,100	111.8	90.0	USER	Level 0 - - S97OPIG 2100kW - 11-2011	4.0	98.0	15.0	100.7	No
35	757,920	1,597,389	547.5	Suzlon S111 2100 111.8 IO! h...	Yes	Suzlon	S111-2,100	2,100	111.8	90.0	USER	Level 0 - - S97OPIG 2100kW - 11-2011	4.0	98.0	15.0	100.7	No
36	757,480	1,596,378	558.2	Suzlon S111 2100 111.8 IO! h...	Yes	Suzlon	S111-2,100	2,100	111.8	90.0	USER	Level 0 - - S97OPIG 2100kW - 11-2011	4.0	98.0	15.0	100.7	No
37	758,225	1,598,756	533.6	Suzlon S111 2100 111.8 IO! h...	Yes	Suzlon	S111-2,100	2,100	111.8	90.0	USER	Level 0 - - S97OPIG 2100kW - 11-2011	4.0	98.0	15.0	100.7	No
38	757,586	1,596,621	555.0	Suzlon S111 2100 111.8 IO! h...	Yes	Suzlon	S111-2,100	2,100	111.8	90.0	USER	Level 0 - - S97OPIG 2100kW - 11-2011	4.0	98.0	15.0	100.7	No
39	750,951	1,586,934	548.8	Suzlon S111 2100 111.8 IO! h...	Yes	Suzlon	S111-2,100	2,100	111.8	90.0	USER	Level 0 - - S97OPIG 2100kW - 11-2011	4.0	98.0	15.0	100.7	No
40	750,921	1,586,734	551.6	Suzlon S111 2100 111.8 IO! h...	Yes	Suzlon	S111-2,100	2,100	111.8	90.0	USER	Level 0 - - S97OPIG 2100kW - 11-2011	4.0	98.0	15.0	100.7	No
41	750,895	1,586,531	554.8	Suzlon S111 2100 111.8 IO! h...	Yes	Suzlon	S111-2,100	2,100	111.8	90.0	USER	Level 0 - - S97OPIG 2100kW - 11-2011	4.0	98.0	15.0	100.7	No
42	750,902	1,586,317	556.0	Suzlon S111 2100 111.8 IO! h...	Yes	Suzlon	S111-2,100	2,100	111.8	90.0	USER	Level 0 - - S97OPIG 2100kW - 11-2011	4.0	98.0	15.0	100.7	No
43	751,024	1,586,030	557.9	Suzlon S111 2100 111.8 IO! h...	Yes	Suzlon	S111-2,100	2,100	111.8	90.0	USER	Level 0 - - S97OPIG 2100kW - 11-2011	4.0	98.0	15.0	100.7	No
44	751,300	1,585,623	553.5	Suzlon S111 2100 111.8 IO! h...	Yes	Suzlon	S111-2,100	2,100	111.8	90.0	USER	Level 0 - - S97OPIG 2100kW - 11-2011	4.0	98.0	15.0	100.7	No
45	751,090	1,585,259	553.1	Suzlon S111 2100 111.8 IO! h...	Yes	Suzlon	S111-2,100	2,100	111.8	90.0	USER	Level 0 - - S97OPIG 2100kW - 11-2011	4.0	98.0	15.0	100.7	No
46	751,127	1,584,988	554.7	Suzlon S111 2100 111.8 IO! h...	Yes	Suzlon	S111-2,100	2,100	111.8	90.0	USER	Level 0 - - S97OPIG 2100kW - 11-2011	4.0	98.0	15.0	100.7	No
47	751,088	1,584,773	555.3	Suzlon S111 2100 111.8 IO! h...	Yes	Suzlon	S111-2,100	2,100	111.8	90.0	USER	Level 0 - - S97OPIG 2100kW - 11-2011	4.0	98.0	15.0	100.7	No
48	750,958	1,584,482	555.7	Suzlon S111 2100 111.8 IO! h...	Yes	Suzlon	S111-2,100	2,100	111.8	90.0	USER	Level 0 - - S97OPIG 2100kW - 11-2011	4.0	98.0	15.0	100.7	No
49	750,464	1,583,476	555.7	Suzlon S111 2100 111.8 IO! h...	Yes	Suzlon	S111-2,100	2,100	111.8	90.0	USER	Level 0 - - S97OPIG 2100kW - 11-2011	4.0	98.0	15.0	100.7	No
50	750,373	1,583,088	554.0	Suzlon S111 2100 111.8 IO! h...	Yes	Suzlon	S111-2,100	2,100	111.8	90.0	USER	Level 0 - - S97OPIG 2100kW - 11-2011	4.0	98.0	15.0	100.7	No
51	750,341	1,582,762	557.9	Suzlon S111 2100 111.8 IO! h...	Yes	Suzlon	S111-2,100	2,100	111.8	90.0	USER	Level 0 - - S97OPIG 2100kW - 11-2011	4.0	98.0	15.0	100.7	No
52	750,283	1,582,561	554.6	Suzlon S111 2100 111.8 IO! h...	Yes	Suzlon	S111-2,100	2,100	111.8	90.0	USER	Level 0 - - S97OPIG 2100kW - 11-2011	4.0	98.0	15.0	100.7	No
53	750,225	1,582,360	555.4	Suzlon S111 2100 111.8 IO! h...	Yes	Suzlon	S111-2,100	2,100	111.8	90.0	USER	Level 0 - - S97OPIG 2100kW - 11-2011	4.0	98.0	15.0	100.7	No

To be continued on next page...

DECIBEL - Main Result

...continued from previous page

	Easting	Northing	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Noise data Creator	Name	Free wind speed	LwaRef	Last wind speed	LwaRef	Pure tones
			[m]					[kW]	[m]	[m]			[m/s]	[dB(A)]	[m/s]	[dB(A)]	
54	750,193	1,592,159	534.3	Suzlon S111 2100 111.8 (C) h...	Yes	Suzlon	S111-2,100	2,100	111.8	90.0	USER	Level 0 - - $97OPIS 2100kW - 11-2011	4.0	98.0	15.0	100.7	No
55	747,314	1,591,519	540.5	Suzlon S111 2100 111.8 (C) h...	Yes	Suzlon	S111-2,100	2,100	111.8	90.0	USER	Level 0 - - $97OPIS 2100kW - 11-2011	4.0	98.0	15.0	100.7	No
56	747,363	1,591,307	542.4	Suzlon S111 2100 111.8 (C) h...	Yes	Suzlon	S111-2,100	2,100	111.8	90.0	USER	Level 0 - - $97OPIS 2100kW - 11-2011	4.0	98.0	15.0	100.7	No
57	747,388	1,591,019	547.8	Suzlon S111 2100 111.8 (C) h...	Yes	Suzlon	S111-2,100	2,100	111.8	90.0	USER	Level 0 - - $97OPIS 2100kW - 11-2011	4.0	98.0	15.0	100.7	No
58	747,341	1,590,750	548.9	Suzlon S111 2100 111.8 (C) h...	Yes	Suzlon	S111-2,100	2,100	111.8	90.0	USER	Level 0 - - $97OPIS 2100kW - 11-2011	4.0	98.0	15.0	100.7	No
59	747,318	1,590,343	553.2	Suzlon S111 2100 111.8 (C) h...	Yes	Suzlon	S111-2,100	2,100	111.8	90.0	USER	Level 0 - - $97OPIS 2100kW - 11-2011	4.0	98.0	15.0	100.7	No
60	747,457	1,590,084	553.6	Suzlon S111 2100 111.8 (C) h...	Yes	Suzlon	S111-2,100	2,100	111.8	90.0	USER	Level 0 - - $97OPIS 2100kW - 11-2011	4.0	98.0	15.0	100.7	No
61	747,277	1,589,808	558.4	Suzlon S111 2100 111.8 (C) h...	Yes	Suzlon	S111-2,100	2,100	111.8	90.0	USER	Level 0 - - $97OPIS 2100kW - 11-2011	4.0	98.0	15.0	100.7	No
62	755,332	1,594,782	544.3	Suzlon S111 2100 111.8 (C) h...	Yes	Suzlon	S111-2,100	2,100	111.8	90.0	USER	Level 0 - - $97OPIS 2100kW - 11-2011	4.0	98.0	15.0	100.7	No
63	750,380	1,587,797	540.4	Suzlon S111 2100 111.8 (C) h...	Yes	Suzlon	S111-2,100	2,100	111.8	90.0	USER	Level 0 - - $97OPIS 2100kW - 11-2011	4.0	98.0	15.0	100.7	No
64	750,516	1,587,333	541.8	Suzlon S111 2100 111.8 (C) h...	Yes	Suzlon	S111-2,100	2,100	111.8	90.0	USER	Level 0 - - $97OPIS 2100kW - 11-2011	4.0	98.0	15.0	100.7	No
65	750,714	1,586,188	550.6	Suzlon S111 2100 111.8 (C) h...	Yes	Suzlon	S111-2,100	2,100	111.8	90.0	USER	Level 0 - - $97OPIS 2100kW - 11-2011	4.0	98.0	15.0	100.7	No
66	750,370	1,587,589	540.7	Suzlon S111 2100 111.8 (C) h...	Yes	Suzlon	S111-2,100	2,100	111.8	90.0	USER	Level 0 - - $97OPIS 2100kW - 11-2011	4.0	98.0	15.0	100.7	No
67	750,639	1,583,932	559.4	Suzlon S111 2100 111.8 (C) h...	Yes	Suzlon	S111-2,100	2,100	111.8	90.0	USER	Level 0 - - $97OPIS 2100kW - 11-2011	4.0	98.0	15.0	100.7	No
68	750,574	1,583,731	558.5	Suzlon S111 2100 111.8 (C) h...	Yes	Suzlon	S111-2,100	2,100	111.8	90.0	USER	Level 0 - - $97OPIS 2100kW - 11-2011	4.0	98.0	15.0	100.7	No
69	747,181	1,589,586	558.6	Suzlon S111 2100 111.8 (C) h...	Yes	Suzlon	S111-2,100	2,100	111.8	90.0	USER	Level 0 - - $97OPIS 2100kW - 11-2011	4.0	98.0	15.0	100.7	No
70	747,097	1,589,383	558.3	Suzlon S111 2100 111.8 (C) h...	Yes	Suzlon	S111-2,100	2,100	111.8	90.0	USER	Level 0 - - $97OPIS 2100kW - 11-2011	4.0	98.0	15.0	100.7	No
71	746,971	1,589,732	560.3	Suzlon S111 2100 111.8 (C) h...	Yes	Suzlon	S111-2,100	2,100	111.8	90.0	USER	Level 0 - - $97OPIS 2100kW - 11-2011	4.0	98.0	15.0	100.7	No
72	746,616	1,588,527	561.3	Suzlon S111 2100 111.8 (C) h...	Yes	Suzlon	S111-2,100	2,100	111.8	90.0	USER	Level 0 - - $97OPIS 2100kW - 11-2011	4.0	98.0	15.0	100.7	No
73	746,765	1,588,240	563.3	Suzlon S111 2100 111.8 (C) h...	Yes	Suzlon	S111-2,100	2,100	111.8	90.0	USER	Level 0 - - $97OPIS 2100kW - 11-2011	4.0	98.0	15.0	100.7	No
74	758,267	1,602,189	528.5	Suzlon S97 2100 97.0 (C) hub...	Yes	Suzlon	S97-2,100	2,100	97.0	120.0	USER	Level 0 - - $97OPIS 2100kW - 11-2011	4.0	100.5	15.0	107.4	No g
75	758,761	1,599,080	551.8	Suzlon S97 2100 97.0 (C) hub...	Yes	Suzlon	S97-2,100	2,100	97.0	120.0	USER	Level 0 - - $97OPIS 2100kW - 11-2011	4.0	100.5	15.0	107.4	No g
76	758,034	1,601,995	528.1	Suzlon S97 2100 97.0 (C) hub...	Yes	Suzlon	S97-2,100	2,100	97.0	120.0	USER	Level 0 - - $97OPIS 2100kW - 11-2011	4.0	100.5	15.0	107.4	No g
77	758,310	1,602,652	528.1	Suzlon S97 2100 97.0 (C) hub...	Yes	Suzlon	S97-2,100	2,100	97.0	120.0	USER	Level 0 - - $97OPIS 2100kW - 11-2011	4.0	100.5	15.0	107.4	No g
78	757,918	1,601,189	522.7	Suzlon S97 2100 97.0 (C) hub...	Yes	Suzlon	S97-2,100	2,100	97.0	120.0	USER	Level 0 - - $97OPIS 2100kW - 11-2011	4.0	100.5	15.0	107.4	No g
79	757,973	1,601,480	524.8	Suzlon S97 2100 97.0 (C) hub...	Yes	Suzlon	S97-2,100	2,100	97.0	120.0	USER	Level 0 - - $97OPIS 2100kW - 11-2011	4.0	100.5	15.0	107.4	No g
80	758,030	1,593,984	552.8	Suzlon S97 2100 97.0 (C) hub...	Yes	Suzlon	S97-2,100	2,100	97.0	120.0	USER	Level 0 - - $97OPIS 2100kW - 11-2011	4.0	100.5	15.0	107.4	No g
81	758,388	1,603,428	528.9	Suzlon S97 2100 97.0 (C) hub...	Yes	Suzlon	S97-2,100	2,100	97.0	120.0	USER	Level 0 - - $97OPIS 2100kW - 11-2011	4.0	100.5	15.0	107.4	No g
82	758,313	1,601,744	522.8	Suzlon S97 2100 97.0 (C) hub...	Yes	Suzlon	S97-2,100	2,100	97.0	120.0	USER	Level 0 - - $97OPIS 2100kW - 11-2011	4.0	100.5	15.0	107.4	No g
83	754,982	1,593,754	553.2	Suzlon S97 2100 97.0 (C) hub...	Yes	Suzlon	S97-2,100	2,100	97.0	120.0	USER	Level 0 - - $97OPIS 2100kW - 11-2011	4.0	100.5	15.0	107.4	No g
84	758,018	1,603,731	533.0	Suzlon S97 2100 97.0 (C) hub...	Yes	Suzlon	S97-2,100	2,100	97.0	120.0	USER	Level 0 - - $97OPIS 2100kW - 11-2011	4.0	100.5	15.0	107.4	No g
85	755,167	1,594,276	552.4	Suzlon S97 2100 97.0 (C) hub...	Yes	Suzlon	S97-2,100	2,100	97.0	120.0	USER	Level 0 - - $97OPIS 2100kW - 11-2011	4.0	100.5	15.0	107.4	No g
86	758,282	1,602,886	530.5	Suzlon S97 2100 97.0 (C) hub...	Yes	Suzlon	S97-2,100	2,100	97.0	120.0	USER	Level 0 - - $97OPIS 2100kW - 11-2011	4.0	100.5	15.0	107.4	No g
87	755,254	1,594,586	547.3	Suzlon S97 2100 97.0 (C) hub...	Yes	Suzlon	S97-2,100	2,100	97.0	120.0	USER	Level 0 - - $97OPIS 2100kW - 11-2011	4.0	100.5	15.0	107.4	No g
88	754,892	1,593,495	550.3	Suzlon S97 2100 97.0 (C) hub...	Yes	Suzlon	S97-2,100	2,100	97.0	120.0	USER	Level 0 - - $97OPIS 2100kW - 11-2011	4.0	100.5	15.0	107.4	No g
89	757,884	1,603,943	528.5	Suzlon S97 2100 97.0 (C) hub...	Yes	Suzlon	S97-2,100	2,100	97.0	120.0	USER	Level 0 - - $97OPIS 2100kW - 11-2011	4.0	100.5	15.0	107.4	No g
90	758,300	1,603,200	528.5	Suzlon S97 2100 97.0 (C) hub...	Yes	Suzlon	S97-2,100	2,100	97.0	120.0	USER	Level 0 - - $97OPIS 2100kW - 11-2011	4.0	100.5	15.0	107.4	No g
91	754,883	1,593,308	547.8	Suzlon S97 2100 97.0 (C) hub...	Yes	Suzlon	S97-2,100	2,100	97.0	120.0	USER	Level 0 - - $97OPIS 2100kW - 11-2011	4.0	100.5	15.0	107.4	No g
92	754,500	1,592,850	543.1	Suzlon S97 2100 97.0 (C) hub...	Yes	Suzlon	S97-2,100	2,100	97.0	120.0	USER	Level 0 - - $97OPIS 2100kW - 11-2011	4.0	100.5	15.0	107.4	No g
93	754,433	1,592,637	543.2	Suzlon S97 2100 97.0 (C) hub...	Yes	Suzlon	S97-2,100	2,100	97.0	120.0	USER	Level 0 - - $97OPIS 2100kW - 11-2011	4.0	100.5	15.0	107.4	No g
94	757,932	1,602,363	528.7	Suzlon S97 2100 97.0 (C) hub...	Yes	Suzlon	S97-2,100	2,100	97.0	120.0	USER	Level 0 - - $97OPIS 2100kW - 11-2011	4.0	100.5	15.0	107.4	No g
95	753,109	1,591,611	537.6	Suzlon S97 2100 97.0 (C) hub...	Yes	Suzlon	S97-2,100	2,100	97.0	120.0	USER	Level 0 - - $97OPIS 2100kW - 11-2011	4.0	100.5	15.0	107.4	No g
96	753,213	1,591,331	543.8	Suzlon S97 2100 97.0 (C) hub...	Yes	Suzlon	S97-2,100	2,100	97.0	120.0	USER	Level 0 - - $97OPIS 2100kW - 11-2011	4.0	100.5	15.0	107.4	No g
97	753,163	1,591,128	546.8	Suzlon S97 2100 97.0 (C) hub...	Yes	Suzlon	S97-2,100	2,100	97.0	120.0	USER	Level 0 - - $97OPIS 2100kW - 11-2011	4.0	100.5	15.0	107.4	No g
98	753,249	1,590,834	551.3	Suzlon S97 2100 97.0 (C) hub...	Yes	Suzlon	S97-2,100	2,100	97.0	120.0	USER	Level 0 - - $97OPIS 2100kW - 11-2011	4.0	100.5	15.0	107.4	No g
99	753,318	1,590,541	554.8	Suzlon S97 2100 97.0 (C) hub...	Yes	Suzlon	S97-2,100	2,100	97.0	120.0	USER	Level 0 - - $97OPIS 2100kW - 11-2011	4.0	100.5	15.0	107.4	No g
100	753,286	1,590,233	561.3	Suzlon S97 2100 97.0 (C) hub...	Yes	Suzlon	S97-2,100	2,100	97.0	120.0	USER	Level 0 - - $97OPIS 2100kW - 11-2011	4.0	100.5	15.0	107.4	No g
101	753,381	1,590,017	543.8	Suzlon S97 2100 97.0 (C) hub...	Yes	Suzlon	S97-2,100	2,100	97.0	120.0	USER	Level 0 - - $97OPIS 2100kW - 11-2011	4.0	100.5	15.0	107.4	No g

f) From other hub height
g) Data calculated from data for other wind speed (uncertain)

Calculation Results

Sound Level

Noise sensitive area					Demands	Sound Level		Demands fulfilled ?
No.	Name	Easting	Northing	Z	Imission height	Min Noise	Max From WTGs	Distance to noise demand	Noise
				[m]	[m]	[dB(A)]	[dB(A)]	[m]	
A	Noise Receptor	754,556	1,595,938	538.0	0.0	45.0	35.6	947	Yes
B	Noise Receptor	757,230	1,596,969	532.4	0.0	45.0	41.2	424	Yes
C	Noise Receptor	754,537	1,596,249	535.9	0.0	45.0	34.1	1,228	Yes
D	Noise Receptor	754,509	1,596,353	535.4	0.0	45.0	33.6	1,332	Yes
E	Noise Receptor	757,270	1,599,032	531.4	0.0	45.0	41.4	407	Yes
F	Noise Receptor	754,552	1,596,469	532.9	0.0	45.0	33.3	1,414	Yes
G	Noise Receptor	754,559	1,596,475	532.5	0.0	45.0	33.3	1,416	Yes
H	Noise Receptor	754,796	1,595,401	540.1	0.0	45.0	40.1	365	Yes
I	Noise Receptor	750,193	1,588,058	535.0	0.0	45.0	47.3	-78	**No**
J	Noise Receptor	750,147	1,588,040	535.0	0.0	45.0	46.9	-60	**No**
K	Noise Receptor	750,193	1,588,057	535.1	0.0	45.0	47.4	-79	**No**
L	Noise Receptor	751,847	1,585,474	546.0	0.0	45.0	42.9	116	Yes
M	Noise Receptor	751,851	1,585,501	545.9	0.0	45.0	42.9	119	Yes
N	Noise Receptor	751,835	1,585,369	547.0	0.0	45.0	42.9	128	Yes
O	Noise Receptor	751,881	1,585,325	546.4	0.0	45.0	42.3	184	Yes
P	Noise Receptor	751,993	1,585,270	543.8	0.0	45.0	41.0	306	Yes

To be continued on next page...

