Perhitungan Noise 48 Jam (Ls,Lm,Lsm)

Tabel 25

NL 1 (Pemukiman Ds.Lainungan)

Hari ke	Tanggal	Parameter	Unit	L 1 06:00-09:00	L 2 09:00-11:00	L 3 14:00-17:00	L 4 17:00-22:00	L 5 22:00-24:00	L 6 24:00-03:00	L 7 03:00-06:00	Ls	Lm	Lsm
Pertama	09/09/2015 s/d 10/09/2015	Noise	dBA	54,6	55,59	55,03	54,16	51,3	47,98	51,08	**54,77**	**50,23**	**54,93**
		Temperature	°C	25,1	32,8	36,3	27,7	24,7	23,8	23,4			
		RH	%	75,5	54,5	38,9	55,2	72,1	77	77,2			
		Pressure	mmHg	750	749	745	749	750	750	750			
		Velocity	m/s	0,0-1,0	0,0-1,1	0,0-1,0	0,0-1,0	0,0-0,5	0,0-1,0	0,0-1,0			
		Weather	-	Sunny	Sunny	Sunny	Sunny	Sunny	Sunny	Sunny			
		Wind direction	-	West	West	West	North	West	West	West			
Kedua	10/09/2015 s/d 11/09/2015	Noise	dBA	54,36	54,27	55,02	50,21	48,04	47,12	49,75	**53,74**	**48,49**	**53,66**
		Temperature	°C	25,3	32,5	36,5	28,4	25,1	24,2	24,1			
		RH	%	75,4	51,6	40,2	50,8	69,8	72,3	80,4			
		Pressure	mmHg	750	750	749	749	750	750	750			
		Velocity	m/s	0,0-1,3	0,0-1,0	0,0-1,2	0,0-1,0	0,0-0,5	0,0-1,0	0,0-1,2			
		Weather	-	Sunny	Sunny	Sunny	Sunny	Sunny	Sunny	Sunny			
		Wind direction	-	West	West	East	West	West	North	West			

Tabel 26

NL 2 (Depan kantor Desa Mattirotasi)

Hari ke	Tanggal	Parameter	Unit	L 1 06:00-09:00	L 2 09:00-11:00	L 3 14:00-17:00	L 4 17:00-22:00	L 5 22:00-24:00	L 6 24:00-03:00	L 7 03:00-06:00	Ls	Lm	Lsm
Pertama	09/09/2015 s/d 10/09/2015	Noise	dBA	55,26	57,71	57,67	53,32	50,71	49,64	48,62	**56,26**	**49,60**	**55,78**
		Temperature	°C	32,1	33,2	33,4	28,7	25,1	25,8	25,2			
		RH	%	43,3	43,1	42,4	61,1	68,3	69,2	70,3			
		Pressure	mmHg	752	752	752	753	754	754	754			
		Velocity	m/s	0,0-5,0	0,0-5,1	0,0-3,4	0,0-1,5	0,0-3,2	0,0-2,8	0,0-2,5			
		Weather	-	Sunny	Sunny	Sunny	Sunny	Sunny	Sunny	Sunny			
		Wind direction	-	West	West	North	South	West	East	North			
Kedua	10/09/2015 s/d 11/09/2015	Noise	dBA	55,3	55,34	55,92	52,91	50,08	48,49	50,35	**54,97**	**49,67**	**54,87**
		Temperature	°C	32,5	32,4	33,8	29,4	25,4	25,8	25,3			
		RH	%	44,2	44,5	43,6	63,4	65,1	70,2	71,3			
		Pressure	mmHg	753	753	752	753	753	753	754			
		Velocity	m/s	0,0-4,2	0,0-4,,5	0,0-2,0	0,0-1,3	0,02,5	0,0-2,0	0,0-2,5			
		Weather	-	Sunny	Sunny	Sunny	Sunny	Sunny	Sunny	Sunny			
		Wind direction	-	West	West	South	West	West	North	West			

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Tabel 27

NL 3 (Pemukiman Desa Pabaresseng)