Project:
rayala shadow flicker - case I

Consultant:
Senes Consultants India Pvt. Ltd,
3rd Floor, Logix techno park, tower B, sector 127, Noida
IN-201304 Noida
01204368426

Calculated:
12/4/2015 5:15 PM/3.0.619

DECIBEL - Main Result

...continued from previous page

Noise sensitive area						Demands	Sound Level		Demands fulfilled ?
No.	Name	Easting	Northing	Z [m]	Imission height [m]	Min Noise [dB(A)]	Max From WTGs [dB(A)]	Distance to noise demand [m]	Noise
Q	Noise Receptor	749,500	1,584,506	542.9	0.0	45.0	38.1	712	Yes
R	Noise Receptor	750,196	1,586,054	535.1	0.0	45.0	47.5	-83	**No**
S	Noise Receptor	749,500	1,584,507	542.9	0.0	45.0	38.1	712	Yes
T	Noise Receptor	749,003	1,583,455	550.9	0.0	45.0	36.5	900	Yes
U	Noise Receptor	751,492	1,581,871	553.1	0.0	45.0	35.9	813	Yes
V	Noise Receptor	751,531	1,581,936	552.1	0.0	45.0	35.9	830	Yes
W	Noise Receptor	751,517	1,581,909	552.9	0.0	45.0	35.9	825	Yes
X	Noise Receptor	746,106	1,591,805	523.5	0.0	45.0	35.1	801	Yes
Y	Noise Receptor	746,068	1,591,751	524.5	0.0	45.0	35.1	823	Yes
Z	Noise Receptor	744,874	1,589,876	530.7	0.0	45.0	30.8	1,791	Yes
AA	Noise Receptor	757,483	1,599,479	525.8	0.0	45.0	43.3	201	Yes
AB	Noise Receptor	757,457	1,599,513	526.5	0.0	45.0	43.2	215	Yes
AC	Noise Receptor	757,493	1,599,415	526.4	0.0	45.0	43.2	211	Yes
AD	Noise Receptor	757,428	1,599,633	525.4	0.0	45.0	43.2	204	Yes
AE	Noise Receptor	754,557	1,595,936	537.9	0.0	45.0	35.6	947	Yes
AF	Noise Receptor	757,446	1,599,174	526.6	0.0	45.0	42.5	300	Yes
AG	Noise Receptor	756,190	1,602,138	520.2	0.0	45.0	37.1	1,071	Yes
AH	Noise Receptor	757,446	1,599,178	526.6	0.0	45.0	42.5	302	Yes
AI	Noise Receptor	757,413	1,599,668	524.9	0.0	45.0	43.2	206	Yes
AJ	Noise Receptor	757,443	1,599,176	526.7	0.0	45.0	42.5	304	Yes
AK	Noise Receptor	757,426	1,599,638	525.3	0.0	45.0	43.2	204	Yes
AL	Noise Receptor	756,193	1,602,137	520.2	0.0	45.0	37.1	1,068	Yes
AM	Noise Receptor	756,188	1,602,136	520.1	0.0	45.0	37.1	1,073	Yes
AN	Noise Receptor	757,445	1,599,180	526.6	0.0	45.0	42.5	304	Yes
AO	Noise Receptor	756,043	1,601,842	516.0	0.0	45.0	36.5	1,168	Yes
AP	Noise Receptor	757,364	1,599,682	524.7	0.0	45.0	42.9	248	Yes
AQ	Noise Receptor	754,095	1,592,315	539.1	0.0	45.0	46.8	-106	**No**
AR	Noise Receptor	757,183	1,596,947	533.5	0.0	45.0	41.0	461	Yes
AS	Noise Receptor	757,229	1,596,968	532.4	0.0	45.0	41.2	424	Yes
AT	Noise Receptor	757,228	1,596,966	532.4	0.0	45.0	41.2	424	Yes
AU	Noise Receptor	756,190	1,602,136	520.1	0.0	45.0	37.1	1,071	Yes
AV	Noise Receptor	756,189	1,602,137	520.1	0.0	45.0	37.1	1,072	Yes
AW	Noise Receptor	754,096	1,592,315	539.1	0.0	45.0	46.8	-107	**No**
AX	Noise Receptor	756,190	1,602,142	520.2	0.0	45.0	37.1	1,071	Yes
AY	Noise Receptor	754,801	1,595,396	540.1	0.0	45.0	40.1	360	Yes
AZ	Noise Receptor	756,190	1,602,140	520.2	0.0	45.0	37.1	1,071	Yes
BA	Noise Receptor	754,095	1,592,314	539.0	0.0	45.0	46.8	-105	**No**
BB	Noise Receptor	756,191	1,602,139	520.2	0.0	45.0	37.1	1,070	Yes
BC	Noise Receptor	754,036	1,591,325	537.9	0.0	45.0	43.9	98	Yes
BD	Noise Receptor	754,035	1,591,323	538.0	0.0	45.0	43.9	96	Yes
BE	Noise Receptor	753,513	1,589,369	540.1	0.0	45.0	42.3	154	Yes

Distances (m)

WTG	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
1	5484	1508	5290	5244	1439	5137	5128	5705	14329	14371	14330	15725	15699	15825	15846	15849	17684	14331	17683	18841	19175	19100
2	5998	1578	5394	5344	1508	5235	5226	5829	14480	14521	14481	15909	15883	16010	16031	16028	17861	14482	17860	19009	19368	19294
3	5398	1489	5212	5170	1431	5066	5057	5694	14196	14238	14197	15587	15831	15687	15677	15679	17533	14197	17532	18690	18996	18921
4	5635	1594	5420	5366	1530	5253	5244	5902	14558	14599	14559	16032	16006	16133	16155	16161	17949	14560	17948	19108	19506	19431
5	3949	3799	3928	3981	3947	3970	3965	3563	10943	10989	10943	11823	11798	11917	11929	11915	13996	10943	13996	15127	15120	15045
6	5250	1417	5079	5035	1365	4933	4924	5434	14020	14062	14021	15364	15338	15464	15483	15484	17348	14022	17348	18504	18798	18723
7	3848	3998	3944	4002	4046	3998	3994	3831	10764	10810	10764	11614	11590	11708	11720	11709	13798	10764	13797	14927	14903	14827
8	4888	2019	4784	4773	2017	4694	4685	4930	13267	13311	13268	14409	14384	14507	14522	14516	16488	13268	16487	17634	17776	17700
9	4969	1916	4853	4838	1907	4755	4747	5034	13417	13461	13418	14586	14560	14683	14700	14694	16683	13418	16682	17801	17961	17885
10	5988	1998	5753	5689	1921	5572	5563	6300	14966	15006	14967	16519	16493	16621	16645	16634	18393	14968	18392	19584	20015	19941
11	5869	1849	5640	5579	1774	5464	5455	6166	14831	14871	14832	16357	16330	16458	16481	16490	18246	14833	18245	19407	19845	19771
12	4778	2124	4686	4681	2128	4606	4597	4797	13083	13128	13084	14201	14176	14298	14313	14306	16289	13084	16289	17435	17560	17484
13	5958	2048	5711	5642	1977	5523	5514	6298	14957	14998	14958	16589	16542	16671	16696	16708	18407	14959	18407	19570	20082	20008
14	4323	2938	4312	4335	2970	4289	4282	4195	12094	12139	12094	13067	13042	13162	13175	13163	15212	12094	15211	16348	16382	16306
15	4488	2818	4488	4476	2844	4424	4417	4384	12380	12396	12381	13336	13311	13431	13444	13432	15477	12381	15476	16614	16681	16676
16	4187	3101	4194	4223	3138	4184	4178	4027	11836	11882	11837	12791	12766	12886	12899	12887	14842	11836	14841	16077	16103	16027

To be continued on next page...

DECIBEL - Main Result

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WTG	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
17	3861	3896	3922	3968	3643	3951	3946	3607	11124	11170	11124	12034	12009	12129	12141	12128	14197	11124	14196	15330	15340	15264
18	4839	2683	4497	4510	2675	4482	4448	4468	12813	12868	12814	13828	13803	13624	13637	13628	15688	12814	15687	16797	16883	16777
19	4682	2272	4606	4606	2283	4536	4528	4673	12894	12939	12895	13981	13956	14078	14093	14084	16082	12895	16082	17226	17330	17238
20	4648	2532	4592	4620	2549	4538	4530	4698	12709	12754	12710	13744	13719	13840	13853	13843	15866	12710	15866	17007	17074	16999
21	4073	3246	4096	4131	3286	4099	4092	3885	11613	11659	11614	12555	12530	12650	12662	12650	14709	11614	14708	15844	15865	15789
22	3951	3418	3994	4034	3462	4010	4004	3730	11388	11404	11388	12285	12260	12380	12392	12378	14443	11388	14442	15577	15593	15517
23	2773	4083	2819	2992	4117	3013	3010	2388	9788	9804	9789	10822	10797	10920	10936	10931	12910	9789	12909	14053	14214	14139
24	2780	3844	2885	2952	3908	2964	2961	2414	9948	9993	9948	11033	11008	11131	11148	11143	13113	9948	13113	14288	14428	14353
25	2711	3941	2805	2864	3924	2863	2899	2423	10182	10227	10183	11311	11285	11409	11426	11423	13374	10183	13374	14531	14717	14642
26	4192	1237	4095	4033	1253	3945	3936	4306	12820	12862	12821	14125	14099	14224	14243	14244	16123	12821	16122	17277	17556	17482
27	2737	3298	2803	2854	3361	2842	2837	2499	10401	10446	10402	11554	11528	11652	11670	11668	13608	10402	13607	14756	14965	14890
28	4327	1123	4179	4153	1128	4061	4052	4463	13003	13048	13004	14327	14301	14426	14446	14447	16317	13004	16316	17472	17763	17688
29	4048	1419	3928	3912	1446	3828	3820	4134	12607	12649	12607	13885	13859	13984	14003	14003	15895	12608	15894	17048	17309	17234
30	2761	3080	2803	2846	3142	2828	2819	2368	10087	10632	10888	11768	11739	11864	11881	11880	13809	10888	13809	14088	15181	15106
31	4476	1083	4318	4288	1044	4192	4183	4629	13191	13233	13191	14831	14804	14630	14650	14662	16813	13192	16812	17668	17971	17886
32	3512	1926	3435	3437	1973	3370	3362	3520	11886	11930	11887	13137	13102	13226	13245	13244	15151	11887	15151	16303	16547	16472
33	3909	1574	3802	3791	1607	3713	3704	3971	12408	12451	12409	13668	13642	13767	13786	13785	15686	12409	15685	16839	17089	17014
34	2865	2833	2879	2913	2894	2881	2874	2721	10839	10884	10840	12033	12007	12132	12150	12149	14072	10840	14071	15222	15451	15376
35	3656	1742	3564	3559	1786	3486	3478	3692	12100	12143	12100	13356	13330	13465	13473	13473	15374	12101	15373	16526	16778	16703
36	2937	2603	2926	2981	2663	2909	2903	2837	11048	11089	11046	12262	12236	12361	12379	12378	14292	11046	14291	15443	15683	15610
37	4626	1018	4489	4428	994	4327	4318	4797	13378	13420	13378	14734	14708	14834	14854	14856	16709	13379	16708	17868	18178	18103
38	3106	2375	3072	3086	2432	3038	3031	3048	11313	11357	11314	12538	12512	12637	12655	12654	14566	11314	14565	15717	15959	15884
39	9699	13575	9981	10069	13648	10192	10200	9299	1356	1367	1355	1713	1692	1797	1858	1963	2829	1351	2828	3987	5092	5032
40	9896	13766	10175	10266	13840	10390	10398	9484	1511	1518	1510	1564	1544	1643	1705	1815	2643	1506	2642	3799	4896	4837
41	10084	13958	10378	10466	14033	10589	10598	9690	1681	1684	1680	1423	1405	1495	1558	1672	2459	1676	2458	3611	4698	4639
42	10292	14146	10576	10668	14221	10788	10796	9883	1880	1881	1879	1266	1282	1330	1394	1512	2290	1878	2289	3438	4488	4426
43	10519	14380	10806	10896	14424	11019	11027	10102	2192	2193	2191	993	982	1046	1110	1231	2188	2187	2188	3273	4188	4128
44	10817	14604	11108	11200	14678	11323	11331	10384	2675	2678	2674	567	564	592	653	778	2118	2670	2118	3139	3797	3694
45	11227	15022	11518	11609	15096	11732	11740	10798	2939	2937	2938	787	799	753	794	903	1759	2934	1759	2759	3412	3352
46	11476	15257	11768	11859	15331	11983	11991	11042	3211	3207	3210	870	888	805	827	911	1696	3206	1696	2618	3136	3077
47	11701	15480	11993	12084	15553	12208	12215	11267	3402	3396	3401	1052	1073	976	987	1054	1587	3397	1587	2446	2930	2872
48	12024	15808	12315	12406	15881	12530	12537	11592	3646	3638	3645	1368	1390	1288	1290	1343	1408	3642	1408	2162	2676	2622
49	12114	16003	12404	12498	16077	12618	12626	12686	4687	4672	4686	2427	2482	2338	2327	2388	1409	4683	1409	1461	1909	1876
50	13514	17298	13804	13896	17372	14018	14026	13083	4973	4957	4972	2805	2830	2709	2698	2718	1665	4969	1666	1418	1653	1633
51	13834	17610	14125	14216	17684	14339	14347	13401	5298	5282	5297	3102	3128	3005	2990	3003	1936	5294	1937	1507	1456	1449
52	14043	17818	14334	14425	17892	14548	14556	13610	5498	5481	5497	3306	3332	3208	3193	3204	2097	5494	2098	1561	1392	1396
53	14252	18026	14543	14634	18099	14758	14766	13819	5698	5681	5697	3511	3537	3413	3396	3405	2265	5694	2266	1641	1358	1373
54	14483	18223	14744	14836	18297	14969	14967	14019	5899	5881	5898	3705	3731	3606	3588	3594	2447	5898	2448	1789	1331	1386
55	8484	12403	8634	8668	12473	8769	8778	8429	4802	4487	4803	7836	7837	7833	7696	7807	7346	4807	7348	8239	10814	10470
56	8563	12500	8720	8756	12571	8858	8868	8495	4318	4299	4316	7363	7344	7440	7502	7614	7132	4320	7131	8023	10304	10260
57	8712	12669	8876	8915	12740	9019	9028	8626	4094	4075	4095	7129	7111	7204	7267	7380	6854	4099	6853	7739	10038	9992
58	8887	12859	9057	9098	12930	9204	9213	8787	3922	3901	3923	6938	6920	7011	7074	7188	6607	3927	6606	7462	9801	9759
59	8993	12992	9175	9222	13064	9330	9339	8865	3520	3497	3521	6517	6500	6588	6651	6767	6165	3525	6164	7047	9359	9317
60	9201	13208	9388	9436	13280	9545	9554	9063	3404	3378	3405	6386	6349	6434	6498	6614	5940	3409	5939	6807	9151	9110
61	9818	13829	9707	9788	13601	9865	9874	9372	3400	3370	3400	6287	6281	6361	6425	6543	5747	3404	5746	6581	8985	8946
62	1384	4588	1860	1765	4662	1850	1852	811	8471	8813	8472	9948	9922	10091	10076	10090	11824	8472	11823	12984	13480	13406
63	9150	13105	9419	9500	13179	9623	9632	8793	321	337	320	2747	2727	2831	2892	2998	3407	316	3406	4555	6029	5973
64	9515	13443	9790	9873	13517	9997	10006	9142	803	806	802	2278	2259	2358	2420	2529	2995	798	2994	4153	5539	5482
65	12384	16175	12674	12765	16248	12889	12897	11955	3928	3916	3927	1731	1754	1645	1645	1690	1261	3923	1261	1852	2422	2374
66	9340	13288	9610	9692	13362	9815	9824	8979	801	803	800	2880	2860	2860	2722	2831	3203	496	3202	4394	5827	5771
67	12629	16418	12919	13010	16492	13133	13141	12199	4182	4137	4149	1989	1983	1870	1866	1904	1278	4146	1276	1704	2231	2186
68	12840	16628	13130	13221	16703	13345	13353	12410	4344	4330	4343	2188	2183	2067	2061	2093	1324	4339	1325	1886	2074	2034
69	9733	13748	9925	9975	13821	10085	10094	9581	3377	3348	3378	6219	6205	6280	6344	6464	5584	3382	5583	6396	8838	8800
70	9930	13946	10124	10174	14021	10285	10295	9772	3368	3333	3368	6152	6138	6210	6273	6394	5437	3372	5436	6227	8703	8667
71	10462	14493	10665	10719	14566	10832	10841	10281	3292	3251	3292	5864	5853	5913	5976	6100	4925	3286	4924	5655	8217	8184
72	10644	14677	10849	10904	14750	11017	11027	10457	3310	3267	3311	5800	5789	5845	5908	6032	4780	3314	4779	5486	8077	8046
73	10929	14968	11137	11193	15038	11307	11316	10736	3403	3388	3403	5761	5752	5802	5864	5988	4613	3406	4612	5273	7916	7887
74	7270	3383	7014	6941	3311	6821	6812	7624	16278	16313	16276	17906	17878	18008	18033	18048	19737	16277	19736	20899	21418	21344
75	5247	1553	5085	5052	1511	4954	4948	5403	13949	13992	13950	15244	15218	15343	15362	15381	17253	13950	17252	18407	18661	18586
76	7052	3150	6799	6727	3078	6607	6598	7401	16056	16094	16057	17675	17649	17778	17802	17814	19513	16058	19512	20675	21185	21111
77	7944	3811	7382	7306	3740	7184	7175	8015	16651	16689	16652	18319	18292	18421	18447	18460	20128	16653	20127	21291	21840	21766
78	6238	2324	5986	5917	2252	5797	5788	6576	15235	15274	15236	16847	16820	16949	16974	16986	18686	15237	18686	19849	20359	20288
79	6811	2619	6289	6188	2547	6067	6058	6889	15514	15552	15515	17138	17112	17241	17268	17278	18971	15516	18970	20134	20682	20578
80	2011	5448	2318	2426	5523	2831	2838	1436	7648	7693	7680	9086	9059	9188	9214	9228	10973	7681	10972	12132	12619	12548
81	8412	4606	8146	8068	4535	7945	7937	8793	17417	17455	17418	19108	19081	19210	19236	19251	20905	17419	20904	22067	22633	22559
82	6862	2944	6611	6541	2871	6421	6412	7205	15863	15902	15864	17471	17444	17573	17598	17609	19315	15865	19314	20477	20979	20905
83	2222	5686	2531	2638	5750	2746	2751	1655	7429	7473	7430	8847	8820	8949	8975	8988	10741	7431	10740	11899	12380	12306
84	8519	4817	8243	8161	4748	8038	8030	8922	17509	17546	17510	19263	19236	19366	19393	19410	21019	17512	21018	22181	22804	22731
85	1781	5114	2080	2188	5188	2286	2290	1194	7981	8024	7982	9418	9391	9520	9548	9559	11310	7983	11309	12468	12946	12873
86	7891	4061	7628	7552	3990	7430	7421	8264	16808	16836	16809	18569	18543	18672	18697	18711	20377	16900	20376	21540	22091	22017

To be continued on next page...

Project:

rayala shadow flicker - case I

Consultant:

Senes Consultants India Pvt. Ltd,
3rd Floor, Logix techno park, tower B, sector 127, Noida
IN-201304 Noida
01204368426

Calculated:
12/4/2015 5:15 PM/3.0.619

DECIBEL - Main Result

...continued from previous page

WTG	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
87	1822	4808	1811	1918	4882	2010	2013	938	8260	8303	8261	9728	9701	9831	9856	9870	11607	8261	11606	12766	13260	13186
88	2462	5968	2773	2879	6039	2990	2998	1907	7188	7209	7166	8868	8842	8671	8696	8710	10466	7186	10465	11624	12102	12029
89	8669	9017	8390	8307	4946	8183	8178	9083	17649	17685	17680	19431	19404	19834	19562	19580	21168	17651	21167	22330	22979	22906
90	8170	4364	7904	7826	4293	7704	7686	8550	17176	17213	17177	18864	18837	18967	18993	19007	20662	17178	20661	21824	22389	22315
91	2736	6298	3048	3153	6371	3267	3273	2198	6837	6881	6838	8238	8211	8341	8367	8382	10131	6838	10130	11289	11777	11704
92	3089	6700	3399	3503	6774	3619	3625	2568	6443	6487	6444	7839	7812	7942	7968	7984	9727	6444	9727	10888	11384	11311
93	3303	6922	3613	3717	6996	3834	3840	2788	6241	6288	6241	7616	7589	7718	7746	7761	9510	6241	9510	10667	11160	11088
94	7258	3466	6993	6916	3336	6794	6786	7636	16264	16302	16266	17952	17925	18088	18081	18099	19748	16266	19747	20910	21480	21406
95	4863	8433	4853	4944	8528	5068	5076	4149	4896	4840	4897	6265	6238	6371	6408	6438	7969	4898	7968	9131	9873	9803
96	4799	8630	5093	5187	8704	5310	5317	4367	4453	4498	4454	6014	5987	6119	6152	6183	7770	4454	7769	8931	9615	9544
97	5001	8821	5296	5390	8895	5513	5521	4566	4291	4336	4292	5810	5783	5915	5948	5978	7580	4292	7580	8741	9410	9339
98	5269	9057	5566	5661	9131	5784	5791	4822	4129	4175	4129	5540	5513	5648	5676	5704	7355	4129	7354	8513	9134	9062
99	5537	9291	5837	5933	9366	6065	6062	5079	3992	4039	3993	5276	5249	5381	5411	5438	7142	3992	7141	8297	8860	8789
100	5747	9494	6047	6143	9568	6265	6273	5288	3840	3887	3840	5068	5041	5172	5201	5228	6949	3840	6948	8103	8680	8578
101	6042	9756	6344	6441	9830	6563	6570	5578	3716	3768	3717	4785	4759	4889	4917	4937	6723	3716	6722	7872	8388	8283

WTG	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR
1	19130	14733	14794	16835	1084	1103	1089	1118	5483	1218	3388	1217	1132	1220	1120	3385	3387	1217	3292	1180	8623	1856
2	19324	14801	14862	16916	1090	1100	1110	1088	5597	1279	3170	1277	1093	1280	1088	3167	3170	1276	3086	1137	8790	1626
3	18981	14686	14747	16774	1148	1178	1140	1213	5398	1222	3613	1221	1233	1228	1216	3610	3613	1222	3808	1284	8478	1841
4	19461	14776	14838	16906	1087	1087	1092	1014	5638	1297	2899	1294	1010	1297	1013	2896	2899	1293	2821	1046	8892	1642
5	19079	12753	12808	14551	4229	4267	4184	4381	3848	3939	7134	3943	4428	3942	4396	7132	7132	3946	6900	4453	9229	3792
6	18753	14566	14626	16643	1152	1184	1132	1242	5249	1173	3758	1172	1267	1176	1246	3755	3758	1173	3639	1318	8292	1467
7	14858	12652	12703	14429	4438	4476	4373	4600	3847	4146	7333	4150	4637	4149	4605	7331	7332	4152	7096	4660	9068	3991
8	17731	14294	14351	16283	2124	2167	2072	2273	4887	1951	5010	1984	2308	1995	2278	5008	5010	1996	4856	2352	7494	2080
9	17916	14375	14433	16379	1975	2016	1926	2118	4968	1822	4832	1824	2153	1826	2123	4829	4832	1826	4684	2198	7646	1951
10	19871	14972	15038	17133	1426	1407	1460	1316	5988	1719	2386	1716	1294	1719	1313	2383	2386	1714	2328	1309	9381	2038
11	19801	14910	14973	17060	1282	1268	1331	1189	5868	1564	2541	1560	1172	1564	1187	2538	2541	1559	2492	1194	9197	1892
12	17515	14178	14235	16153	2278	2321	2223	2431	4777	2084	5191	2087	2468	2087	2436	5188	5190	2089	5028	2510	7309	2150
13	20038	14836	14899	17011	1492	1464	1552	1355	5958	1798	2007	1794	1326	1796	1351	2004	2007	1792	1975	1328	9384	2083
14	16337	13577	13631	15463	3263	3305	3201	3426	4322	3005	6219	3009	3464	3009	3431	6217	6218	3011	6020	3497	6336	2946
15	16606	13779	13834	15680	3106	3149	3048	3268	4484	2862	6062	2865	3306	2868	3273	6059	6061	2867	5872	3342	6588	2830
16	16038	13386	13440	15255	3487	3498	3394	3621	4186	3189	6408	3193	3689	3192	3626	6406	6407	3188	6200	3690	6084	3108
17	18295	12896	12908	14674	4017	4056	3962	4179	3860	3730	6031	3734	4217	3733	4188	6830	6030	3736	6702	4242	9398	3891
18	16808	13868	13924	15786	2915	2961	2859	3079	4538	2682	5870	2685	3117	2686	3085	5868	5869	2688	5686	3154	6746	2668
19	17285	14069	14126	16027	2469	2512	2412	2626	4681	2258	5401	2261	2663	2262	2631	5399	5400	2263	5230	2703	7120	2294
20	17029	14003	14059	15936	2764	2807	2708	2923	4647	2540	5706	2543	2960	2543	2928	5704	5705	2545	5529	2999	6938	2551
21	18819	13219	13272	15072	3628	3665	3561	3788	4072	3349	6867	3353	3826	3352	3793	6866	6866	3355	6352	3858	8867	3246
22	18948	13026	13079	14862	3830	3860	3756	3983	3980	3838	6749	3842	4021	3841	3989	6747	6748	3844	6826	4048	8620	3418
23	14169	11488	11510	13286	4878	4907	4813	4728	2772	4268	7282	4272	4759	4270	4730	7281	7281	4274	7010	4771	4001	4030
24	14384	11574	11626	13392	4364	4396	4300	4514	2759	4057	7088	4061	4548	4059	4519	7083	7083	4063	6815	4560	4183	3822
25	14672	11689	11742	13536	4060	4092	3996	4210	2710	3753	6788	3757	4244	3755	4215	6787	6787	3759	6521	4256	4410	3519
26	17512	13586	13644	15618	1504	1546	1442	1668	4191	1256	4460	1259	1705	1259	1672	4458	4460	1261	4266	1738	7074	1288
27	14920	11824	11878	13693	3813	3846	3750	3968	2736	3507	6558	3511	3999	3509	3970	6557	6557	3513	6294	4012	4627	3277
28	17719	13708	13767	15749	1327	1370	1267	1488	4226	1100	4281	1103	1526	1103	1494	4279	4280	1105	4098	1563	7264	1181
29	17268	13483	13511	15465	1737	1778	1674	1901	4048	1474	4681	1478	1939	1477	1906	4688	4690	1480	4488	1970	6852	1432
30	15136	11932	11986	13820	3993	3626	3529	3745	2760	3287	6349	3291	3779	3288	3750	6347	6347	3292	6087	3792	4813	3060
31	17926	13840	13900	15803	1174	1217	1117	1331	4475	977	4114	980	1368	981	1336	4112	4113	982	3937	1408	7458	1088
32	16503	12905	12962	14877	2361	2399	2296	2522	3511	2067	5261	2071	2559	2070	2527	5259	5260	2074	5032	2582	6121	1921
33	17044	13316	13374	15316	1931	1971	1867	2094	3909	1657	4876	1661	2132	1660	2100	4874	4875	1663	4667	2161	6649	1882
34	18406	12111	12166	14018	3338	3371	3274	3491	2864	3032	6120	3036	3526	3034	3496	6118	6118	3038	5863	3540	5066	2814
35	16734	13089	13146	15048	2158	2193	2090	2317	3685	1866	5073	1870	2354	1869	2322	5071	5072	1872	4851	2379	6338	1742
36	15640	12240	12295	14165	3103	3137	3039	3257	2936	2798	5900	2802	3292	2800	3262	5899	5899	2804	5647	3307	5274	2586
37	18133	13971	14031	16034	1036	1076	985	1185	4626	884	3947	886	1221	888	1190	3946	3946	888	3779	1264	7651	1059
38	15918	12446	12505	14391	2860	2895	2796	3016	3105	2557	5691	2561	3052	2559	3021	5689	5689	2563	5444	3069	5543	2361
39	8057	6870	6899	6752	14144	14162	14092	14258	9699	13857	16081	13860	14280	13857	14259	16081	16079	13861	15754	14270	6232	13533
40	4862	6993	6980	6818	14238	14283	14283	14447	9836	14047	16280	14051	14472	14048	14451	16280	16278	14052	15953	14462	8420	13728
41	4864	7124	7110	6888	14828	14846	14478	14640	10098	14239	16481	14243	14668	14240	14644	16481	16478	14244	16153	14656	8610	13917
42	4451	7288	7273	7000	14716	14734	14663	14829	10293	14427	16681	14430	14854	14427	14833	16681	16679	14431	16354	14845	8795	14106
43	4150	7585	7569	7254	14920	14939	14866	15035	10519	14629	16916	14633	15060	14629	15039	16916	16914	14634	16589	15052	8995	14310
44	3720	8074	8058	7706	15179	15193	15119	15292	10817	14880	17224	14883	15318	14880	15295	17224	17221	14886	16898	15311	7252	14566
45	3377	8227	8208	7743	15591	15611	15537	15709	11128	15298	17633	15302	15736	15298	15713	17633	17630	15303	17307	15729	7869	14983
46	3102	8468	8447	7938	15825	15846	15771	15948	11477	15532	17884	15535	15971	15532	15949	17884	17881	15537	17558	15968	7907	15218
47	2896	8607	8588	8028	16048	16069	15994	16168	11701	15754	18108	15758	16194	15758	16172	18108	18106	15759	17783	16188	8131	15441
48	2645	8755	8731	8081	16376	16397	16322	16496	12024	16082	18430	16086	16522	16083	16499	18430	18428	16087	18104	16515	8458	15769
49	1890	9398	9368	8495	17472	17493	17417	17591	13114	17178	19518	17182	17617	17179	17595	19518	19515	17183	19192	17611	9553	16864
50	1643	9705	9674	8736	17867	17888	17812	17986	13514	17572	19918	17576	18013	17573	17990	19918	19916	17577	19592	18007	9949	17259
51	1453	9986	9953	8972	18179	18200	18124	18299	13834	17884	20240	17888	18326	17885	18303	20239	20237	17889	19914	18320	10264	17572
52	1396	10144	10111	9098	18386	18408	18331	18507	14043	18091	20449	18095	18533	18092	18511	20449	20446	18097	20123	18528	10472	17780
53	1368	10304	10270	9226	18894	18918	18839	18718	14282	18299	20688	18303	18741	18300	18719	20688	20685	18304	20332	18738	10681	17987

To be continued on next page...

Project:
rayala shadow flicker - case I

Consultant:
Senes Consultants India Pvt. Ltd,
3rd Floor, Logix techno park, tower B, sector 127, Noida
IN-201304 Noida
01204368426

Calculated:
12/4/2015 5:15 PM/3.0.619

DECIBEL - Main Result

...continued from previous page

WTG	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR
84	1347	10476	10441	9373	18792	18813	18737	18913	14484	18496	20860	18800	18939	18497	18916	20860	20857	18802	20834	18934	10880	18186
85	10489	1241	1267	2942	12914	12918	12883	12966	8488	13699	13840	13701	12977	12687	12968	13841	13837	12701	13819	12947	6828	12382
86	10279	1343	1360	2862	13018	13016	12983	13070	8564	12797	13979	12799	13081	12796	13072	13980	13976	12800	13957	13052	6817	12480
87	10011	1485	1490	2742	13188	13190	13155	13246	8712	12966	14195	12968	13257	12965	13247	14196	14192	12969	13872	13229	6853	12619
88	9778	1624	1619	2617	13381	13384	13347	13441	8887	13156	14422	13158	13453	13155	13443	14423	14419	13159	14098	13425	6933	12808
89	9335	2030	2019	2682	13521	13525	13486	13586	8994	13290	14642	13292	13599	13289	13588	14643	14639	13293	14316	13573	6869	12942
90	9128	2188	2170	2591	13740	13744	13704	13806	9202	13506	14885	13509	13819	13505	13808	14886	14882	13509	14589	13794	7003	13189
91	8963	2317	2290	2424	14062	14066	14028	14128	9518	13826	15216	13829	14142	13826	14130	15217	15213	13830	14890	14117	7268	13479
92	13436	9687	9750	11586	9157	9177	9103	9278	1383	4868	7396	4869	9302	4866	9279	7398	7394	4870	7086	9288	2760	4849
93	9997	5859	5850	5885	13672	13688	13623	13776	9180	13393	15473	13396	13798	13393	13779	15473	15471	13397	15144	13785	5849	13062
94	9506	6288	6276	6193	14011	14028	13960	14118	9516	13728	15864	13732	14141	13729	14121	15865	15862	13733	15535	14129	6142	13400
95	2395	8922	8896	8168	16743	16764	16689	16862	12384	16450	18789	16453	16888	16450	16866	18789	18786	16455	18463	16882	8823	16136
96	5795	5996	5986	5953	13855	13871	13805	13960	9340	13575	15670	13578	13982	13575	13963	15670	15667	13580	15341	13970	6018	13245
97	2205	9088	9067	8280	16887	17007	16932	17106	12629	16683	19033	16687	17132	16684	17110	19033	19031	16688	18708	17126	9067	16379
98	2082	9228	9199	8382	17197	17218	17142	17316	12842	16903	19345	16907	17343	16904	17320	19346	19342	16908	18919	17336	9278	16589
99	8817	2466	2434	2325	14283	14288	14246	14351	9734	14046	15450	14049	14365	14046	14353	15451	15448	14050	15124	14342	7433	13699
70	8683	2617	2582	2277	14484	14490	14447	14553	9931	14247	15664	14249	14567	14246	14555	15665	15662	14250	15338	14542	7587	13900
71	8199	3192	3151	2389	15033	15039	14998	15106	10463	14791	16270	14793	15121	14790	15108	16271	16267	14794	15943	15067	7974	14444
72	8080	3377	3334	2447	15219	15225	15180	15292	10646	14975	16470	14977	15307	14974	15294	16471	16467	14978	16143	15284	8117	14628
73	7900	3628	3583	2521	15507	15514	15468	15582	10830	15262	16773	15265	15597	15261	15584	16774	16770	15266	16446	15574	8289	14916
74	21374	18991	18095	18193	2821	2796	2880	2890	7269	3128	3078	3121	2662	3134	2686	3078	3080	3119	2251	2668	10719	3418
75	18617	14600	14689	16660	1367	1403	1339	1473	5247	1341	4031	1341	1501	1344	1477	4028	4031	1342	3910	1552	8205	1601
76	21141	15815	15879	18011	2587	2563	2646	2458	7052	2890	2052	2887	2430	2889	2454	2049	2054	2885	2194	2434	10491	3186
77	21796	16253	16317	18468	3255	3228	3315	3119	7643	3561	2084	3557	3089	3560	3114	2082	2087	3555	2313	3088	11126	3845
78	20318	15086	15149	17266	1784	1738	1824	1631	6235	2070	1971	2066	1603	2068	1627	1968	1972	2064	1985	1606	9662	2359
79	20608	15311	15375	17500	2060	2034	2120	1926	6510	2368	1901	2362	1897	2364	1922	1897	1902	2360	1964	1898	9982	2653
80	12876	9186	9236	10985	6018	6038	5963	6137	2010	5728	5236	5728	6163	5725	6141	5236	5234	5730	7923	6137	1913	5410
81	22589	16908	16973	19137	4051	4024	4111	3914	8412	4357	2547	4353	3884	4355	3910	2546	2550	4351	2829	3883	11913	4640
82	20935	15664	15728	17854	2390	2356	2438	2252	6861	2682	2061	2678	2225	2681	2248	2058	2063	2677	2172	2230	10289	2981
83	12336	9069	9118	10809	6255	6276	6201	6375	2221	5962	5473	5965	6401	5962	6379	5473	5471	5967	8160	6396	1681	5648
84	22780	16850	16915	19091	4276	4245	4338	4130	8518	4583	2419	4579	4098	4581	4126	2417	2422	4577	2727	4092	12062	4847
85	12903	9421	9472	11222	6683	6704	6629	6803	1781	6390	7024	6393	6830	6390	6807	7024	7022	6395	7613	6824	2249	6076
86	22047	16473	16537	18692	3828	3478	3968	3360	7801	3810	2232	3806	3339	3809	3364	2230	2235	3804	2481	3339	11376	4098
87	13216	9861	9614	11399	6377	6397	6323	6495	1521	6088	7610	6088	6922	6085	6499	7609	7608	6090	7299	6916	2880	4769
88	12059	8916	8963	10622	6534	6554	6479	6654	2462	6240	5745	6244	6680	6241	6657	5744	5742	6246	8430	6675	1406	5926
89	22935	16913	16978	19161	4482	4451	4545	4334	8669	4789	2475	4785	4301	4787	4329	2474	2478	4783	2793	4293	12230	5045
90	22345	16690	16754	18915	3810	3782	3870	3672	8170	4116	2362	4112	3642	4114	3668	2360	2365	4110	2624	3640	11669	4297
91	11734	8700	8747	10368	6866	6887	6812	6988	2736	6573	9088	6577	7012	6574	6989	9087	9085	6578	8742	7006	1072	6289
92	11340	8489	8803	10078	7269	7290	7213	7388	3089	6977	9441	6980	7414	6977	7392	9440	9438	6982	9123	7408	671	6661
93	11117	8368	8412	9980	7481	7512	7437	7610	3303	7198	9662	7202	7636	7199	7614	9662	9660	7203	9348	7630	467	6883
94	21436	15853	15918	18068	2919	2889	2981	2776	7287	3228	1756	3222	2745	3224	2772	1754	1759	3220	1960	2741	10756	3497
95	9832	7006	7042	8416	9002	9019	8951	9111	4563	8718	10969	8722	9135	8719	9114	10968	10966	8723	10643	9124	1212	8351
96	9573	7123	7157	8465	9199	9217	9147	9311	4799	8912	11210	8916	9335	8913	9314	11209	11207	8917	10885	9326	1321	8589
97	9368	7119	7152	8412	9390	9409	9338	9503	5002	9103	11413	9106	9528	9103	9506	11412	11410	9107	11089	9519	1492	8780
98	9092	7209	7239	8430	9636	9646	9573	9741	5269	9337	11680	9340	9766	9337	9745	11680	11678	9341	11357	9738	1706	9016
99	8818	7323	7351	8471	9860	9880	9807	9977	5537	9569	11947	9572	10003	9569	9981	11947	11945	9574	11625	9996	1936	9252
100	8608	7329	7356	8424	10063	10083	10009	10181	5747	9771	12157	9774	10207	9771	10184	12157	12155	9776	11835	10200	2141	9459
101	8313	7462	7487	8478	10325	10346	10270	10445	6043	10031	12449	10035	10471	10032	10448	12448	12447	10036	12128	10465	2415	9717

WTG	AS	AT	AU	AV	AW	AX	AY	AZ	BA	BB	BC	BD	BE
1	1506	1508	3386	3388	8623	3390	5704	3389	8624	3388	9513	9515	11493
2	1577	1579	3168	3170	8790	3173	5838	3171	8791	3170	9688	9690	11675
3	1491	1492	3612	3613	8475	3616	5593	3615	8476	3613	9355	9357	11327
4	1595	1597	2898	2899	8892	2902	5901	2900	8893	2899	9801	9803	11796
5	3798	3796	7132	7133	5228	7138	3558	7136	5230	7134	5901	5903	7692
6	1418	1419	3757	3758	8292	3761	5433	3760	8293	3758	9167	9170	11136
7	3999	3997	7331	7332	5067	7337	3526	7335	5069	7334	5720	5722	7493
8	2020	2020	5008	5010	7493	5013	4927	5012	7495	5010	6304	6306	10212
9	1917	1917	4830	4832	7646	4835	5031	4834	7647	4832	8466	8468	10384
10	1996	1999	2355	2356	9350	2358	6300	2357	9351	2356	10277	10279	12284
11	1850	1852	2539	2541	9197	2543	6165	2542	9198	2540	10118	10120	12121
12	2124	2124	5189	5190	7308	5194	4784	5192	7310	5191	8109	8111	10009
13	2050	2052	2006	2007	9383	2009	6298	2008	9384	2007	10322	10324	12336
14	2938	2937	6217	6219	6335	6223	4191	6221	6336	6220	7071	7073	8911
15	2818	2817	6060	6061	6589	6065	4380	6063	6589	6062	7331	7333	9177
16	3101	3100	6406	6408	6083	6412	4022	6410	6085	6409	6808	6810	8640
17	3596	3594	6930	6931	5394	6935	3602	6933	5396	6932	6086	6086	7893

To be continued on next page...