Hari ke	Tanggal	Parameter	Unit	L 1	L 2	L 3	L 4	L 5	L 6	L 7	Ls	Lm	Lsm
				06:00-09:00	09:00-11:00	14:00-17:00	17:00-22:00	22:00-24:00	24:00-03:00	03:00-06:00			
Pertama	11/09/2015 s/d 12/09/2015	Noise	dBA	51,72	53,7	52,18	49,16	46,78	46,07	47,31	51,61	46,75	51,66
		Temperature	°C	24,9	29,8	31,6	25,7	25,3	24,5	24,2			
		RH	%	72,5	55,6	43,6	60,9	65,3	69,5	78,3			
		Pressure	mmHg	753	752	749	752	752	753	753			
		Velocity	m/s	0,0-1,5	0,0-1,9	0,0-2,1	0,0-0,5	0,0-2,1	0,0-1,9	0,0-1,5			
		Weather	-	Sunny	Sunny	Sunny	Sunny	Sunny	Sunny	Sunny			
		Wind direction	-	West	North	North	West	West	West	North			
Kedua	12/09/2015 s/d 13/09/2015	Noise	dBA	52,89	53,58	53,4	50,83	46,99	46,36	46,69	52,67	46,65	52,35
		Temperature	°C	25,2	31,2	32,5	26,4	25,4	24,2	24,1			
		RH	%	70,8	54,6	44,8	60,5	67,4	70,4	80,2			
		Pressure	mmHg	754	753	753	754	754	753	753			
		Velocity	m/s	0,0-1,5	0,0-2,0	0,0-2,5	0,0-1,5	0,0-1,8	0,0-1,0	0,0-1,3			
		Weather	-	Sunny	Sunny	Sunny	Sunny	Sunny	Sunny	Sunny			
		Wind direction	-	East	West	West	West	West	West	North			

Tabel 28

NL 4 (Bukit MT 1)

Hari ke	Tanggal	Parameter	Unit	L 1	L 2	L 3	L 4	L 5	L 6	L 7	Ls	Lm	Lsm
				06:00-09:00	09:00-11:00	14:00-17:00	17:00-22:00	22:00-24:00	24:00-03:00	03:00-06:00			
Pertama	11/09/2015 s/d 12/09/2015	Noise	dBA	53,89	54,42	55,77	54,44	53,68	52,94	51,65	54,90	52,72	56,05
		Temperature	°C	23,8	32,5	29,7	24,5	24,2	23,6	22,4			
		RH	%	70,9	62,2	68,2	69,1	70,1	74,3	82,1			
		Pressure	mmHg	743	744	755	748	744	745	746			
		Velocity	m/s	0,0-4,3	0,0-4,3	0,0-4,1	0,0-3,0	0,0-2,5	0,0-4,5	0,0-4,3			
		Weather	-	Sunny	Sunny	Sunny	Sunny	Sunny	Sunny	Sunny			
		Wind direction	-	West	West	West	West	West	West	West			
Kedua	12/09/2015 s/d 13/09/2015	Noise	dBA	53,76	54,03	54,79	53,69	52,97	52,06	51,9	54,19	52,25	55,46
		Temperature	°C	24,2	32,7	29,5	25,7	24,5	23,6	23,4			
		RH	%	73,2	65,4	69,3	73,4	77,4	79,3	83,2			
		Pressure	mmHg	743	743	744	744	743	744	744			
		Velocity	m/s	0,0-5,3	0,0-5,0	0,0-5,1	0,0-4,5	0,0-3,5	0,0-4,8	0,0-5,2			
		Weather	-	Sunny	Sunny	Sunny	Sunny	Sunny	Sunny	Sunny			
		Wind direction	-	West	West	West	West	West	West	West			

Appendix D

Environmental and Social Baseline Study

- Dry Season
- Wet Season

Sidrap Wind Farm Environmental Consultancy

30 November 2015

Environmental and Social Baseline Study

Dry Season Field Survey and Sampling Campaign

D R A F T

Environmental and Social Baseline Study

Dry Season

Prepared for

PT. UPC Sidrap Bayu Energi

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30 November 2015

JKTD14001 Sidrap Wind Farm AMDAL

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Quality Information

Document Environmental and Social Baseline Study

Ref JKTD14001 Sidrap Wind Farm AMDAL

Date 30 November 2015

Prepared by Agus Dwi Wahyono

Reviewed by Andrew Sembel

Revision History

Revision	Revision Date	Details	Authorised	
			Name/Position	Signature
00	17 Feb 2014	Draft for submission	Andrew Sembel Manager	Andrew

D R A F T

Table of Contents

D R A F T

DRAFT

List of Tables

DRAFT

List of Figures

Appendix

Appendix A Sampling Locations Maps

Appendix B Photographs of Sampling Activities

Appendix C Laboratory Result

1.0 INTRODUCTION

1.1 Study Background

PT UPC Sidrap Bayu Energi (UPC) appointed PT AECOM Indonesia (AECOM) to undertake a baseline study program and assist UPC on Environmental and Social Impact Assessment (ESIA) preparation for the 30 x 2.5 MW Wind Turbines Sidrap Wind Farm Project (hereby referred to as the Project), located in Sidenreng Rappang (Sidrap) Regency, South Sulawesi Province.

The objective of AECOM's work is to provide a comprehensive ESIA that will meet international standards, including IFC Environmental, Health and Safety (EHS) Guidelines for Wind Energy.

1.2 Study Objective

The key objective of this study and this report is to provide baseline data that would meet the requirements of IFC guidelines for the purposes of preparing the ESIA (IFC, 2012).

1.3 Sampling Period

The bulk of the field survey and sampling for this study was undertaken from 8 to 16 September 2015 and particularly for dustfall has monitored for a month (9 September to 8 October 2015), which represented a dry season appraisal. Bat survey and sampling was undertaken from 25 September to 2 October 2015. Further studies on (flora, fauna and bird) were undertaken from 14 to 20 October 2015. Laboratory results were received on 16 November 2015.

2.0 SCOPE OF STUDY

This scope of study was based on the proposal and contract signed in June 2015. Details of the scope of study are discussed below.

2.1 Geographical Study

The study area is located in Mattirotasi Village, Lainungan Village, Lawawoi Village and Uluale Village, Watang Pulu Sub District, Sidrap Regency, South Sulawesi Province (Figure 2-1).

2.2 Sub Studies

This study covers the environmental and social components which could be affected by the Project. The following areas were studied:

- Land Use and Planning;
- Climate;
- Surface Hydrology and Hydraulics;
- Groundwater;
- Air Quality;
- Noise;
- Terrestrial Biota;
- Freshwater Aquatic Biota;
- Traffic and Transport; and
- Culture Heritage and Indigenous People.

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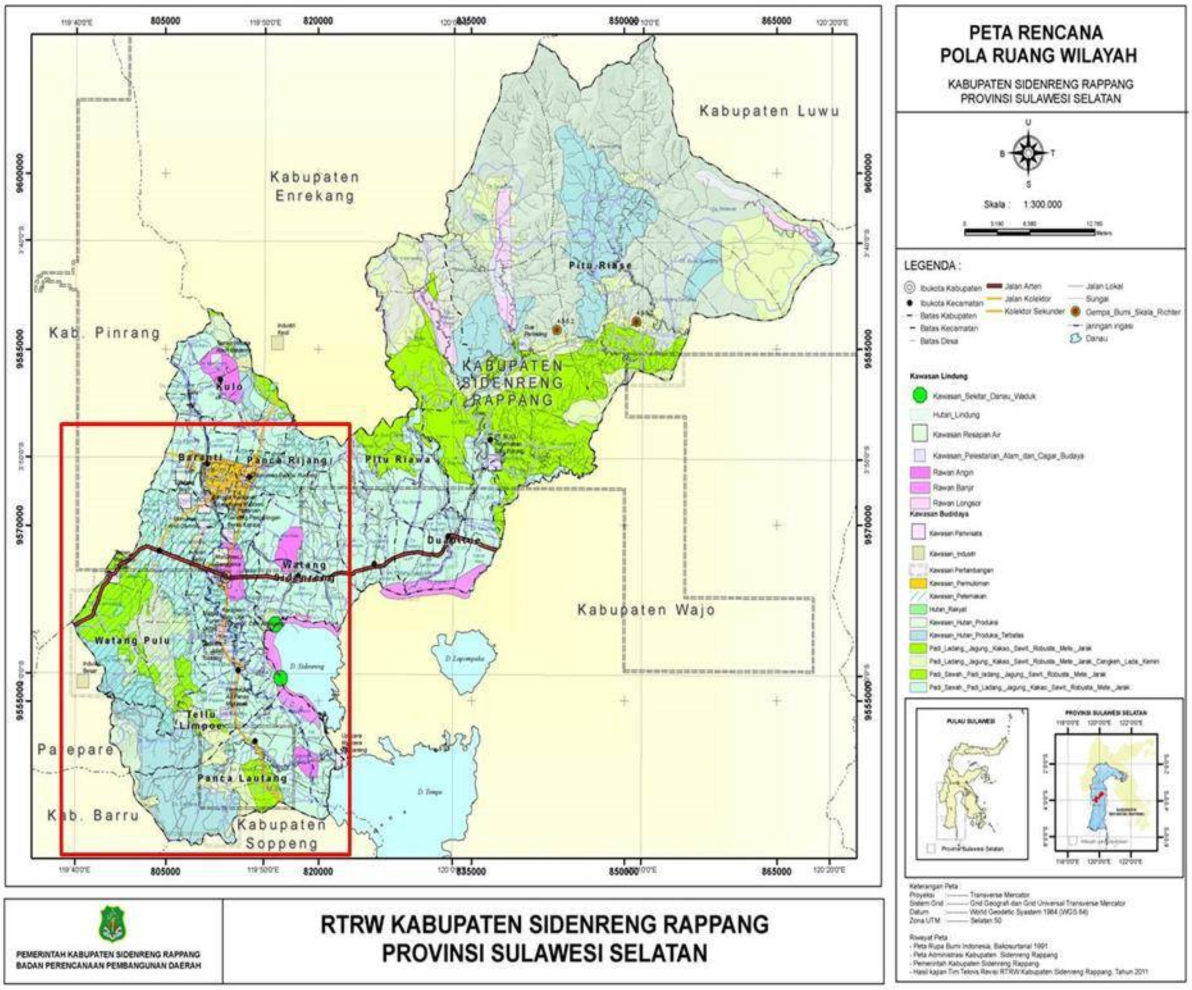