DECIBEL - Main Result

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WTG	AS	AT	AU	AV	AW	AX	AY	AZ	BA	BB	BC	BD	BE
18	2653	2652	5868	5870	6745	5874	4461	5872	6746	5871	7502	7504	9361
19	2272	2271	5399	5401	7119	5405	4670	5403	7121	5402	7908	7910	9796
20	2532	2532	5704	5706	6938	5710	4595	5708	6939	5706	7704	7707	9572
21	3245	3244	6565	6567	5866	6571	3880	6569	5868	6568	6582	6584	8406
22	3417	3416	6748	6749	5619	6753	3726	6751	5620	6750	6323	6325	8140
23	4052	4050	7280	7282	4000	7286	2382	7284	4001	7283	4743	4746	6625
24	3843	3841	7083	7084	4183	7088	2409	7086	4184	7085	4941	4943	6832
25	3540	3538	6786	6788	4410	6792	2418	6790	4411	6789	5193	5195	7103
26	1237	1237	4459	4460	7073	4464	4304	4462	7075	4461	7937	7939	9898
27	3297	3295	6556	6557	4626	6562	2494	6560	4627	6559	5423	5425	7342
28	1124	1123	4279	4281	7263	4285	4461	4283	7264	4282	8133	8135	10099
29	1419	1418	4689	4690	6852	4694	4132	4692	6853	4691	7707	7709	9661
30	3079	3077	6347	6348	4812	6353	2564	6351	4813	6350	5622	5624	7549
31	1054	1054	4112	4114	7457	4118	4628	4116	7458	4114	8332	8334	10301
32	1925	1923	5259	5260	6121	5265	3518	5263	6122	5261	6962	6964	8907
33	1574	1573	4874	4876	6648	4880	3969	4878	6650	4877	7497	7499	9447
34	2832	2830	6118	6119	5065	6124	2717	6122	5066	6120	5883	5886	7816
35	1742	1740	5071	5072	6338	5077	3690	5075	6339	5074	7184	7187	9134
36	2602	2600	5898	5900	5273	5904	2833	5902	5275	5901	6102	6104	8042
37	1018	1019	3945	3947	7651	3950	4796	3949	7652	3947	8530	8533	10503
38	2374	2372	5689	5690	5543	5695	3042	5693	5544	5692	6376	6378	8318
39	13573	13571	16079	16080	6233	16085	9298	16083	6231	16083	5366	5364	3535
40	13765	13762	16276	16279	6421	16284	9493	16282	6420	16281	5548	5546	3696
41	13957	13955	16479	16479	6611	16485	9689	16483	6609	16482	5731	5729	3861
42	14145	14143	16679	16680	6795	16685	9883	16683	6794	16683	5908	5906	4016
43	14349	14347	16914	16915	6996	16920	10101	16918	6994	16917	6092	6089	4165
44	14603	14601	17222	17223	7253	17228	10383	17226	7251	17225	6324	6322	4351
45	15021	15019	17631	17631	7670	17636	10797	17635	7668	17634	6744	6741	4771
46	15256	15253	17882	17882	7908	17887	11041	17886	7906	17885	6975	6972	4990
47	15478	15476	18106	18107	8131	18112	11266	18110	8130	18110	7197	7195	5210
48	15806	15804	18428	18429	8458	18434	11590	18432	8457	18431	7525	7523	5539
49	16902	16900	19516	19517	9553	19522	12684	19520	9552	19519	8621	8619	6632
50	17297	17295	19916	19917	9950	19922	13082	19920	9948	19920	9015	9013	7022
51	17609	17607	20238	20238	10264	20243	13400	20241	10263	20241	9326	9324	7329
52	17817	17815	20447	20448	10473	20453	13609	20451	10472	20450	9534	9532	7535
53	18024	18022	20656	20657	10681	20662	13818	20660	10680	20659	9741	9739	7742
54	18222	18220	20858	20858	10880	20863	14018	20862	10879	20861	9939	9937	7938
55	12401	12399	13838	13839	6829	13843	8432	13842	6827	13841	6725	6724	6561
56	12499	12497	13977	13977	6818	13982	8498	13980	6817	13980	6683	6682	6459
57	12667	12665	14193	14193	6854	14198	8629	14196	6852	14196	6677	6676	6365
58	12857	12855	14420	14421	6934	14425	8790	14423	6933	14423	6720	6718	6325
59	12990	12988	14640	14640	6870	14645	8869	14643	6869	14643	6595	6593	6077
60	13207	13205	14883	14884	7004	14888	9065	14887	7003	14886	6695	6694	6098
61	13527	13525	15214	15214	7266	15219	9374	15217	7265	15217	6928	6926	6251
62	4587	4584	7394	7395	2768	7400	806	7398	2770	7397	3701	3704	5720
63	13103	13101	15471	15472	5850	15477	8793	15475	5848	15475	5081	5079	3505
64	13441	13439	15863	15863	6143	15868	9141	15866	6142	15866	5330	5328	3629
65	16173	16171	18787	18787	9824	18793	11953	18791	9823	18790	7893	7891	5909
66	13286	13284	15668	15669	6018	15674	8979	15672	6017	15671	5234	5232	3612
67	16417	16415	19032	19032	9068	19037	12198	19035	9067	19035	8136	8134	6150
68	16627	16625	19243	19243	9278	19248	12409	19247	9277	19246	8346	8344	6358
69	13747	13745	15449	15449	7434	15454	9584	15452	7433	15452	7072	7071	6336
70	13947	13945	15663	15663	7588	15668	9774	15666	7587	15666	7206	7204	6416
71	14491	14489	16268	16269	7975	16273	10283	16272	7974	16271	7526	7524	6573
72	14676	14673	16469	16469	8118	16473	10459	16472	8117	16472	7650	7648	6651
73	14963	14961	16771	16772	8360	16776	10737	16775	8358	16774	7870	7868	6812
74	3384	3386	2078	2079	10719	2078	7624	2078	10720	2077	11659	11661	13673
75	1554	1555	4029	4031	8204	4034	5402	4033	8206	4031	9066	9068	11022
76	3152	3154	2052	2053	10491	2053	7401	2052	10492	2051	11429	11431	13442
77	3812	3815	2085	2086	11126	2083	8015	2084	11127	2083	12072	12074	14089
78	2325	2328	1970	1972	9662	1973	6577	1972	9663	1971	10600	10603	12614

To be continued on next page...

DECIBEL - Main Result

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WTG	AS	AT	AU	AV	AW	AX	AY	AZ	BA	BB	BC	BD	BE
79	2620	2622	1900	1901	9951	1902	6859	1901	9953	1900	10891	10894	12906
80	5448	5445	8234	8235	1913	8240	1432	8236	1914	8237	2839	2841	4858
81	4608	4610	2548	2548	11912	2545	8794	2546	11914	2545	12861	12863	14880
82	2945	2947	2061	2062	10289	2062	7205	2061	10290	2060	11225	11227	13237
83	5685	5683	8471	8472	1680	8477	1652	8475	1681	8474	2600	2602	4619
84	4818	4820	2420	2420	12062	2416	8923	2418	12063	2418	13020	13022	15043
85	5113	5111	7922	7923	2249	7928	1190	7926	2250	7926	3171	3173	5188
86	4063	4065	2233	2233	11376	2231	8265	2231	11377	2231	12322	12325	14340
87	4807	4804	7608	7609	2549	7614	930	7612	2551	7611	3481	3483	5500
88	5964	5961	8743	8744	1406	8749	1904	8747	1407	8746	2321	2323	4340
89	5018	5020	2477	2477	12229	2472	9084	2474	12231	2474	13192	13194	15215
90	4365	4368	2363	2364	11669	2360	8551	2361	11670	2361	12617	12620	14636
91	6296	6294	9056	9056	1072	9062	2196	9060	1073	9059	1991	1994	4013
92	6699	6697	9439	9439	670	9444	2566	9442	672	9442	1594	1596	3618
93	6921	6919	9660	9661	466	9666	2785	9664	468	9663	1371	1373	3395
94	3467	3469	1757	1758	10755	1756	7636	1756	10757	1755	11705	11708	13725
95	8432	8430	10967	10967	1212	10972	4148	10971	1211	10970	970	970	2278
96	8629	8626	11208	11208	1322	11213	4366	11211	1321	11211	823	822	1985
97	8820	8817	11411	11411	1493	11416	4565	11414	1492	11414	866	865	1786
98	9056	9053	11678	11679	1706	11684	4821	11682	1705	11682	928	926	1489
99	9290	9288	11945	11946	1937	11951	5078	11949	1935	11948	1062	1060	1188
100	9493	9490	12155	12156	2141	12161	5287	12159	2140	12158	1244	1241	990
101	9755	9753	12447	12448	2416	12453	5573	12451	2414	12450	1477	1474	668

Annexure - XIX: Shadow Flicker modelling Results (Worst Case Scenario)

ShadowReceptors	Receptor photograph	Village Name	Receptor Coordinates		Shadow hours per year (h/year)	WTGs Impacting the Receptor	WTG Coordinates		Distance of WTG from the Receptor (in km)
			Easting	Northing			Easting	Northing	
B(RE2) ***Few households***		Vepakunta	757230	1598969	46:12	P15	758631	1599474	1.48
						P21	758615	1599267	1.41
						P10	758194	1598545	1.06
						P20	758225	1598756	1.03
E(RE5) ***Group of households***		Vepakunta	757270	1599032	30:29	P15	758631	1599474	1.42
						P21	758615	1599267	1.35
						P10	758194	1598545	1.05
						P20	758225	1598756	1.00
L(RE12) ***Group of households***		Eduguralla palle	751847	1585474	81:01	P76	751300	1585623	0.56

ShadowReceptors	Receptor photograph	Village Name	Receptor Coordinates		Shadow hours per year (h/year)	WTGs Impacting the Receptor	WTG Coordinates		Distance of WTG from the Receptor (in km)
			Easting	Northing			Easting	Northing	
						P77	751090	1585259	0.79
M(RE13) ***Group of households***		Eduguralla palle	751851	1585501	68:57	P76	751300	1585623	0.57
						P77	751090	1585259	0.82
N(RE14) ***Group of households***		Eduguralla palle	751835	1585369	62:27	P76	751300	1585623	0.58

ShadowReceptors	Receptor photograph	Village Name	Receptor Coordinates		Shadow hours per year (h/year)	WTGs Impacting the Receptor	WTG Coordinates		Distance of WTG from the Receptor (in km)
			Easting	Northing			Easting	Northing	
						P77	751090	1585259	0.76
O(RE15) ***Group of households***		**Eduguralla palle**	**751881**	**1585325**	**55:47**	P76	751300	1585623	0.65
						P77	751090	1585259	0.80
P(RE16) ***Group of households***		Eduguralla palle	751993	1585270	41:05	P76	751300	1585623	0.77

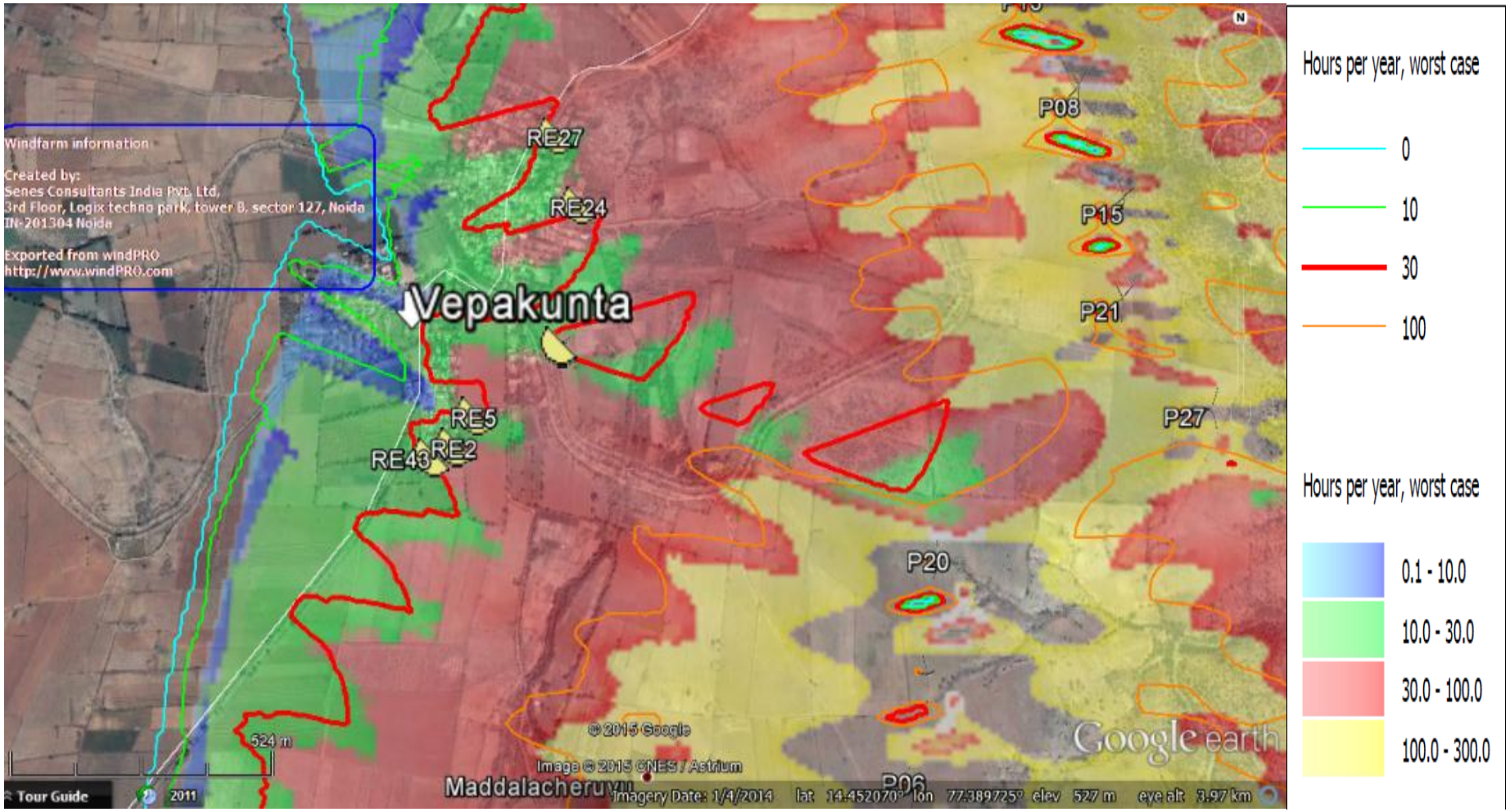
ShadowReceptors	Receptor photograph	Village Name	Receptor Coordinates		Shadow hours per year (h/year)	WTGs Impacting the Receptor	WTG Coordinates		Distance of WTG from the Receptor (in km)
			Easting	Northing			Easting	Northing	
						P77	751090	1585259	0.92
AA(RE27) ***Group of households***		Vepakunta	757483	1599479	35:33	P08	758544	1599702	1.12
						P13	758472	1599938	1.08
						P15	758631	1599474	1.21
						P21	758615	1599267	1.24
						P27	758781	1599050	1.47
AB(RE28)		Vepakunta	757457	1599513	46:42	P08	758544	1599702	1.21

ShadowReceptors	Receptor photograph	Village Name	Receptor Coordinates		Shadow hours per year (h/year)	WTGs Impacting the Receptor	WTG Coordinates		Distance of WTG from the Receptor (in km)
			Easting	Northing			Easting	Northing	
A few households						P13	758472	1599938	1.25
						P15	758631	1599474	1.22
						P21	758615	1599267	1.17
						P27	758781	1599050	1.35
AD(RE30)		Vepakunta	757428	1599633	42:57	P08	758544	1599702	1.22
School and few households						P13	758472	1599938	1.27
						P15	758631	1599474	1.22
						P21	758615	1599267	1.18
						P27	758781	1599050	1.35
AK(RE37)		Vepakunta	757426	1599638	43:16	P08	758544	1599702	1.20

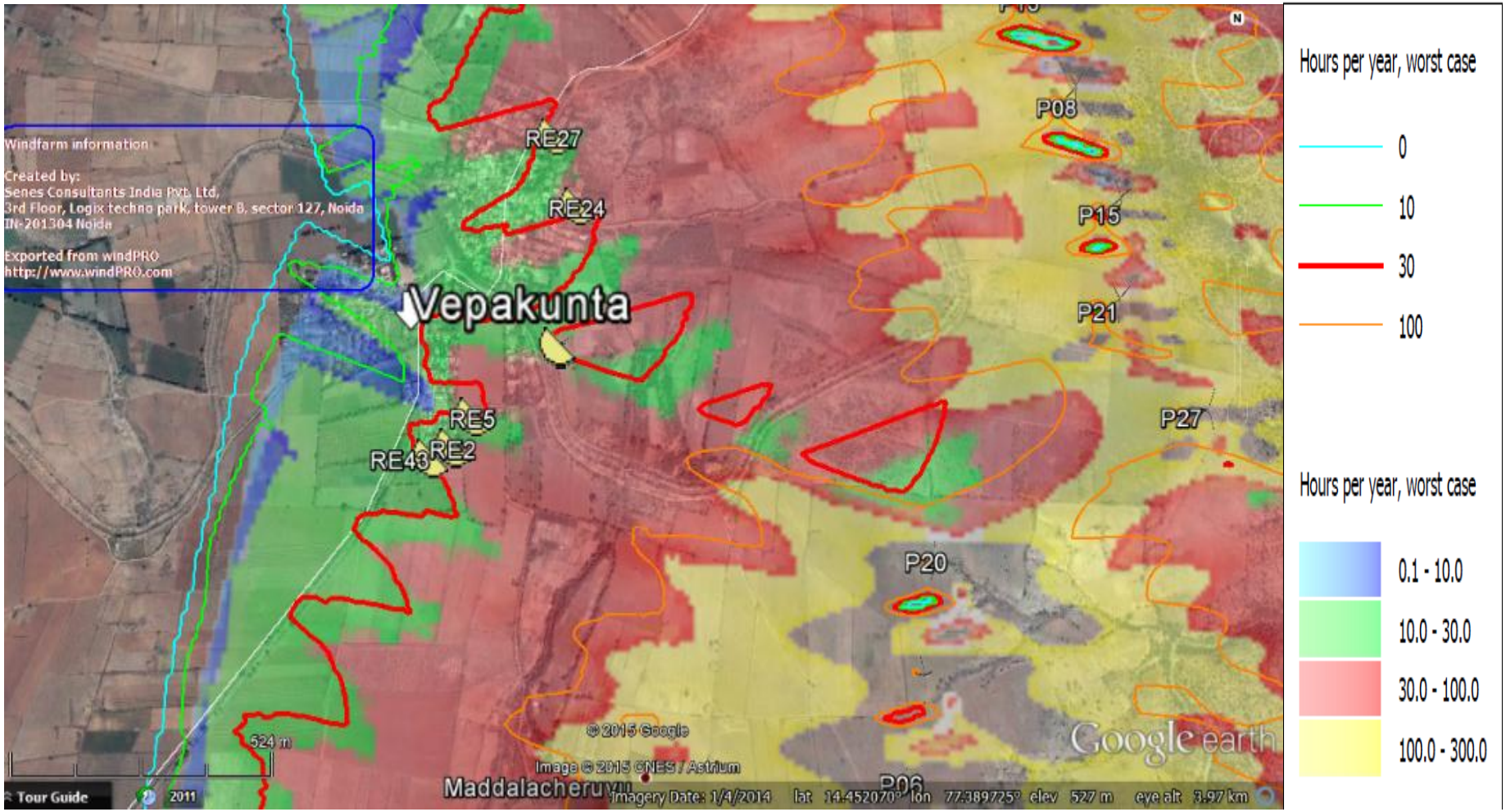
ShadowReceptors	Receptor photograph	Village Name	Receptor Coordinates		Shadow hours per year (h/year)	WTGs Impacting the Receptor	WTG Coordinates		Distance of WTG from the Receptor (in km)
			Easting	Northing			Easting	Northing	
School and few households						P13	758472	1599938	1.29
						P15	758631	1599474	1.21
						P21	758615	1599267	1.17
						P27	758781	1599050	1.34
AR(RE43) **Temple**		Vepakunta	757183	1598949	31:13	P21	758615	1599267	1.46
						P10	758194	1598545	1.10
						P20	758225	1598756	1.08
AS(RE44) ***Group of households***		Vepakunta	757229	1598968	46:12	P15	758631	1599474	1.48
						P21	758615	1599267	1.41
						P10	758194	1598545	1.06

ShadowReceptors	Receptor photograph	Village Name	Receptor Coordinates		Shadow hours per year (h/year)	WTGs Impacting the Receptor	WTG Coordinates		Distance of WTG from the Receptor (in km)
			Easting	Northing			Easting	Northing	
						P20	758225	1598756	1.02
AT(RE45) ***Group of households***		Vepakunta	757228	1598966	46:09	P15	758631	1599474	1.48
						P21	758615	1599267	1.42
						P10	758194	1598545	1.06
						P20	758225	1598756	1.03
BC(RE55)		Shivapuram	754036	1591325	40:26	P62	753109	1591611	0.96
						P63	753213	1591331	0.82
						P64	753193	1591126	0.86
BD(RE56)		Shivapuram	754035	1591323	40:36	P62	753109	1591611	0.97
						P63	753213	1591331	0.82
						P64	753193	1591126	0.87