Figure 2-1 Map of Study Area

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3.0 METHODOLOGY

3.1 Land Use and Planning

Both the Analisis Mengenai Dampak Lingkungan (AMDAL) and ESIA require a detailed and accurate map of the current land use in the study area. A full ground truthing of the study area was undertaken to provide a land use map and a photographic database. A handheld GPS and a digital camera were used during the ground truthing.

Results obtained from ground truthing were photo and GPS tracked, which were then synced to get geotagged photos. The geotagged photos are used to identify the type of land use.

Planning regulations refer to the local regulations for Sidrap, which include Sidenreng Rappang Regulation No. 5 of 2012 concerning Spatial Plan Sidenreng Rappang period year 2012 to 2032.

3.2 Climate

Climate data was collected from rainfall station Pabbaresseng, Mattirotasi Village. The rainfall data was recorded from 1999 to 2013. Air temperature and relative humidity were collected from the Meteorology Station Class I Panakukkang Maros, South Sulawesi, recorded from 2008 to 2012.

3.3 Surface Hydrology and Hydraulics

3.3.1 River Characteristic

The AECOM field team conducted ground truthing to examine the characteristics of rivers within the project area. There are five ephemeral and periodic streams/rivers within the study area, two of which were identified as potentially impacted water bodies. These were traced from downstream to the upstream area where water samples were taken. A handheld GPS and digital camera were used during ground truthing to identify all sampling points for future reference.

3.3.2 Surface Water Quality

The surface water quality sampling targeted the relevant parameters currently listed in the Indonesian government guidelines for water quality (Government Regulation No. 82/2001). The surface water samples were collected using a small bucket. Field measurements of temperature, dissolved oxygen (DO), and pH were obtained from the surface water samples using a HI 9145 DO meter and HI 98130 pH/EC/TDS meter, respectively. The remaining surface water was drained into the appropriate sub-sample bottles containing predetermined quantities of preservatives. The sub-samples were kept at 4°C during transport to the laboratory for subsequent physical and chemical analyses.

Following the field collection, the samples were sent to an accredited laboratory (by KAN – *Komite Akreditasi Nasional* or Indonesian National Accreditation Committee), *Balai Besar Industri Hasil Perkebunan (BBIHP)* in Makassar.

3.4 Groundwater

During the survey, the AECOM field team did not find groundwater wells. The samples were instead taken from two water storage tanks (same locations as from previous survey during wet season). Two additional samples were collected from two natural springs. The sampling map provided in Appendix A.

3.5 Air Quality

Site specific baseline data on air quality was collected for assessment of potential impacts on nearby communities and for project site during the operation and eventual decommissioning of the Project.

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Data is required for comparison with government regulations and decrees with respect to human settlements and occupational health standards.

Air quality samples were collected during discrete sampling periods, the frequency of which coincided with regulatory requirements of the Government Regulation Number 41 year 1999 Concerning Air Pollution Control. Air quality measurements were taken continuously for 24-hours.

3.6 Noise

Noise is a potential impact resulting from project implementation from Wind Turbine Generators (WTGs). Thus, the noise baseline levels should be determined in all of the potentially affected communities. International Finance Corporation (IFC) requirements for noise differ from Indonesian standards.

Baseline data on ambient noise levels are required to quantify potential effects on nearby inhabitants and settlements. Ambient noise levels were measured at the same sites as air quality monitoring locations. Noise data was compared to noise standards of the State Minister of Environment Decree No.48/1996 and IFC ESHIA EHS Guidelines which in turn can be used to assess the future impacts on nearby habitations/settlements. Noise measurements were taken for continuously within a 48-hour period.

3.7 Terrestrial Biota

3.7.1 Flora

A qualitative survey was undertaken by walking the area and documenting the dominant flora using a handheld GPS and digital camera.

3.7.2 Fauna

The key objective of the terrestrial fauna field survey is to provide sufficient information to allow assessment of potential impacts arising from habitat loss, displacement of wildlife, collision risk, and cumulative impacts of the proposed wind farm development. Information was gathered through walking field observations and interviews with the local residents regarding the avian, mammal, reptile, and amphibian populations in the area.

Quantitative data is required to study the bird and bat populations since wind energy developments have the potential to cause harm through direct habitat loss or damage, disturbance and displacement of species from feeding, nesting and migration and direct collision with turbines.

Bird and bat observations and results will be assessed in relation to a number of factors, including:

- Perceived vulnerability to wind farm development;
- Numbers of birds;
- Distance from site; and
- Protected status.

3.7.2.1 Birds

Birds are identified to be the most impacted fauna due to project activity. Quantitative data is required to study the bird populations since wind energy developments have the potential to cause harm through direct habitat loss or damage, disturbance and displacement of species from feeding, nesting and migration and direct collision with turbines

This is the second birds survey where the initial survey was undertaken during the wet season. Features of interest with regard to conservation of ecological values were noted and general habitat type was mapped. An appraisal of the suitability of the habitat for target bird species and species known within the area was carried out. The survey also aimed to identify any further suitable locations for Vantage Point (VP) surveys as detailed below and the extent of the survey area for walkover Common Bird Census (CBC) work.

The survey area included land within the proposed site (which included the turbine location, access roads, and other associated installations), and up to 500 meters radius – where safe access can be obtained. Vantage points were chosen so that data collected also covered potential alternative locations for turbines.

Vantage Point Surveys

In order to identify flights at potential collision-risk height (i.e. not at ground level), VP surveys were conducted to observe the flight patterns and behavior of target species within the survey envelope. The list of target species was compiled for protected species or those of conservation concern and those likely to be subjected to impact from a wind turbine development. Target species were chosen carefully, as too many target species may dilute the survey effort to concentrate on the species most at risk. Each VP survey lasted no longer than 2 hours. The number of VP locations needed to cover the site adequately was established during the initial scoping survey and was based on the topography of the land, the presence of obstructions to views into and around the site, and the visual envelope from the selected VP locations.

During the surveys, details of all target species seen or heard were recorded. Information recorded included: species, sex (if possible), number, flight direction, location, and flight zone (nominally assigned as ‘below’, ‘within’ and ‘above’ the turbine height). If no target species were present within the VP, information on secondary species was collected, and summarized in ten-minute intervals. Secondary species are those not included on the target species list, but still thought to be at risk from a wind turbine development. Observation of target species takes priority over secondary species. As well as the internationally important assemblage of migratory and over wintering water birds, the estuary situated at the south of the proposed WTGs was surveyed to recognize the important bird area (IBA) for other assemblages of other birds at specific times of year. Ideally, VP surveys were specifically scheduled when the weather is favorable to record the movements of these specific groups of birds.

Nocturnal Surveys

The site and the surrounding area is used by a range of birds during hours of darkness. Survey techniques include:

- The use of mist nets to capture birds foraging at night;
- The use of high powered lights to observe birds; and
- Listening for migrants flyingover the site and nearby foraging/roosting water birds.

Location

Dry season surveys were conducted at 5 locations, VP1, VP2, VP 4, VP6 and VP7. The study area includes the area within 500 meters of the proposed turbine locations, and all aquatic habitats adjacent to the site if not already within the 500 meter zone. Given the study area is less likely to be part of migration route; therefore the survey envelope was not to be extended.

Equipment

The following equipment was used at all locations:

- Handheld GPS
- High power lights
- Binoculars
- 50 m measuring tape
- Digital camera

3.7.2.2 Bats

Sampling Location

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On the dry season the sampling were conducted at 3 locations, VP2, VP3 and VP8. VP2, VP3 and VP8 are located at Dusun Kampung Baru (Mattirotasi Village), Dusun Kulua I (Lainungan Village), and Dusun Pabberessang (Mattirotasi Village), respectively. Based on the construction plan, bat survey on dry season period was focused on these two locations, as these locations will directly be affected by the wind farm construction.

Different from the site VP3, the position of the mist nets at the site VP2 is slightly out from the proposed turbine area. This is because in most areas of the proposed turbine specifically in turbine 1 to 2, the vantage points do not have big trees or flowering and fruiting trees. Technically it was difficult to set up a mist net in an open area without trees, and in terms of scientific probability of bat trapped in the area without flowering and fruiting trees was little. The site VP2 was choosen as area to set up mist net because it has similar habitat with area of turbine 1 to 3 and 12 to 15 where the area was dominated by cashew nut trees and also because of access wise.

The third location of bat survey this dry season period was Pabberessang, a sub-village at Southern part of VP2 and VP3. This sub-village is relatively far away from locations of Wind Farm construction that it will not directly be influenced by the project and is considered to be as control location.

Method

Bats were captured by mist net at three main sites. At each site five mist nets were set over two nights at appropriate locations considered as flying paths for bats or at the areas where the bats were concentrated, such as: track-hacker, creeks, and the vicinity of flowering and/or fruiting trees. The nets used were one of 18m x 1.7m, three of 12m x 1.7m and two 9m x 1.7 m dimensions. All nets have a 31 mm mesh size. The nets were set in late afternoon, and cheeked at 11 PM and 06.00 AM. Trapped bats were removed from the net and then identified individually. Observation was focused on species, age, sex, length of forearm, body weight, and reproductive condition. In addition, location, date, time, number and size (length and width) of nets were all recorded. Once identified, all captured bats were released near the points of capture.