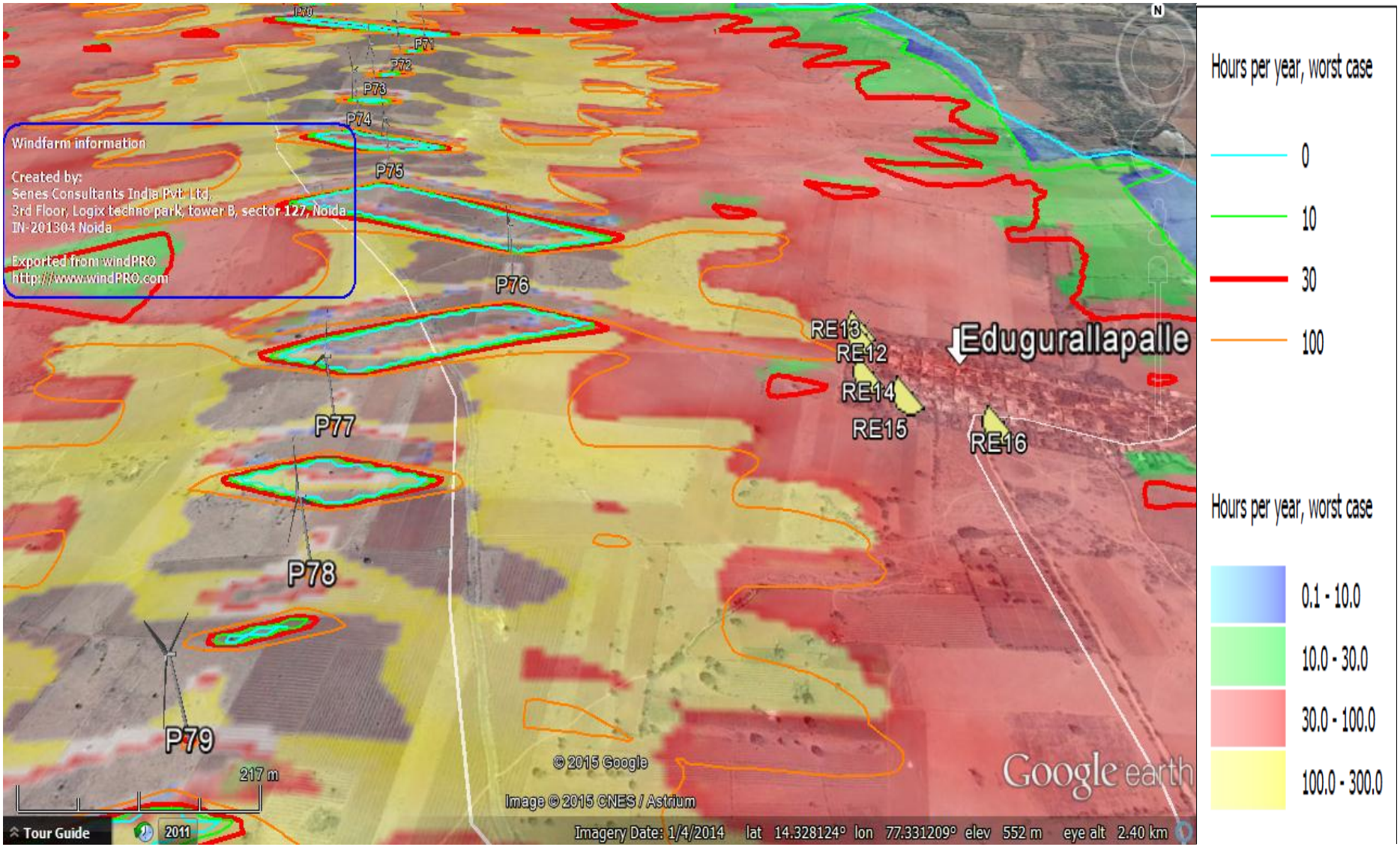
SHADOW FLICKER MODELLING RESULTS (RE 2, 5, 43 & 27)



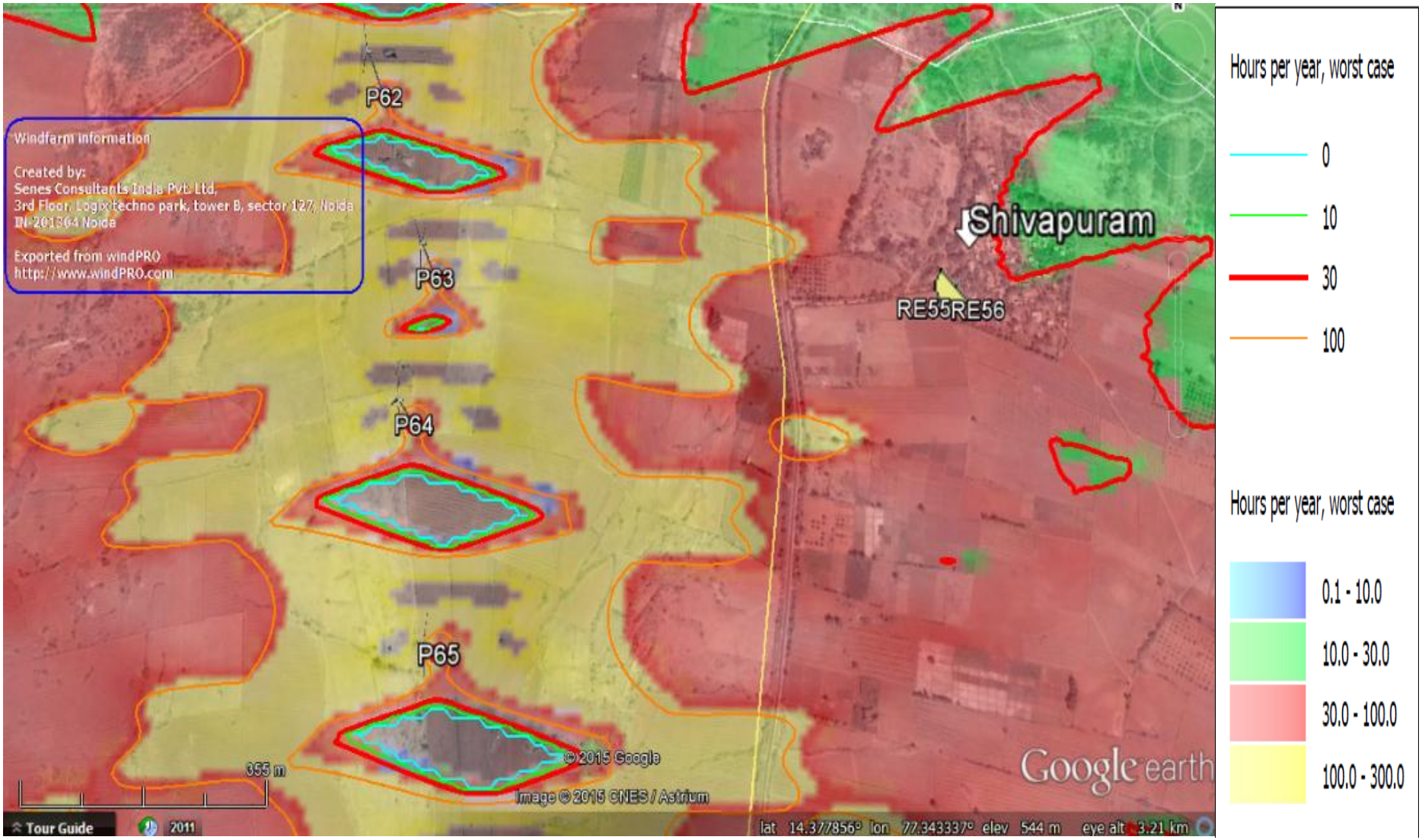
SHADOW FLICKER MODELLING RESULTS (RE 2, 5, 43 & 27)



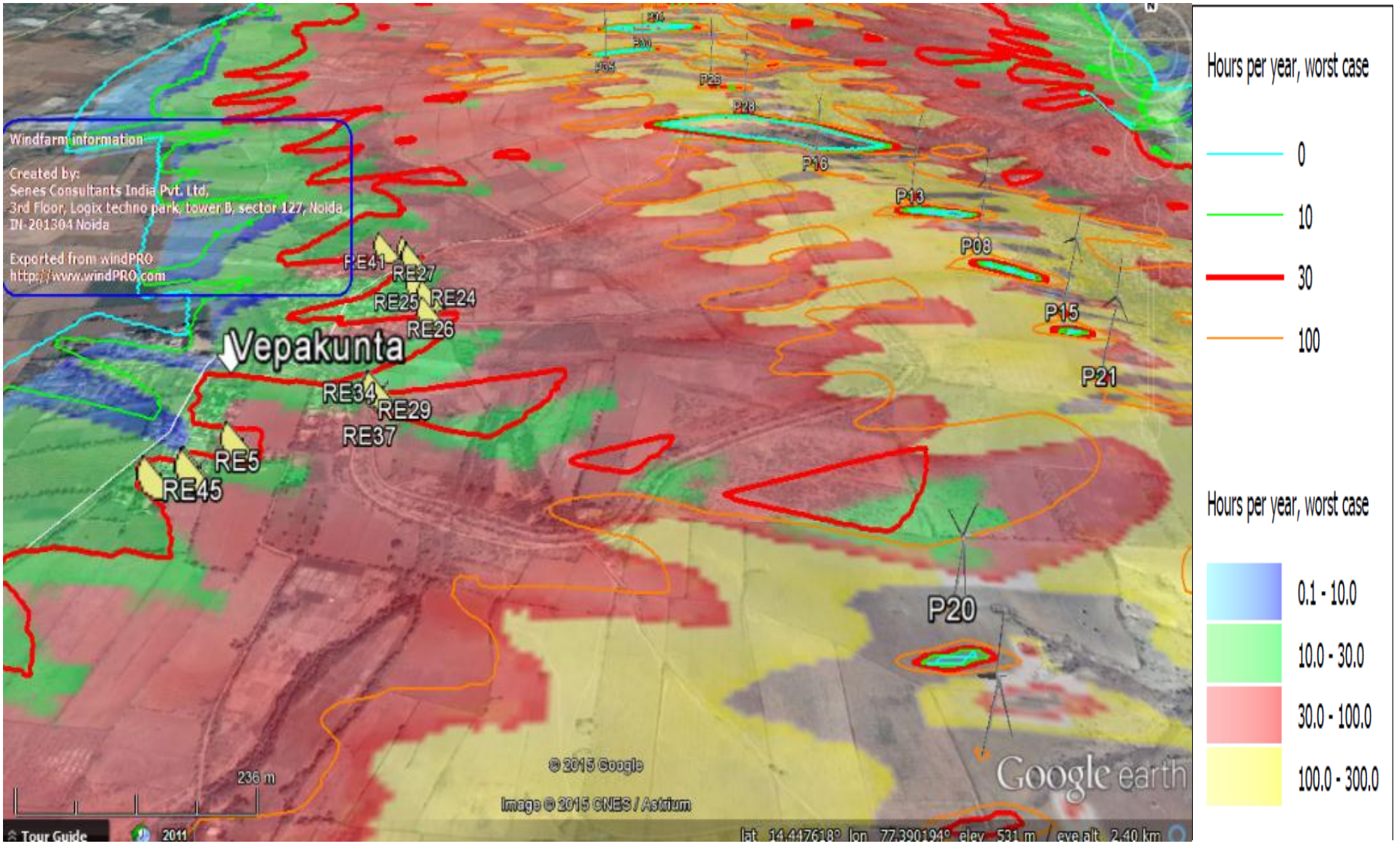
SHADOW FLICKER MODELLING RESULTS (RE 2, 5, 43 & 27)



SHADOW FLICKER MODELLING RESULTS (RE 55 & 56)



SHADOW FLICKER MODELLING RESULTS (RE 45 & 37)


Windfarm information
Created by:
Senes Consultants India Pvt. Ltd.
3rd Floor, Logix techno park, tower B, sector 127, Noida
IN-201304 Noida
Exported from windPRO
http://www.windPRO.com
RE41
RE27
RE25
RE24
RE26
Vepakunta
RE34
RE29
RE37
RE5
RE45
P16
P13
P08
P15
P21
P20
© 2015 Google
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Google earth
236 m
Tour Guide
2011
Hours per year, worst case
0
10
30
100
Hours per year, worst case
0.1 - 10.0
10.0 - 30.0
30.0 - 100.0
100.0 - 300.0

Shadow Flicker Modelling Output- Real Scenario

Project:
rayala shadow flicker - case I real scenario

Licensed user:
Senes Consultants India Pvt. Ltd,
3rd Floor, Logix techno park, tower B, sector 127, Noida
IN-201304 Noida
01204368426

Calculated:
1/11/2016 7:40 PM/3.0.619

SHADOW - Main Result

Assumptions for shadow calculations

Maximum distance for influence
Calculate only when more than 20 % of sun is covered by the blade
Please look in WTG table

Minimum sun height over horizon for influence	3 °
Day step for calculation	1 days
Time step for calculation	1 minutes

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
8.75	9.73	9.52	9.74	8.93	6.61	5.89	6.10	6.62	6.26	6.21	6.68

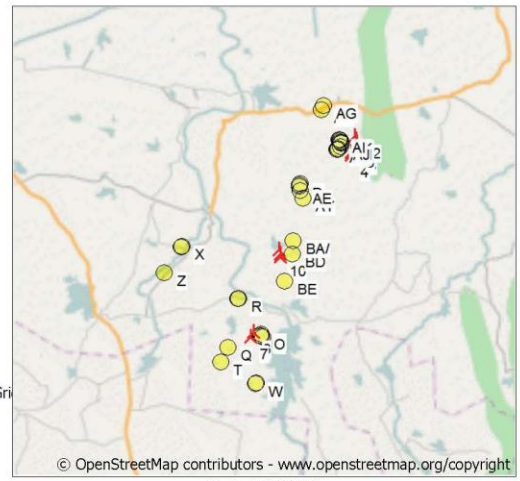
Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
114	209	957	1,845	662	397	124	102	1,232	2,015	322	124	8,103

Idle start wind speed: Cut in wind speed from power curve

A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:
Height contours used: Elevation Grid Data Object: rayala shadow flicker_EMDGri
Obstacles used in calculation
Eye height: 1.5 m
Grid resolution: 10.0 m

All coordinates are in
UTM (north)-WGS84 Zone: 43



Scale 1:400,000
New WTG Shadow receptor

WTGs

	Easting	Northing	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Shadow data Calculation distance	RPM
			[m]					[kW]	[m]	[m]	[m]	[RPM]
1	758,544	1,599,702	533.4	Suzlon S97 2100 97.0 !O! hub: 120.0 m (...Yes		Suzlon	S97-2,100	2,100	97.0	120.0	2,500	15.4
2	758,631	1,599,474	531.2	Suzlon S97 2100 97.0 !O! hub: 120.0 m (...Yes		Suzlon	S97-2,100	2,100	97.0	120.0	2,500	15.4
3	758,615	1,599,267	530.9	Suzlon S97 2100 97.0 !O! hub: 120.0 m (...Yes		Suzlon	S97-2,100	2,100	97.0	120.0	2,500	15.4
4	758,194	1,598,545	537.5	Suzlon S111 2100 111.8 !O! hub: 90.0 m... Yes		Suzlon	S111-2,100	2,100	111.8	90.0	2,500	13.0
5	758,225	1,598,756	533.6	Suzlon S111 2100 111.8 !O! hub: 90.0 m... Yes		Suzlon	S111-2,100	2,100	111.8	90.0	2,500	13.0
6	751,300	1,585,623	553.5	Suzlon S111 2100 111.8 !O! hub: 90.0 m... Yes		Suzlon	S111-2,100	2,100	111.8	90.0	2,500	13.0
7	751,090	1,585,259	553.1	Suzlon S111 2100 111.8 !O! hub: 90.0 m... Yes		Suzlon	S111-2,100	2,100	111.8	90.0	2,500	13.0
8	758,781	1,599,050	531.8	Suzlon S97 2100 97.0 !O! hub: 120.0 m (...Yes		Suzlon	S97-2,100	2,100	97.0	120.0	2,500	15.4
9	753,109	1,591,611	537.6	Suzlon S97 2100 97.0 !O! hub: 120.0 m (...Yes		Suzlon	S97-2,100	2,100	97.0	120.0	2,500	15.4
10	753,213	1,591,331	543.9	Suzlon S97 2100 97.0 !O! hub: 120.0 m (...Yes		Suzlon	S97-2,100	2,100	97.0	120.0	2,500	15.4
11	753,193	1,591,126	546.6	Suzlon S97 2100 97.0 !O! hub: 120.0 m (...Yes		Suzlon	S97-2,100	2,100	97.0	120.0	2,500	15.4
12	758,472	1,599,938	532.7	Suzlon S97 2100 97.0 !O! hub: 120.0 m (...Yes		Suzlon	S97-2,100	2,100	97.0	120.0	2,500	15.4

Shadow receptor-Input

No.	Easting	Northing	Z	Width	Height	Height a.g.l.	Degrees from south cw	Slope of window	Direction mode
			[m]	[m]	[m]	[m]	[°]	[°]	
A	754,556	1,595,938	538.0	1.0	1.0	1.0	0.0	90.0	"Green house mode"
B	757,230	1,598,969	532.4	1.0	1.0	1.0	0.0	90.0	"Green house mode"
C	754,537	1,596,249	535.9	1.0	1.0	1.0	0.0	90.0	"Green house mode"
D	754,509	1,596,353	535.4	1.0	1.0	1.0	0.0	90.0	"Green house mode"
E	757,270	1,599,032	531.4	1.0	1.0	1.0	0.0	90.0	"Green house mode"
F	754,552	1,596,469	532.8	1.0	1.0	1.0	0.0	90.0	"Green house mode"
G	754,559	1,596,475	532.5	1.0	1.0	1.0	0.0	90.0	"Green house mode"
H	754,796	1,595,401	540.1	1.0	1.0	1.0	0.0	90.0	"Green house mode"
I	750,193	1,588,058	535.0	1.0	1.0	1.0	0.0	90.0	"Green house mode"
J	750,147	1,588,040	535.0	1.0	1.0	1.0	0.0	90.0	"Green house mode"

To be continued on next page...