Estimation of bat density was determined by the number of bats caught per square meter of mist net set per night. The calculation was done by dividing the numbers of bats caught during the night(s) of survey with total net panel coverage during the night(s) of survey, or according to the following formula;

$$\mathrm{d} = \frac{\mathrm{tB}}{\mathrm{tN}}$$

$\mathrm{d} = \text{bat density},$

$\mathrm{tB} = \text{the number of bats caught during the survey},$

$\text{and } \mathrm{tN} = \text{total net panel coverage during the survey}$

3.8 Freshwater Aquatic Biota

This survey was undertaken at flowing rivers, especially any nearby rivers that are likely to receive run-off from project activities. Samples of plankton and macro benthos were taken during surveys. Information regarding other aquatic biota including fish was obtained through interviews and incidental observation.

3.9 Traffic and Transport

Transporting the main components of the WTGs (towers, turbines, rotors/blades) to site during construction will be one of the more significant activities of the project. In the dry season survey the AECOM team only conducted visual observation for transportation route during mobilisation from Pare-pare Port to project area. All relevant field findings were documented using a handheld GPS and digital camera.

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3.10 Cultural Heritage

The cultural heritage assessment will consider impacts to both tangible and intangible cultural heritage within the Study Area. Tangible cultural heritage incorporates physical resources such as grave sites, mosques or historical memorials, whereas intangible cultural heritage considers issues such as traditional practices or rituals. Note that no culturally-significant sites have been identified within the proposed construction envelope, and so the assessment focused on secondary impacts to surrounding sites.

3.11 Indigenous People

IFC guidelines require proponents to determine the presence or absence of Indigenous Peoples (IPs) in the study area, and to assess potential adverse impacts on identified groups. This assessment also consider potential impacts to IPs who although not physically residing within the study area, but have a longstanding historic / traditional association with the area, and who may utilise natural resources located therein for subsistence, livelihood or cultural purposes were also considered.

While there is no universally-accepted definition for IPs, under Performance Standard 7 (PS 7), they are characterised as a distinct social and cultural group possessing the following characteristics in varying degrees:

- Self-identification as members of a distinct indigenous cultural group and recognition of this identity by others;
- Collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories;
- Customary cultural, economic, social, or political institutions that are separate from those of the mainstream society or culture; or
- A distinct language or dialect, often different from the official language or languages of the country or region in which they reside (IFC, 2012a).

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4.0 STUDY RESULTS

4.1 Land Use and Planning

The location boundary based on Principle Permit of Working Area for Wind Farm Development on Sidrap Regency is distributed in three districts, covers eight villages with a total area of approximately 233 km^2.

The location was divided into six land coverage classifications which are largely dominated by moor and forest. Land coverage classification include forest (23.17%), farm/plantation (1.56%), residential (1.18%), irrigated fields (9.62%), shrub / alang (16.42%) and moor (48.05%).

Based on EIA study boundaries, the wind farm Sidrap Stage 1 is located in the Watang Pulu District, which covers five villages with a total area about 85 km^2. Land coverage in the study areas is dominated by moor Table 4-1 below shows the percentage of land use classification on EIA boundary.

Table 4-1 Percentage of Land Coverage Classification

No	Land Coverage Classification	Deployment Area (%)	Scope of Village
1	Forest	2.37	Mattirotasi
2	Dwelling	1.72	Arawa, Lainungan, Lawawoi, Mattirotasi, Uluale
3	Agriculture	18.34	Arawa, Lainungan, Lawawoi, Mattirotasi, Uluale
4	Shrubs	14.60	Lainungan, Lawawoi, Mattirotasi, Uluale
5	Moor	62.98	Lainungan, Lawawoi, Mattirotasi, Uluale

Source: BAKOSURTANAL year 1991 dan BAPPEDA Government Sidrap Regency year 2011

According to Local Regulation Sidrap Regency No. 5/2012 about Spatial Plans in the Regency (Figure 4-1), all project boundaries are within a cultivated area. Cultivated area is divided into various sub areas. Project area consists of two sub areas, including agriculture and forest. Spatial pattern which dominate project boundary is agriculture area which covers 69.14% of project total area. Agriculture area consists of paddy field, maize, cacao, palm oil, coffee, cashew, castor oil, pepper, and nutmeg. Table 4-2 shows land use in project area. Land use map is shown in Figure 4-2. It is noted that there is no WTG or substation in paddy field area, (only transmission line is/will be present).

Table 4-2 Land Use in Project Area

No	Land Use Pattern	Land Use Classification	ID_WTG
1	Agriculture	Cultivated Land	4, 5, 6, 7, 8, 9, 10, 11, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30
2	Limited Production Forest	Cultivated Land	1, 2, 3, 12, 13, 14, 15, 16

Source: Land Use Map Interpretation in accordance with Local Regulation Sidrap Regulation No. 5/2012

Based on ground truthing result, the majority of land use in project area is non-cultivated consisting of pasture and woods as land boundary markers. Coverage area of non-cultivated land reach 66.59% of total project area, the rest are corn, teak, cashew, and paddy field.

In proposed WTG location, it is found that some locations (17 of 28) are in cultivated land. Cultivation lands usually fall on the ridge, and main locations of WTG are proposed along the ridge lines. Land coverage classification in study area is shown on Figure 4-2.

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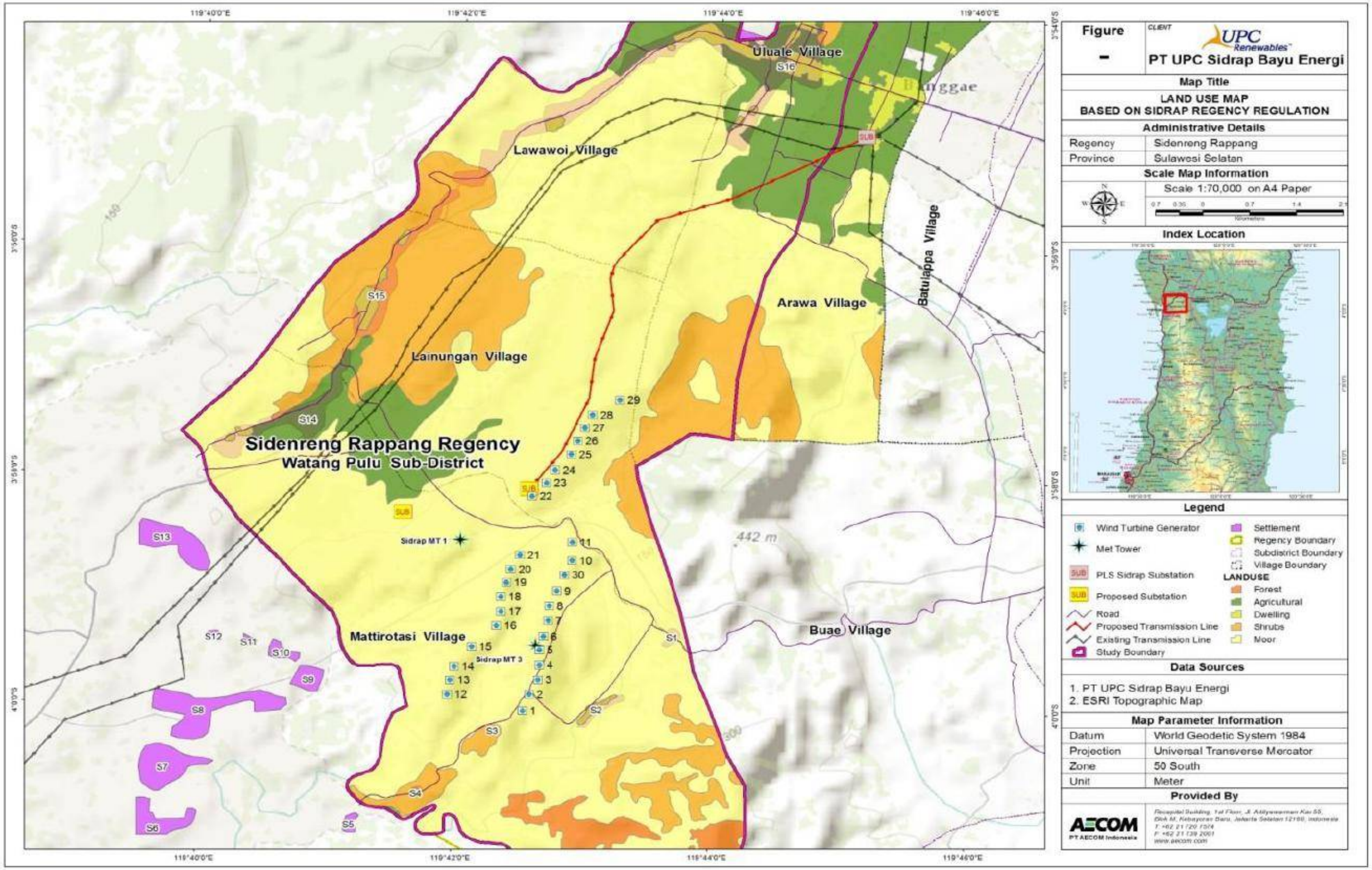