SHADOW - Main Result

...continued from previous page

No.	Easting	Northing	Z [m]	Width [m]	Height [m]	Height a.g.l. [m]	Degrees from south cw [°]	Slope of window [°]	Direction mode
K	750,193	1,588,057	535.1	1.0	1.0	1.0	0.0	90.0	"Green house mode"
L	751,847	1,585,474	546.0	1.0	1.0	1.0	0.0	90.0	"Green house mode"
M	751,851	1,585,501	545.9	1.0	1.0	1.0	0.0	90.0	"Green house mode"
N	751,835	1,585,369	547.0	1.0	1.0	1.0	0.0	90.0	"Green house mode"
O	751,881	1,585,325	546.4	1.0	1.0	1.0	0.0	90.0	"Green house mode"
P	751,993	1,585,270	543.8	1.0	1.0	1.0	0.0	90.0	"Green house mode"
Q	749,500	1,584,506	542.9	1.0	1.0	1.0	0.0	90.0	"Green house mode"
R	750,196	1,588,054	535.1	1.0	1.0	1.0	0.0	90.0	"Green house mode"
S	749,500	1,584,507	542.9	1.0	1.0	1.0	0.0	90.0	"Green house mode"
T	749,003	1,583,455	550.9	1.0	1.0	1.0	0.0	90.0	"Green house mode"
U	751,492	1,581,871	553.1	1.0	1.0	1.0	0.0	90.0	"Green house mode"
V	751,531	1,581,936	552.1	1.0	1.0	1.0	0.0	90.0	"Green house mode"
W	751,517	1,581,909	552.9	1.0	1.0	1.0	0.0	90.0	"Green house mode"
X	746,106	1,591,805	523.5	1.0	1.0	1.0	0.0	90.0	"Green house mode"
Y	746,068	1,591,751	524.5	1.0	1.0	1.0	0.0	90.0	"Green house mode"
Z	744,874	1,589,876	530.7	1.0	1.0	1.0	0.0	90.0	"Green house mode"
AA	757,483	1,599,479	525.8	1.0	1.0	1.0	0.0	90.0	"Green house mode"
AB	757,457	1,599,513	526.5	1.0	1.0	1.0	0.0	90.0	"Green house mode"
AC	757,493	1,599,415	526.4	1.0	1.0	1.0	0.0	90.0	"Green house mode"
AD	757,428	1,599,633	525.4	1.0	1.0	1.0	0.0	90.0	"Green house mode"
AE	754,557	1,595,938	537.9	1.0	1.0	1.0	0.0	90.0	"Green house mode"
AF	757,446	1,599,174	526.6	1.0	1.0	1.0	0.0	90.0	"Green house mode"
AG	756,190	1,602,138	520.2	1.0	1.0	1.0	0.0	90.0	"Green house mode"
AH	757,446	1,599,178	526.6	1.0	1.0	1.0	0.0	90.0	"Green house mode"
AI	757,413	1,599,668	524.9	1.0	1.0	1.0	0.0	90.0	"Green house mode"
AJ	757,443	1,599,176	526.7	1.0	1.0	1.0	0.0	90.0	"Green house mode"
AK	757,426	1,599,638	525.3	1.0	1.0	1.0	0.0	90.0	"Green house mode"
AL	756,193	1,602,137	520.2	1.0	1.0	1.0	0.0	90.0	"Green house mode"
AM	756,188	1,602,136	520.1	1.0	1.0	1.0	0.0	90.0	"Green house mode"
AN	757,445	1,599,180	526.6	1.0	1.0	1.0	0.0	90.0	"Green house mode"
AO	756,043	1,601,842	516.0	1.0	1.0	1.0	0.0	90.0	"Green house mode"
AP	757,364	1,599,682	524.7	1.0	1.0	1.0	0.0	90.0	"Green house mode"
AQ	754,095	1,592,315	539.1	1.0	1.0	1.0	0.0	90.0	"Green house mode"
AR	757,183	1,598,947	533.5	1.0	1.0	1.0	0.0	90.0	"Green house mode"
AS	757,229	1,598,968	532.4	1.0	1.0	1.0	0.0	90.0	"Green house mode"
AT	757,228	1,598,966	532.4	1.0	1.0	1.0	0.0	90.0	"Green house mode"
AU	756,190	1,602,136	520.1	1.0	1.0	1.0	0.0	90.0	"Green house mode"
AV	756,189	1,602,137	520.1	1.0	1.0	1.0	0.0	90.0	"Green house mode"
AW	754,096	1,592,315	539.1	1.0	1.0	1.0	0.0	90.0	"Green house mode"
AX	756,190	1,602,142	520.2	1.0	1.0	1.0	0.0	90.0	"Green house mode"
AY	754,801	1,595,398	540.1	1.0	1.0	1.0	0.0	90.0	"Green house mode"
AZ	756,190	1,602,140	520.2	1.0	1.0	1.0	0.0	90.0	"Green house mode"
BA	754,095	1,592,314	539.0	1.0	1.0	1.0	0.0	90.0	"Green house mode"
BB	756,191	1,602,139	520.2	1.0	1.0	1.0	0.0	90.0	"Green house mode"
BC	754,036	1,591,325	537.9	1.0	1.0	1.0	0.0	90.0	"Green house mode"
BD	754,035	1,591,323	538.0	1.0	1.0	1.0	0.0	90.0	"Green house mode"
BE	753,513	1,589,369	540.1	1.0	1.0	1.0	0.0	90.0	"Green house mode"

Calculation Results

Shadow receptor

Shadow, expected values

No.	Shadow hours per year [h/year]
A	0:00
B	21:59
C	0:00

To be continued on next page...

SHADOW - Main Result

...continued from previous page

Shadow, expected values

No.	Shadow hours per year [h/year]
D	0:00
E	15:37
F	0:00
G	0:00
H	0:00
I	0:00
J	0:00
K	0:00
L	34:56
M	31:56
N	16:01
O	8:59
P	6:46
Q	0:36
R	0:00
S	0:38
T	0:00
U	0:00
V	0:00
W	0:00
X	0:00
Y	0:00
Z	0:00
AA	16:44
AB	21:15
AC	14:10
AD	19:54
AE	0:00
AF	13:11
AG	0:00
AH	12:51
AI	19:06
AJ	13:23
AK	19:55
AL	0:00
AM	0:00
AN	12:56
AO	0:00
AP	17:39
AQ	0:00
AR	18:38
AS	22:02
AT	22:04
AU	0:00
AV	0:00
AW	0:00
AX	0:00
AY	0:00
AZ	0:00
BA	0:00
BB	0:00
BC	18:57
BD	19:08
BE	0:00

SHADOW - Main Result

Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Worst case [h/year]	Expected [h/year]
1	Suzlon S97 2100 97.0 !O! hub: 120.0 m (TOT: 168.5 m) (1)	33:14	16:27
2	Suzlon S97 2100 97.0 !O! hub: 120.0 m (TOT: 168.5 m) (3)	41:24	20:20
3	Suzlon S97 2100 97.0 !O! hub: 120.0 m (TOT: 168.5 m) (6)	40:00	19:25
4	Suzlon S111 2100 111.8 !O! hub: 90.0 m (TOT: 145.9 m) (31)	28:50	11:41
5	Suzlon S111 2100 111.8 !O! hub: 90.0 m (TOT: 145.9 m) (37)	33:28	14:38
6	Suzlon S111 2100 111.8 !O! hub: 90.0 m (TOT: 145.9 m) (44)	87:20	33:53
7	Suzlon S111 2100 111.8 !O! hub: 90.0 m (TOT: 145.9 m) (45)	64:16	34:00
8	Suzlon S97 2100 97.0 !O! hub: 120.0 m (TOT: 168.5 m) (125)	39:28	17:39
9	Suzlon S97 2100 97.0 !O! hub: 120.0 m (TOT: 168.5 m) (145)	16:43	6:30
10	Suzlon S97 2100 97.0 !O! hub: 120.0 m (TOT: 168.5 m) (146)	12:39	6:26
11	Suzlon S97 2100 97.0 !O! hub: 120.0 m (TOT: 168.5 m) (147)	12:20	6:42
12	Suzlon S97 2100 97.0 !O! hub: 120.0 m (TOT: 168.5 m) (1)	36:45	16:26

Annexure - XX: OSTRO Health & Safety Policy

OSTRO

HEALTH AND SAFETY POLICY

We, at Ostro, firmly believe that health & safety of our employees and contractors is of utmost importance. Ostro is committed to practice, promote and inculcate best possible standards of health and safety in its business. We believe that Safety is Everyone's Responsibility and Line Management has a leadership role in implementation of, and ensuring compliance with HSE policies and standards. In pursuit of our belief and commitment, we strive -

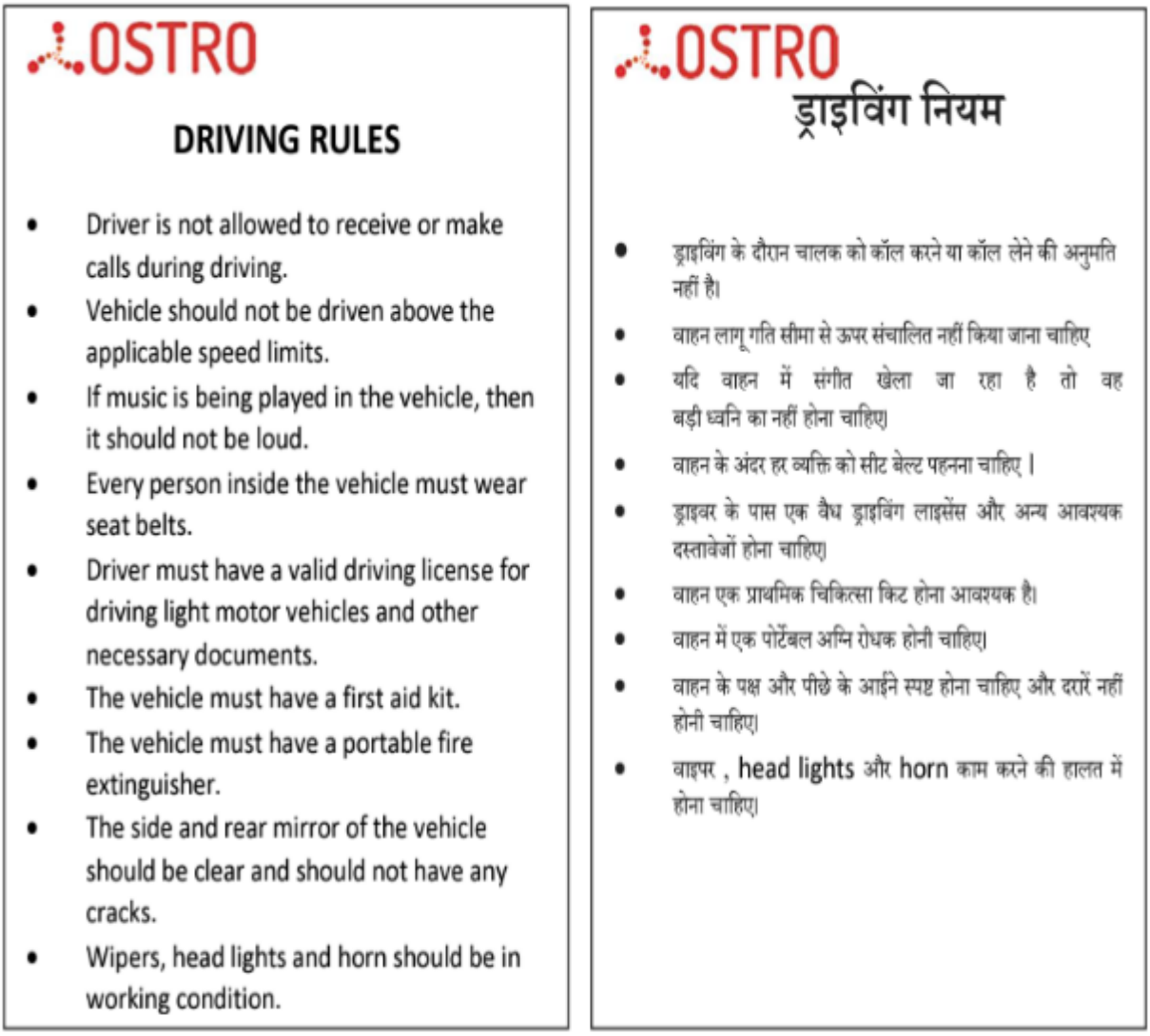
- *To ensure that all employees and contractors work in safe working conditions.*
- *To identify and eliminate all risks by taking adequate preventive measures.*
- *To provide health and safety training to all relevant persons.*
- *To establish, maintain and practice a certifiable occupational health and safety management system (OHSAS: 18001).*
- *To ensure that all activities are in compliance with applicable health and safety regulations.*

Ostro is committed to develop a culture of safety through active leadership at all levels and making sure that resources are made available to implement this policy.

This policy is applicable to all business and project related activities of Ostro Energy. All employees and contractors of Ostro are required to adhere to this policy.

Ranjit Gupta-Chief Executive Officer
Date: January 2015

Annexure - XXI: OSTRO Driving Rules



OSTRO

DRIVING RULES

- Driver is not allowed to receive or make calls during driving.
- Vehicle should not be driven above the applicable speed limits.
- If music is being played in the vehicle, then it should not be loud.
- Every person inside the vehicle must wear seat belts.
- Driver must have a valid driving license for driving light motor vehicles and other necessary documents.
- The vehicle must have a first aid kit.
- The vehicle must have a portable fire extinguisher.
- The side and rear mirror of the vehicle should be clear and should not have any cracks.
- Wipers, head lights and horn should be in working condition.

OSTRO

ड्राइविंग नियम

- ड्राइविंग के दौरान चालक को कॉल करने या कॉल लेने की अनुमति नहीं है।
- वाहन लागू गति सीमा से ऊपर संचालित नहीं किया जाना चाहिए
- यदि वाहन में संगीत खेला जा रहा है तो वह बड़ी ध्वनि का नहीं होना चाहिए।
- वाहन के अंदर हर व्यक्ति को सीट बेल्ट पहनना चाहिए ।
- ड्राइवर के पास एक वैध ड्राइविंग लाइसेंस और अन्य आवश्यक दस्तावेजों होना चाहिए।
- वाहन एक प्राथमिक चिकित्सा किट होना आवश्यक है।
- वाहन में एक पोर्टेबल अग्नि रोधक होनी चाहिए।
- वाहन के पक्ष और पीछे के आईने स्पष्ट होना चाहिए और दरारें नहीं होनी चाहिए।
- वाइपर , head lights और horn काम करने की हालत में होना चाहिए।

Annexure - XXII: OSTRO CSR Policy

OSTRO

CORPORATE SOCIAL RESPONSIBILITY (CSR) POLICY

We, at Ostro, believe that communities in which we operate, are one of the important stakeholders in our business. Through CSR activities, we intend to contribute to their socio-economic development and enhance their quality of life. This policy demonstrates Ostro's commitment to undertake CSR activities. Ostro will participate in CSR activities, directly or indirectly, in the following manner-

- *Consult proactively with communities to identify issues and grievances and design CSR activities accordingly.*
- *Undertake projects with due care to activities and sensitivities of local people.*
- *Strategize and execute CSR activities with a clear focus on capacity building in areas of basic education, health care and drinking water.*
- *Monitor, review and evaluate CSR programs on a periodic basis.*

This policy is applicable to all project related activities of Ostro. Ostro is committed to deploy appropriate resources to fulfil its CSR obligation.

Ranjit Gupta-Chief Executive Officer
Date: May 2015

Annexure - XXIII: CTE & CTO Requirements as per Andhra Pradesh Wind Power Policy

GOVERNMENT OF ANDHRA PRADESH
ABSTRACT

ENERGY, INFRASTRUCTURE & INVESTMENT DEPARTMENT - Development of Wind Power in Andhra Pradesh – Andhra Pradesh Wind Power Policy, 2015 - Orders – Issued.

ENERGY, INFRASTRUCTURE & INVESTMENT (PR.II) DEPARTMENT

G.O.MS.No. 9 Dated:13.02.2015

Read the following:

1. G.O.Ms.No.48, Energy (Res) Deptt., dated 11.04.2008.
2. G.O.Ms.No.99, Energy (Res) Deptt., dated 09.08.2008.
3. From the VC&MD, NREDCAP, Hyderabad Lr.No.NREDCAP / WE/Govt./2014, dated 25.09.2014.

****

ORDER :

In order to promote Wind Power Projects, the Government of Andhra Pradesh have issued orders formulating Andhra Pradesh Wind Power Policy, 2012 vide references 1st and 2nd read above. The operative period of policy was 5 years and it expired in April, 2013, Considering, the good wind power potential existing in the State and to achieve 4000 MW capacity addition through wind power during the next 5 years period, there is a need to bring out comprehensive wind power policy.

2. Government, after detailed discussions on the proposal vide reference 3rd cited with various stakeholders viz., APTRANSCO., APDISCOMs, NREDCAP Wind Power Developers and Associations etc., hereby issue the Wind Power Policy, 2015 as mentioned below:

PREAMBLE

India is amongst the largest wind power markets in the world. Wind power is already economical in comparison to conventional power sources and Andhra Pradesh has a huge wind power potential that is yet to be harnessed. The wind power potential in the combined state of Andhra Pradesh as estimated by the National Institute of Wind Energy (NIWE) , formerly known as Centre for Wind Energy Technology (C-WET) is around14,497 MW at 80 m level with maximum potential existing in the districts of Ananthapur, Kadapa, Kurnool, Chittoor and Nellore districts.

The Government of Andhra Pradesh has earlier issued "Wind Power Policy", vide G.O.Ms.No.48 dated 11.04.2008 and G.O.Ms.No.99 dated 09.09.2008, to promote wind power projects. Since the policy operative period was for five (5) years, the policy expired in April, 2013. Taking into consideration the rising power requirements of the State post bifurcation and clean energy considerations, the government of Andhra Pradesh is keen to promote wind power generation in a big way.

OBJECTIVES:

1. To encourage, develop and promote wind power generation in the State with a view to meet the growing demand for power in an environmentally and economically sustainable manner.

2. To attract private investment to the State for the establishment of large wind power projects.

3. To promote investments for setting up manufacturing facilities in the State, which can generate gainful local employment.

... Contd 2..

h) **Deemed Industry Status**

Generation of electricity from wind power projects shall be treated as eligible industry under the schemes administered by the Industries Department and incentives available to industrial units under such schemes shall be available to the wind power producers.

i) **Must run status**

Injection from wind power projects shall be considered to be deemed scheduled subject to prevailing regulations/grid code of appropriate commission.

j) **Pollution Clearance**

Wind power projects will be exempted from obtaining any NOC/Consent for establishment under pollution control laws from AP Pollution Control Board.

9 **Nodal Agency**

New and Renewable Energy Development Corporation of A.P. Ltd (NREDCAP) shall act as a Nodal Agency under this policy and as decided by the government from time to time.

The Nodal Agency and/or designated offices by the Nodal Agency shall be responsible for facilitating single window clearance of the projects for the following activities:

a) Registration of projects

b) Allotment of capacity of projects

c) Processing of proposals for allotment of revenue land or Forest land.

d) Arranging approval for power evacuation plan and open access.

e) Arranging other statutory clearances/approvals if any.

f) Co-ordination with MNRE/SECI/APTransco/APDiscoms and other central and state agencies.

An online system will be established by the Nodal Agency for acceptance of applications and for providing status updates. The developers will be given a login access for tracking the status updates. All approvals/clearances shall be disposed within 30 days from the date of registration.

10 **Time Lines for Project Completion**

The Eligible Developers should enter into a project agreement along with the applicable fees and bank guarantees with the Nodal Agency within two (2) months from the date of sanction of the capacity allotment.

In case of wind power projects allotted in revenue lands, the project shall be commissioned within 18 months from the date of possession of revenue lands and/ or issue of power evacuation clearance, whichever is later. In case of wind power projects allotted in private lands, the projects shall be commissioned within 18 months from the date of issue of power evacuation clearance.

Contd.. 7

Annexure - XXIV: 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 - XXV: Community Grievance Register Format

OSTRO		Register for Documenting Community Grievances- (Site name) Project		**Note:** This sheet has to be used to document all the communitiy issues, grievances received from local people with all the relevant details. Actions taken to resolve the grievance by the site team, developers team should be				
S.N	**roject Nam**	**Date when the**	**Community Grievances**	**Village**	**Date when the**	**How was the Grievance was**	**Total number of**	**What was the impact of the**
1								
2								
3								
4								
5								
6								

Annexure - XXVI: DOs & DON'Ts (For Wildlife Management)

DOs

- The developer should intimate the District Forest Officer about the project activity prior to the starting of the project.
- Awareness programs should be conducted for all contractors and their workers regarding the presence of the wildlife species in the region and their conservation status. Also the punishment/ penalty imposed on hunting or killing should be clearly described in such programs.
- The presence of the antelopes and bears need to be managed both during the construction and operation phase of the project.
- The movement of vehicles through access road (day and night time) needs to be monitored constantly for presence of black buck herds or bears in and around the road.
- Signages showing the presence of wildlife should be placed within the project site and near to the approach roads for generating awareness amongst the vehicle drivers and labors.
- Signages prohibiting the hunting or killing of the antelope or bears should also be placed in and around the project site.
- The construction area about 50 m surrounding a WTG location needs to be temporally barricaded to prevent the antelopes and bears from entering the area while the work is on.
- Proper fencing should be done around the labour camp to avoid attacks from wild animals like bears.
- If pits are dug on the ground for project activity it should be suitably barricaded and closed permanently after construction so that the animals are prevented from falling in the pit.
- The area around the WTGs should not be used for any other purposes other than the work specified both during construction and operation phase of the project.
- The WTGs with associated facilities like generator, cables and transformer should be properly fenced to prevent accidental electrocution of the wild animals.
- About 50 m around the WTGs should be kept free of grasses and shrubs to keep the antelopes away from nearing WTGs.
- During operation phase the security guards should be periodically trained regarding the management of the wildlife around the WTGs.
- Record should be maintained about the presence of the black bucks or any other wild animals in and around the project area in all seasons during operation phase.

Don'ts

- Hunting or killing of black bucks is totally prohibited under Wild Life Protection Act and the punishment includes punishable with imprisonment for a term which shall not be less than one year but may extend to six years and also with fine which shall not be less than five thousand rupees.
- No construction activity should start without an awareness program regarding the presence of the antelopes, bears, etc. and their management.
- No injury to the wild animals (antelopes, bear, etc.) should result due to any sort of construction activities on site.

- The workers should not be allowed to throw stones or wood or any other weapon to ward off the wild animals from the site.
- DG sets without acoustic cover should not be used during project construction phase.
- No pits should be left uncovered near to the WTGs during construction and operation phase of the project.
- Fencing of the WTG area should be properly insulated so that electrocution can be avoided.
- No electric cables should be loosely hanged or left above the ground during operation phase of the project.
- Construction activity should preferably continue during day time and should not be allowed during night time.

Annexure - XXVII: Blasting Protocol

Protocol to conduct blasting activities

- Use of explosive falls under Explosive Rules 2008, which are applicable for regulating the manufacture, import, export, transport, **possession for sale and use of explosives**.

- Site contractor/developer has to first inform Ostro site team, construction head and ESH about the planned blasting activities for any location at site.

- Ostro will request following information to developer

    - Authorisation from Chief Controller of Explosives for use of explosives.
    - Name of person who be in-charge of undertaking activity, how may blasting activities he has handled before?
    - Name of blasting material used, quantity.(may be ammonium nitrate)
    - From where the blasting material is being taken.
    - How the blasting material is going to be transported on blast location.
    - How is the blasting material going to be handled? any special tools or manually.
    - We want to be sure that no blasting material remains on site or in any labour camp.
    - How many people in total will be present at the blasting location?

After review of the required approvals and information, Ostro will decide and will formally inform the OEM whether blasting activity is permitted or not.

If blasting activity will be permitted following safety measures should be implemented.

- Blasting shall be performed during daytime only.
- No person will be allowed to work in the area suspected of being under the influence of alcohol or drugs.
- No person will be allowed to carry matchbox, lighter, any kind of flame near explosives during its handling.
- Warning signs will be erected and maintained at all approaches to the blast area within 300 m from blast location.
- All workers involved in blasting must wear safety goggles and safety helmet.
- Only authorised and trained person to be allowed to handle explosives and conduct blasting.
- Drill holes should not be left loaded overnight. Detonators should not be connected to blasting agents and left overnight.
- Remains (split) of blasting material (if any) has to be destroyed.
- Safe work permit has to be obtained from the concerned site supervisor, this will also be approved by Ostro site head.
- Audible blast signals such as air horns or siren will be sounded before and after each blast.
- Safety kit/first aid box to be present at blasting location.

Annexure - XXVIII: Accident & Incident Investigating Form

ECOREN RENEWABLES

Attachment-23

PROJECT SITE ACCIDENT/INCIDENT INVESTIGATION FORM

Project Site:	**Project: Manager:**	**Project EHS Manager:**
Date:	**Location:**	**Shift:**
Employee: Yes/No	**Employee Name:**	**Immediate Supervisor:**
Sub-Contractor: Yes/No	**Name:**	**Immediate Supervisor:**

Accident Type: Injury/Illness/Serious Injury/Fatality/Properly Damage/Vehicle Accident/First Aid/Near Miss

 # Of Employees Injured:

Principal Activity:

Description of Accident/Incident:

Contributing Causes: Unsafe Condition/Unsafe Acts

5 WHY Root Cause Analysis:

Who:

What:

Where:

When:

Why:

Corrective Action:

1.

2.

3.

Preventive Action:

1.
2.
3.

Annexure - XXIX: Stakeholder Engagement Plan

OSTRO RENEWABLES	STAKEHOLDER ENGAGEMENT PLAN	VER-01

1 STAKEHOLDER ENGAGEMENT FRAMEWORK

The stakeholder engagement and communication framework has been prepared to guide stakeholder engagement across the lifecycle of the project, demonstrating Company's commitment towards its stakeholders while also addressing the requirements of the International Finance Corporation (IFC) Performance Standards (PSs). This engagement plan is focussed on the engagement during the construction and operation phases of the project. It is expected that the plan will be a "live" document and will continue to evolve and be updated continuously as the project progresses.

1.1 PROJECT PHASES AND ACTIVITIES

The project life-cycle (PLC) can be divided into four phases and ensuring the completion of all the tasks in each phase, within the planned Turn-around Time (TAT), is the major responsibility of the corporate management. The four phases of the PLC are as follows:

- Planning and preconstruction phase;
- Construction phase;
- Operation (including maintenance and repair) phase; and
- Decommissioning.

1.2 AIMS AND OBJECTIVES OF THE STAKEHOLDER ENGAGEMENT PLAN (SEP)

This engagement plan will guide all the stakeholder engagement during construction phase and operation phase; however with the change in Industry practices and regulatory requirements, the plan will be reviewed and revised accordingly.

The objectives of this SEP are 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'

Stakeholder identification, mapping and analysis will be undertaken during ESIA stage and much stress has to be put in rationalising the organisational structure for implementation of the stakeholder engagement and communication plan, depending upon the self-development model or turnkey development model to be followed for any project of Ostro.

1.3 APPLICABLE REFERENCE FRAMEWORK

The disclosure of project information and consultations with stakeholders has been increasingly emphasised by project finance institutions and government regulatory bodies. A brief overview of the requirements of public disclosure and stakeholder consultation applicable to this project is provided below (***Table 1.1***).

Table 1.1 Overview of Disclosure and Stakeholder Consultation Requirements

Institution/ Regulatory Body	Requirements
IFC PS-1	• In keeping with this PS, community engagement is to be undertaken with the affected communities and must be free of external manipulation, interference, or coercion, and intimidation. • Furthermore, in situations where an affected community may be subject to risks or adverse impacts from a project, the proponent must undertake a process of consultation so as to provide the affected communities with an opportunity to express their views on the project risks, impacts, and mitigation measures, as well as allow the proponents to consider and respond to them. • *Informed participation:* For projects with significant adverse impacts on affected communities, the consultation process must ensure that free, prior and informed consultation with affected communities occurs and that processes exist to facilitate participation by those affected. • Apart from such a consultation process, the project proponents are also to establish a Grievance Redressal Mechanism, which will allow the affected communities' concerns and grievances about the project proponent's environmental and social performance to be received and allow for steps to be taken to resolve the same • *Broader stakeholder engagement:* The proponent must identify and engage with stakeholders that are not directly affected by the Project but those that have established relationships with local communities and/or interest in the Project – local government, civil society organisations, etc. – and establish a dialogue.

2 STAKEHOLDER IDENTIFICATION AND ANALYSIS

2.1 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.

This stakeholder engagement will enable Ostro to assess the socio-political environment in which they are to operate and in particular to:

- Train Ostro site officials to identify conflict of interests between stakeholders in order to help manage such relationships during the course of the project;
- Help project officials to identify relations between stakeholders that may enable "coalitions" of project sponsorship, ownership and co-operation;
- Generate information critical to planning, implementation and monitoring of the project; and
- Develop the framework of participatory planning and implementation.

2.1.1 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**. Keeping in mind the nature of the project and its setting, a broad list of stakeholders have been identified and listed in the table given below (***Table 2.1***).

Table 2.1 Stakeholder Group Categorization

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
Government Bodies	Regulatory Authorities; District Administration	
Other Groups		Media Other industries/projects

2.1.2 Stakeholder Analysis

The table below ***Table 2.2*** provides the profile of the key stakeholders who might have certain direct or indirect impact. These stakeholders will need to be classified in accordance with the level of influence they might have over the project as well as their priority to the project proponent in terms of importance. The influence and priority have both been primarily rated as:

- ***High Influence:*** This implies a high degree of influence of the stakeholder on the project in terms of participation and decision making or high priority to engage with the stakeholder;
- ***Medium Influence:*** Which implies a moderate level of influence and participation of the stakeholder in the project as well as a priority level to engage the stakeholder which is neither highly critical nor are insignificant in terms of influence.
- ***Low Influence:*** This implies a low degree of influence of the stakeholder on the project in terms of participation and decision making or low priority to engage that stakeholder.

The intermediary categories of low to medium or medium to high primarily imply that their influence and important could vary in that particular range subject to context specific conditions or also based on the responses of the project towards the community.

The coverage of stakeholders as stated above includes any person, group, institution or organization that is likely to be impacted (directly or indirectly) or may have interest/influence over project. Keeping this wide scope of inclusion in stakeholder category and the long life of project, it is difficult to identify all potential stakeholders and gauge their level of influence over project at the outset of the project. Therefore project proponent is advised to consider this stakeholder mapping as a live document which should be revised in a timely manner so as to make it comprehensive for any given period of time.

Table 2.2 Stakeholder Analysis

Relevant Stakeholders	Profile/Status	Impact/Influence of the Project on this Stakeholder Group	Impact/Influence of the Stakeholder Group on the Project	Expectations, Opinions Key Concerns of Stakeholders	Rating of Stakeholder Influence
Developers and EPC Contractor					
Local Labourers					
Migrant Workforce					
Gram Panchayats					
Regulatory Authorities					
District/Tehsil Administration					
Local Community					
Vulnerable Community					
Civil Society/Local NGOs					

3 STAKEHOLDER ENGAGEMENT & COMMUNICATION STRATEGY

Stakeholder engagement and communication strategy will take into cognisance the various stakeholder engagement and CSR activities already being undertaken by the company or partner NGO, or developer under turnkey model and existing communication routes being followed. Presence of CSR agencies needs to be considered, as they are considered to be an extension of the project and the staff therein is considered, to an extent, representative for the project. The construction team mobilised at the site, serves as another extension. Coordinated flow and collation of information, concerns and grievances, therefore becomes important.

3.1 STAKEHOLDER ENGAGEMENT PRINCIPLE

The Stakeholder Engagement framework considers the analysis, mapping and feedback of consultations during the ESIA process and the same has been provided in this document.

This plan provides details on the general principles for Ostro stakeholder engagement which shall be used for implementing, monitoring and evaluating stakeholder engagement activities. In line with current international best practices, the SEP basically aims to:

- Describe the general requirements for engagement and disclosure;
- Identify the stakeholders being directly or indirectly affected or having any sort of interest in the project;
- Identify any specific requirements, expectations and preferences of key stakeholders (affected parties, authorities, NGOs) and pay particular attention to the needs of vulnerable groups;
- Provide a strategy for sharing of information and consulting with each of these stakeholder groups during various phases;
- Document Ostro's resources and responsibilities for implementing activities and provide contact information at all levels and on all subjects;
- Maintain detailed reporting/documentation of engagement and disclosure activities; and
- Agree on monitoring and evaluation processes;

By assessing the present status of stakeholder engagement, challenges in the process and the phase of project cycle, the way forward has to consider and address all the remnants of the previous stages and aspects that will add onto the current stage of development. In order to ensure the smooth functioning of the project a long term engagement strategy has been formulated.

3.2 OVERALL STAKEHOLDER ENGAGEMENT STRATEGY

The overall stakeholder strategy will be cognisant of the requirement of the various stakeholders and the level at which communication is presently being undertaken by the project.

3.2.1 Regulatory Authorities

The regulatory authorities will be coordinated directly by Ostro legal team via OEMs/developers, or project based team. These consultations are in relation to the Power purchase agreement, power evacuation arrangements; Consent to establish related permits, revenue land allotment, or other requirements

required for the wind power projects. The copy of the permits and communication will be made available to Ostro at various levels. Ostro team at the corporate level will be responsible for driving the timely fulfilment of the project level regulatory compliances. After completion, a copy of the relevant permits and compliances will be provided to the corporate team from all the projects, for records.

The corporate representatives of Ostro will drive the liaison (either through direct meetings or through ~~state~~ site team) with authorities that include the Ministry of New and Renewable Energy, state Revenue Departments, state Renewable Energy Corporation, State Pollution Control Boards and other necessary agencies, as and when required.

3.2.2 *Community around the Projects*

The project liaison officer of each site will be solely responsible for interaction with the community members residing near each project, through village meetings and other platforms. The minutes of the meetings will be shared with the respective site in-charge as well as the corporate liaising team in standard reporting formats in pre-decided time intervals.

3.2.3 *NGOs, Civil society, Political leaders and Media*

Ostro's ESG head along with the developers CSR team ~~corporate liaising in-charge~~ will be accountable for any communication with local NGOs, civil society members, political leaders and media. The details of any such communication concerning the projects will be made available to the Ostro corporate team in the form of stakeholder engagement records. Nobody apart from designated the Ostro corporate liaising in-charge will be responsible for communication with the above mentioned stakeholder.

3.3 *Organisational Structure & Roles and Responsibilities*

During the construction stage, owing to the interplay of the various actors involved, it is important to have a system in place which ensures that the community as one of the key stakeholders is aware about the Stakeholder engagement as well as the communication protocol including the grievance mechanism. Due to the interplay of various actors, the organisational structure for CSR and stakeholder engagement has been shown in context to the complete organisational structure.

Section 3.2 suggests the mechanism in place for establishing clear protocol of communication between the Corporate team and the various stakeholders including the community. It is also suggested above that all these communication platforms have to consolidate the stakeholder engagement records and submit it to the corporate team of Ostro.

3.3.1 *Financial Resourcing*

The corporate team of Ostro will ensure that the budgetary allocations for SEP are adequate to meet its objectives as laid out in the stakeholder engagement policy. Once the construction phase of a project is over, the stakeholder engagement will continue to be budgeted for the complete lifecycle of each project. Community head at the corporate level will ensure that budgeting related to SEP are not compromised and financial resources for conducting the stakeholder consultations are made available to the dedicated team at the project site level.

3.4 ENGAGEMENT METHODS

The methods of communication can be either verbal or written, on the basis of the purpose of communication and the target stakeholder group. Some of the key methods of communication are as follows:

Meetings and Discussions: Meetings and discussions are an essential component of any communication exercise. The corporate CSR team of Ostro will have regular interface with their counterparts in the project in order to review the current engagement with local community. These discussions are will be to communicate specific information to the target stakeholders and allow for the collective opinion of the groups to be captured and assessed.
Reports and Notices: Information disclosure is an important process of communication with the local stakeholders and is part of the applicable reference framework for the project. A mandatory communication from the corporate team will guide project teams for the forthcoming meetings in each project. The process of disclosure of information to the communities at the project will involve the provisioning of information in an accessible manner (a manner which allows for easy understanding, such as in the local language) to the various stakeholders in a project. There will be visits of the designated members of corporate team at regular intervals to each project.

The details of the relevant stakeholders, stage at which the engagement needs to be undertaken, purpose of consultation, mode of engagement, responsible person for stakeholder engagement, person to whom reporting is to be done, and the system of maintaining records of stakeholder engagement is mentioned in ***Table 3.1.***

Table 3.1 Stakeholder Engagement

Relevant Stakeholders	Stage at which the consultation	Purpose of the Consultation	Mode of engagement	Responsible person	Reporting	Reporting Format
Developers and EPC Contractors	Mobilisation Construction Stage Operation stage	• Engagement by Project team will be at various stages of the project	• Meetings • Submission of reports	•		• Reports on various aspects
Regulatory Authorities	Mobilisation Construction Stage Operation stage	• Various permissions and licenses related to setting up of the project • Land procurement on lease; • Submission of compliance related returns;	• Meeting • Submission of compliance documents; • Official letters	•	•	• Evidence as well as details of communication
District/Tehsil Administration	Mobilisation Construction Stage Operation stage	• Some of the regulatory permission in relation to land; • Development intervention for the district; • Other issues seeking participation of the project by the District Administration	• Meeting • Submission of compliance documents; • Official letters	•	•	• Evidence as well as details of communication • Verbal communication and relevant records as applicable
Gram Panchayats	Mobilisation Construction Stage Operation stage	• NOC from the local Panchayat • Information on the project	• Meetings •	•	•	• Records of communication at site level
Local Community	Mobilisation	• Information sharing on the project; • Compensation and other issues; • Details on the activities to the project; • CSR and other benefits to the local population	• Meetings	•	•	• Records of communication at site level

10.4 **Roles & Responsibilities of Sub-Contractors:**

- The sub-contractors are hereby responsible to comply with the guidelines of this plan.
- The sub-contractors shall track all the findings raised by "Ecoren Renewables Pvt Ltd" to closure within the timeline prescribed.
- Sub-Contractor shall provide all resources to implement the requirements of this plan in their respective work area.
- Sub-Contractor is responsible to communicate the requirements of the plan to all their sub-contractors and their contractors, their employees and visitors

10.5 **Types of Emergencies:**

"Ecoren Renewables Pvt Ltd" shall ensure appropriate measures are taken to address the following types of emergencies that could arise in the project site.

i. Fire: Fire can result from variety of operations in the project site including but not limited to: Welding operations, hot works, electrical short circuit, flammables, etc. Site shall take all fire prevention measures to ensure fire does not happen in the project site.

- Maintain good housekeeping
- Provide adequate number of Fire Extinguishers
- Provide fire detection devices like Smoke/Heat Detectors in site offices
- Ensure Fire Extinguishers and Smoke/Heat Detectors always in working conditions
- Provide Photo luminescent stickers for EXIT DOORs so that one can easily identify during an emergency.
- Provide secondary exits in all offices and work locations as appropriate.
- Designate a Primary and Secondary Emergency Assembly Area in the site.
- Provide directional Exit guidance labels to guide personnel to nearest assembly area.
- Provide Emergency Evacuation Map in the project site
- Provide Fire Extinguisher labels on top of the Fire Extinguisher
- Fire Extinguisher must be placed 1 meter from the ground
- All Fire Extinguisher's, Heat and Smoke Detectors must be numbered and an in inventory must be maintained.

ii. Medical: Medical can result from variety of operations in the project site including but not limited to: Welding operations, hot works, electrical short circuit, flammables, etc. and it could result in fracture, first aid, burns, serious injury etc. Site shall take all measures to ensure fire does not happen in the project site.

- Provide adequate number of First Aid Boxes.
- Maintain an inventory of all first aid boxes.
- First Aid Boxes must be numbered and a label should be displayed on the top.
- All First Aid Boxes must be inspected once a week and during inspection expiry and quantity must be verified.
- At least 10% of the site personnel must be trained in First Aid and CPR Training.
- Display the list of First Aid Trained Personnel in the prominent locations.
- First Aid trained people must be part of ERT.
- Identify and maintain a list of nearest hospitals with their contact numbers.
- Enter into an MOU with the nearest hospital for providing cashless treatment in case of emergency.
- Ensure site is adequately sanitized using DDT etc. to control the mosquitoes.
- If case of any illness, personnel must be asked to visit the doctor immediately to prevent the spread of contagious diseases.

iii. Earthquake: Earthquake is a naturally occurring emergency, but still we need to prepare to the extent as practicable.

- Maintain calm during the earthquake
- Do not panic and stampede to evacuate.
- Do not try to protect the company assets or personal belongings during an earthquake.
- Sit below a working table or a secured place as far as possible

iv. Floods: Flood is a naturally occurring emergency, but still we need to prepare to the extent as practicable.

- Maintain calm during the flood
- Do not panic and stampede to evacuate.
- Do not try to protect the company assets or personal belongings during a flood.
- Locate yourself to higher location in the project site.

v. Civil Disturbances: Flood is a naturally occurring emergency, but still we need to prepare to the extent as practicable.

- Maintain calm during the flood
- Do not panic and stampede to evacuate.
- Do not try to protect the company assets or personal belongings during a flood.
- Locate yourself to higher location in the project site.

10.6 Emergency Response Team:

"**Ecoren Renewables Pvt Ltd**" shall form an Emergency Response Team (ERT) to address and co-ordinate during the above mentioned emergencies. The sub-contractors shall ensure the same for their respective work locations and comply with the requirements of this plan.

- ERT team must meet on a monthly basis and review the preparedness of the team to address all kinds of emergencies mentioned above in the plan.

  "Ecoren Renewables Pvt Ltd" shall display the list of firs trained personnel using *Project Site First Aid Team* as per ***Attachment 26***.

  Emergency Response Team must have the following members:

- Project Manager
- Project EHS Manager
- Project Security Manager
- Sub-Contractor EHS Representatives
- First Aid Trained Team Members.
- Fire Extinguisher Trained Team Members
- Spill Response Trained Team Members

10.7 Emergency Drills:

"**Ecoren Renewables Pvt Ltd**" shall ensure that Emergency Response Team (ERT) to conducts emergency drills to check the preparedness of the ERT to address and co-ordinate during the above mentioned emergencies. The sub-contractors shall ensure the same for their respective work locations and comply with the requirements of this plan.

"**Ecoren Renewables Pvt Ltd**" shall conduct quarterly drills and shall document the same using *Project Site Emergency Drill Sheets* as per ***Attachment 27***.

- Quarterly emergency drill shall be conducted by the ERT in the site like Fire Fighting Training, First and CPR Case Reviews, Spill Response, Emergency Evacuation etc.
- All drills must be documented using the drill critique Sheets and findings must be tracked on Safety Audit Tracker (SAT)
- If drill suggests additional training for ERT, the same shall be organized.

10.8. **Emergency Equipment's:**

"Ecoren Renewables Pvt Ltd" shall ensure that inventory of all emergency equipment's are maintained to address and co-ordinate during the above mentioned emergencies. The sub-contractors shall ensure the same for their respective work locations and comply with the requirements of this plan.

"Ecoren Renewables Pvt Ltd" shall document the inventory of all emergency equipment's using *Project Site Emergency Equipment's Inventory* per ***Attachment 28***.

The following equipment's must be installed in site as minimum requirements:

- Fire Extinguisher's
- Smoke /Heat Detectors (Office)
- Emergency Lamps
- First Aid Boxes
- Spill Response Kits
- Breathing Apparatus
- Rescue equipment (Confined Space)
- Public Address System
- Emergency Alarm

10.9. **Emergency Alarm:**

"Ecoren Renewables Pvt Ltd" shall ensure that alarm system is installed alert all personnel to address and co-ordinate during the above mentioned emergencies. The sub-contractors shall ensure the same for their respective work locations and comply with the requirements of this plan.

The following any one of the alarm systems shall installed in the site

- Electric Alarm
- Manual Bell (Approved only when site is small)
- Public Address System

10.10 Emergency Response Plan Communication & Training:

"**Ecoren Renewables Pvt Ltd**" shall ensure that emergency response and evacuation procedures are communicated to all personnel to address and co-ordinate during the above mentioned emergencies. The sub-contractors shall ensure the same for their respective work locations and comply with the requirements of this plan.

"**Ecoren Renewables Pvt Ltd**" shall document and display the emergency contact information using *Project Site Emergency Contact Database* per ***Attachment 29***

The following any communication and trainings would be provided to site personnel, visitors and ERT to address all kinds of emergencies

- Site Safety Orientation Training (All personnel)
- Site Safety Passport (All visitors)
- First and CPR Training for ERT
- Fire Fighting Training for ERT
- Spill Response Training for ERT
- Project Site Emergency Plan Training to ERT

10.11 External Communication & Co-ordination:

"**Ecoren Renewables Pvt Ltd**" shall co-ordinate with nearest fire, police and hospitals to address and co-ordinate during the above mentioned emergencies. The sub-contractors shall ensure the same for their respective work locations and comply with the requirements of this plan.

The following actions shall be taken in this regards

- Meet the nearest the fire station and invite them to the project site to make them familiar about the project site and route to project site
- Share Project Site Emergency Response Plan and ERT information with fire department.
- Sign an MOU with nearest hospital to provide cashless treatment in case of an emergency.
- Meet the nearest police station and make them familiar about the project site and work activity.

Annexure - XXXI: WTG Profiling (Extra 62 locations)

ID	GPS coordinates		Type of land		Village	Nearest settlement		GPS coordinates		Water Body		Forest Area	
			Terrain	Landuse		Name	Distance (Km)/Direction			Name	Distance/Direction	Name	Distance/Direction
S11	14°26'38.34"N	77°22'37.44"E	flat	Agriculture	Vepakunta	Vepakunta	1.21/NE	14°27'3.77"N	77°23'8.22"E	Bhadrapuram forest reservoir	4.73/SE	Narasampalli RF	3.04/E
S15	14°26'55.08"N	77°22'33.22"E	flat	Agriculture	Vepakunta	Vepakunta	1.08/NE	14°27'3.77"N	77°23'8.22"E	Bhadrapuram forest reservoir	4.94/SE	Narasampalli RF	2.79/E
S16	14°26'47.48"N	77°22'34.58"E	flat	Agriculture	Vepakunta	Vepakunta	1.15/NE	14°27'3.77"N	77°23'8.22"E	Bhadrapuram forest reservoir	4.83/SE	Narasampalli RF	2.99/E
S23	14°19'0.97"N	77°18'10.67"E	flat	Open Scrubland	Ayyampalli	Ayyampalli	0.69/SE	14°18'46.54"N	77°18'29.06"E	Chennampalli lake	2.88/NE	Narasampalli RF	16.74/NE
S26	14°27'2.44"N	77°22'35.18"E	flat	Agriculture	Vepakunta	Vepakunta	1.00/E	14°27'3.86"N	77°23'8.23"E	Bhadrapuram forest reservoir	4.98/SE	Narasampalli RF	2.90/E
S31	14°25'33.66"N	77°22'15.92"E	flat	Agriculture	Maddalacheruvu	Maddalacheruvu	1.11/SW	14°25'26.80"N	77°21'39.79"E	Bhadrapuram forest reservoir	5.85/NE	Narasampalli RF	3.86/E
S32	14°25'26.14"N	77°22'11.83"E	flat	Agriculture	Maddalacheruvu	Maddalacheruvu	0.97/W	14°25'26.80"N	77°21'39.79"E	Bhadrapuram forest reservoir	5.51/NE	Narasampalli RF	4.54/E
S37	14°23'19.00"N	77°17'28.91"E	flat	Agriculture	Rallapalle	Rallapalle	0.99/SW	14°23'15.19"N	77°16'56.37"E	ralla Anantapuram reservoir	1.51/NW	Narasampalli RF	13.58/NE
S38	14°20'48.76"N	77°20'5.44"E	flat	Agriculture	Perur	Perur	1.64/NE	14°20'54.39"N	77°20'59.66"E	Upper Penneru Reservoir	2.23/SE	Narasampalli RF	11.93/NE
S40	14°22'0.80"N	77°20'57.31"E	flat	Agriculture	Perur	Perur	0.29/SE	14°21'51.80"N	77°20'59.97"E	Upper Penneru Reservoir	1.75/SE	Narasampalli RF	9.30/NE
S41	14°23'21.51"N	77°18'5.48"E	flat	Agriculture	Rallapalle	Rallapalle	2.08/W	14°23'15.10"N	77°16'56.43"E	RAlla Anantapuram reservoir	1.62/NW	Narasampalli RF	12.21/NE
S42	14°20'40.99"N	77°20'3.19"E	flat	Agriculture	Perur	Eudugurallapalli	1.62/SE	14°19'48.36"N	77°20'5.81"E	Upper Penneru Reservoir	2.16/SE	Narasampalli RF	12.26/NE
S43	14°21'48.74"N	77°18'12.81"E	undulating	open Scrubland	Chennampalle	Chennampalle	1.43/SE	14°21'21.33"N	77°18'51.30"E	RAlla Anantapuram reservoir	4.42/NW	Narasampalli RF	13.08/NE
S44	14°21'58.24"N	77°18'12.57"E	undulating	open Scrubland	Chennampalle	Chennampalle	1.61/SE	14°21'21.33"N	77°18'51.30"E	RAlla Anantapuram reservoir	4.05/NW	Narasampalli RF	12.92/NE
S45	14°21'52.89"N	77°19'36.60"E	flat	open Scrubland	Chennampalle	Chennampalle	1.16/SW	14°21'20.62"N	77°19'15.59"E	konetinayanipalyam reservoir	3.18/NE	Narasampalli RF	13.1./NE
S46	14°19'53.91"N	77°18'28.18"E	Flat	Agriculture	Ayyampalli	Ayyampalli	0.70/S	14°19'31.12"N	77°18'30.57"E	Chennampalle lake	1.12/NE	Narasampalli RF	14.95/NE

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S47	14°20'4.18"N	77°18'1.96"E	Flat	Agriculture	Ayyampalli	Ayyampalli	1.48/SE	14°19'31.12" N	77°18'30.57" E	Chennampalle lake	1.52/NE	Narasampalli RF	15.55/NE
S48	14°21'20.25" N	77°18'26.66" E	undulating	open Scrubland	Acchampalli	Acchampalli	1.13/E	14°21'22.58" N	77°19'4.32"E	Chennampalle lake	1.58/SE	Narasampalli RF	13.38/NE
S49	14°20'32.28" N	77°18'5.28"E	flat	open Scrubland	Chennampalle	Acchampalli	0.28/N	14°20'41.29" N	77°18'5.76"E	Chennampalle lake	1.19/E	Narasampalli RF	14.80/Ne
S50	14°22'17.37" N	77°19'34.05" E	flat	Agriculture	Chennampalle	Chennampalle	1.63/SW	14°21'29.89" N	77°19'9.21"E	Chennampalle lake	3.43/SW	Narasampalli RF	10.70/NE
S51	14°22'5.13"N	77°19'33.85" E	flat	Agriculture	Chennampalle	Chennampalle	1.31/SW	14°21'29.89" N	77°19'9.21"E	Chennampalle lake	3.05/SW	Narasampalli RF	11.20/NE
S52	14°20'17.25" N	77°18'2.43"E	undulating	open Scrubland	Chennampalle	Chennampalle	0.74/NE	14°20'41.13" N	77°18'5.73"E	Chennampalle lake	1.32/NE	Narasampalli RF	15.76/NE
T14	14°16'50.96" N	77°19'36.19" E	Flat	Agriculture	Kottakurakulapalli	Kottakurakulapalli	1.75/NW	14°17'43.68" N	77°19'57.52" E	Upper Penneru Reservoir	3.91/NW	Narasampalli RF	18.35/NE
T17	14°22'44.16" N	77°17'36.94" E	Flat	Open Scrubland	Rallapalle	Rallapalle	1.54/NE	14°23'13.38" N	77°16'54.99" E	Ralla Anantapuram reservoir	2.54/N	Narasampalli RF	13.65/NE
T28	14°17'14.68" N	77°19'38.36" E	Flat	Agriculture	Kottakurakulapalli	Kottakurakulapalli	1.08/NW	14°17'43.81" N	77°19'56.63" E	Upper Penneru Reservoir	3.29/NW	Narasampalli RF	17.58/NE
T29	14°17'30.67" N	77°19'46.47" E	Flat	Agriculture	Kottakurakulapalli	Kottakurakulapalli	0.49/NW	14°17'46.11" N	77°19'52.13" E	Upper Penneru Reservoir	2.91/NW	Narasampalli RF	17.17/NE
T35	14°27'4.88"N	77°23'47.43" E	Flat	Open Scrubland	Vepakunta	Vepakunta	0.93/E	14°27'11.15" N	77°23'17.11" E	Bhadrapuram forest reservoir	2.98/SE	Narasampalli RF	0.35/E
T38	14°19'36.90" N	77°18'3.75"E	Flat	Agriculture	Ayyampalli	Ayyampalli	0.70/SW	14°19'34.43" N	77°18'26.80" E	Upper Penneru Reservoir	4.70/W	Narasampalli RF	15.98/NE
T39	14°17'39.89" N	77°19'44.86" E	Flat	Agriculture	Kottakurakulapalli	Kottakurakulapalli	0.29/NW	14°17'46.11" N	77°19'52.13" E	Upper Penneru Reservoir	2.67/NW	Narasampalli RF	16.55/NE
T40	14°17'48.53" N	77°19'30.41" E	Flat	Agriculture	Kottakurakulapalli	Kottakurakulapalli	0.69/W	14°17'48.27" N	77°19'53.52" E	Upper Penneru Reservoir	3.02/NW	Narasampalli RF	16.94/NE
T41	14°16'58.98" N	77°19'38.17" E	Flat	Agriculture	Kottakurakulapalli	Kottakurakulapalli	1.50/NW	14°17'43.68" N	77°19'57.52" E	Upper Penneru Reservoir	3.85/NW	Narasampalli RF	17.84/NE
T42	14°17'6.55"N	77°19'38.71" E	undulating	Open Scrubland	Kottakurakulapalli	Kottakurakulapalli	1.27/NW	14°17'43.81" N	77°19'57.64" E	Upper Penneru Reservoir	3.60/NW	Narasampalli RF	17.62/NE

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T44	14°19'43.56" N	77°18'7.92"E	Flat	Agriculture	Ayyampalli	Ayyampalli	0.64/SW	14°19'34.43" N	77°18'26.80" E	Upper Penneru Reservoir	4.55/W	Narasampalli RF	15.76/NE
T48	14°26'17.87" N	77°22'41.37" E	Flat	Agriculture	Vepakunta	Vepakunta	1.5/NW	14°27'3.66"N	77°23'8.17"E	Bhadrapuram forest reservoir	4.50/E	Narasampalli RF	2.94/E
T49	14°19'47.43" N	77°19'38.34" E	Undulating	Open Scrubland	Chennampalle	Edugurallapalli	0.79/W	14°19'45.44" N	77°20'5.17"E	Upper Penneru Reservoir	1.86/W	Narasampalli RF	13.64/NE
T51	14°22'6.73"N	77°20'31.93" E	Flat	agriculture	Perur	Perur	0.95/SW	14°21'51.56" N	77°21'0.04"E	Konetinayanipalyam reservoir	2.33/N	Narasampalli RF	9.50/NE
T52	14°26'1.94"N	77°22'40.30" E	Flat	Agriculture	Vepakunta	Maddulacheruvu	1.91/E	14°25'50.66" N	77°21'37.87" E	Bhadrapuram forest reservoir	4.52/E	Narasampalli RF	3.02/E
T54	14°27'0.32"N	77°22'56.81" E	Flat	Agriculture	Vepakunta	Vepakunta	0.36/ NW	14°27'3.79"N	77°23'8.17"E	Bhadrapuram forest reservoir	4.24/SE	Narasampalli RF	2.33/E
T55	14°26'25.17" N	77°22'43.25" E	Flat	Agriculture	Vepakunta	Vepakunta	1.4/NW	14°27'4.76"N	77°23'7.99"E	Bhadrapuram forest reservoir	4.43/SE	Narasampalli RF	2.94/E
T56	14°26'9.16"N	77°22'40.71" E	Flat	Agriculture	Vepakunta	Vepakunta	1.95/NW	14°27'4.32"N	77°23'7.93"E	Bhadrapuram forest reservoir	4.50/E	Narasampalli RF	3.01/E
T57	14°26'39.26" N	77°22'51.88" E	Flat	Agriculture	Vepakunta	Vepakunta	0.96/NW	14°27'5.02"N	77°23'8.11"E	Bhadrapuram forest reservoir	4.29/SE	Narasampalli RF	2.50/E
T58	14°26'32.26" N	77°22'46.10" E	Flat	Agriculture	Vepakunta	Vepakunta	1.20/NW	14°27'2.96"N	77°23'6.96"E	Bhadrapuram forest reservoir	4.39/SE	Narasampalli RF	2.93/E
T59	14°20'52.23" N	77°19'37.40" E	Undulating	Open Scrubland	Chennampalle	Chennampalle	1.03/NE	14°21'16.09" N	77°19'12.81" E	Upper Penneru Reservoir	3.00/SE	Narasampalli RF	12.38/NE
T60	14°19'29.61" N	77°18'4.31"E	Flat	Agriculture	Ayyampalli	Ayyampalli	0.65/W	14°19'28.65" N	77°18'25.97" E	Upper Penneru Reservoir	4.61/W	Narasampalli RF	16.26/NE
T61	14°22'35.59" N	77°20'44.14" E	Flat	Agriculture	Perur	Konetinayanipalem	1.27/NW	14°22'56.94" N	77°21'20.66" E	Konetinayanipalyam reservoir	1.45/N	Narasampalli RF	8.77/NE
T62	14°19'22.86" N	77°18'2.84"E	Flat	Agriculture	Ayyampalli	Ayyampalli	0.87/W	14°19'25.11" N	77°18'32.11" E	Upper Penneru Reservoir	4.59/W	Narasampalli RF	16.45/NE
T65	14°21'51.50" N	77°20'32.70" E	Flat	Open Scrubland	Perur	Perur	0.80/SW	14°21'46.21" N	77°20'58.86" E	Konetinayanipalyam reservoir	2.82/N	Narasampalli RF	9.70/NE

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T66	14°18'45.91" N	77°18'59.34" E	Flat	Agriculture	Kottakurakulapalli	Kamulla shedlu	0.84/E	14°18'42.61" N	77°18'30.14" E	Upper Penneru Reservoir	3.52/W	Narasampalli RF	15.13/NE
T67	14°25'22.25" N	77°22'31.97" E	Flat	Agriculture	Vepakunta	Maddulacheruvu	1.67/E	14°25'26.82" N	77°21'39.56" E	Bhadrapuram forest reservoir	4.95/NE	Narasampalli RF	3.77/E
T68	14°25'53.74" N	77°22'38.38" E	Flat	Agriculture	Vepakunta	Maddulacheruvu	1.85/E	14°25'50.66" N	77°21'37.87" E	Bhadrapuram forest reservoir	4.56/NE	Narasampalli RF	3.02/E
T69	14°19'17.18" N	77°17'35.06" E	undulating	Open Scrubland	Ayyampalli	Ayyampalli	1.81/NW	14°19'25.05" N	77°18'32.07" E	Upper Penneru Reservoir	5.42/NW	Narasampalli RF	16.62/NE
T70	14°19'8.10"N	77°17'58.25" E	undulating	Open Scrubland	Ayyampalli	Ayyampalli	1.14/NW	14°19'25.05" N	77°18'32.07" E	Upper Penneru Reservoir	4.71/NW	Narasampalli RF	16.66/NE
T71	14°21'58.85" N	77°20'32.78" E	Flat	Open Scrubland	Perur	Perur	0.84/SW	14°21'51.56" N	77°21'0.04"E	Konetinayanipalyam reservoir	2.50N	Narasampalli RF	9.50/NE
T72	14°25'46.45" N	77°22'38.04" E	Flat	Agriculture	Vepakunta	Maddulacheruvu	1.82/E	14°25'44.24" N	77°21'39.64" E	Bhadrapuram forest reservoir	4.72/NW	Narasampalli RF	3.03/E
T75	14°22'44.90" N	77°20'40.33" E	Undulating	Agriculture	Perur	Konetinayanipalem	1.26/NW	14°22'56.94" N	77°21'20.66" E	Konetinayanipalyam reservoir	1.20/N	Narasampalli RF	8.70/NE
T76	14°23'1.10"N	77°20'20.08" E	Flat	Agriculture	Perur	Konetinayanipalem	0.93/E	14°23'12.80" N	77°19'51.58" E	Konetinayanipalyam reservoir	0.74/W	Narasampalli RF	8.46/NE
T77	14°20'59.89" N	77°19'38.85" E	Undulating	Open Scrubland	Chennampalle	Chennampalle	0.93/NE	14°21'16.09" N	77°19'12.81" E	Upper Penneru Reservoir	3.13/SW	Narasampalli RF	11.82/NE
T78	14°19'16.29" N	77°19'6.22"E	Flat	Agriculture	Chennampalle	Ayyampalli	0.57/E	14°19'16.66" N	77°18'47.05" E	Upper Penneru Reservoir	2.68/NW	Narasampalli RF	14.44/NE
T81	14°25'29.78" N	77°22'30.22" E	Flat	Agriculture	Vepakunta	Maddulacheruvu	1.58/E	14°25'29.10" N	77°21'38.22" E	Bhadrapuram forest reservoir	4.91/NW	Narasampalli RF	3.25/E
T82	14°22'52.61" N	77°20'27.40" E	Undulating	Agriculture	Perur	Konetinayanipalem	1.26/E	14°23'13.05" N	77°19'51.07" E	Konetinayanipalyam reservoir	0.89/NW	Narasampalli RF	8.74/NE
T87	14°23'10.32" N	77°20'12.73" E	Flat	Agriculture	Perur	Konetinayanipalem	0.64/E	14°23'12.79" N	77°19'51.53" E	Konetinayanipalyam reservoir	0.70/w	Narasampalli RF	8.56/NE
T92	14°19'15.84" N	77°18'2.34"E	Flat	Agriculture	Ayyampalli	Ayyampalli	1.07/NW	14°19'25.10" N	77°18'32.13" E	Upper Penneru Reservoir	4.52/W	Narasampalli RF	16.51/NE

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T93	14°26'48.24" N	77°22'49.01" E	Flat	Agriculture	Vepakunta	Vepakunta	0.74/NW	14°27'3.79"N	77°23'8.17"E	Bhadrapuram forest reservoir	4.38/SE	Narasampalli RF	2.67/E
T95	14°22'28.48" N	77°20'43.36" E	Undulating	Open Scrubland	Perur	Konetinayanipalem	1.42/NW	14°22'56.94" N	77°21'20.66" E	Konetinayanipalyam reservoir	1.68/N	Narasampalli RF	8.92/NE
T100	14°22'13.61" N	77°20'30.20" E	Flat	Open Scrubland	Perur	Perur	1.12/SW	14°21'51.56" N	77°21'0.04"E	Konetinayanipalyam reservoir	2.07/N	Narasampalli RF	9.45/NE
T101	14°25'37.05" N	77°22'35.23" E	Flat	Agriculture	Vepakunta	Maddulacheruvu	1.63/E	14°25'36.87" N	77°21'39.06" E	Bhadrapuram forest reservoir	4.72/NE	Narasampalli RF	3.17/E
T102	14°22'22.81" N	77°20'28.09" E	Undulating	Agriculture	Perur	Perur	1.36/SW	14°21'51.56" N	77°21'0.04"E	Konetinayanipalyam reservoir	1.79/N	Narasampalli RF	9.43/NE