Figure 4-1 Land Use Map Based on Sidrap Regency Regulation

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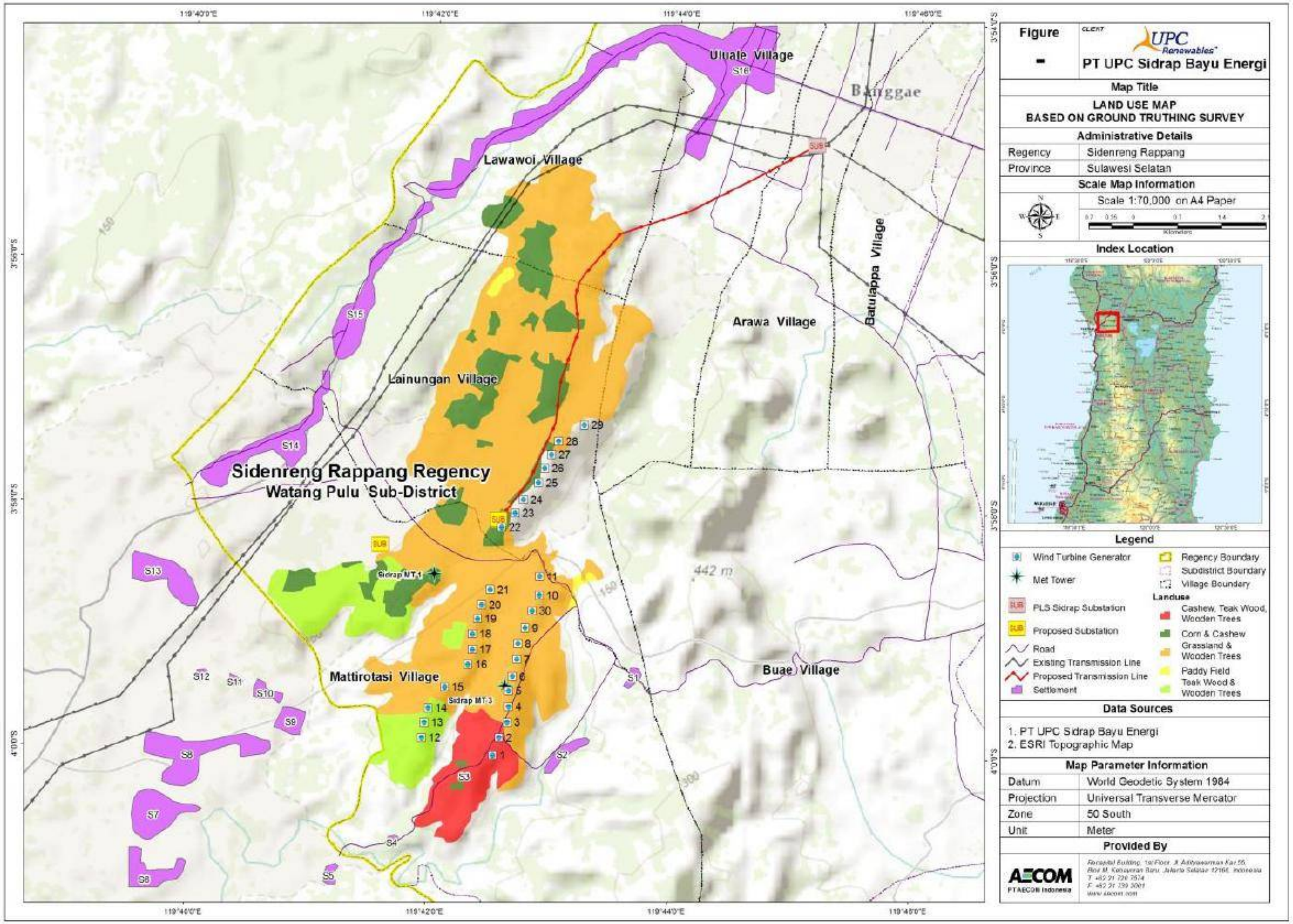

Figure 4-2 Land Use Map Based on Ground Truthing Survey

D R A F T

4.2 Climate

The climate of the study area is affected by the local geography, such as the altitude of the study area, land cover, soil surface and soil condition. The microclimate helps to describe the climatic condition of a particular study area. In the study area, there are a variety of land uses that may affect the climate. The data collected relating to climate for the area include monthly rainfall, air temperature and relative humidity.

4.2.1 Rainfall

Rainfall data from 1999 to 2013 was collected from the rainfall station at Pabberessang, Mattirotasi Village (Figure 4-3). Generally, the rainfall is higher at the beginning and end of the year, corresponding with the rainy season Figure 4-3.

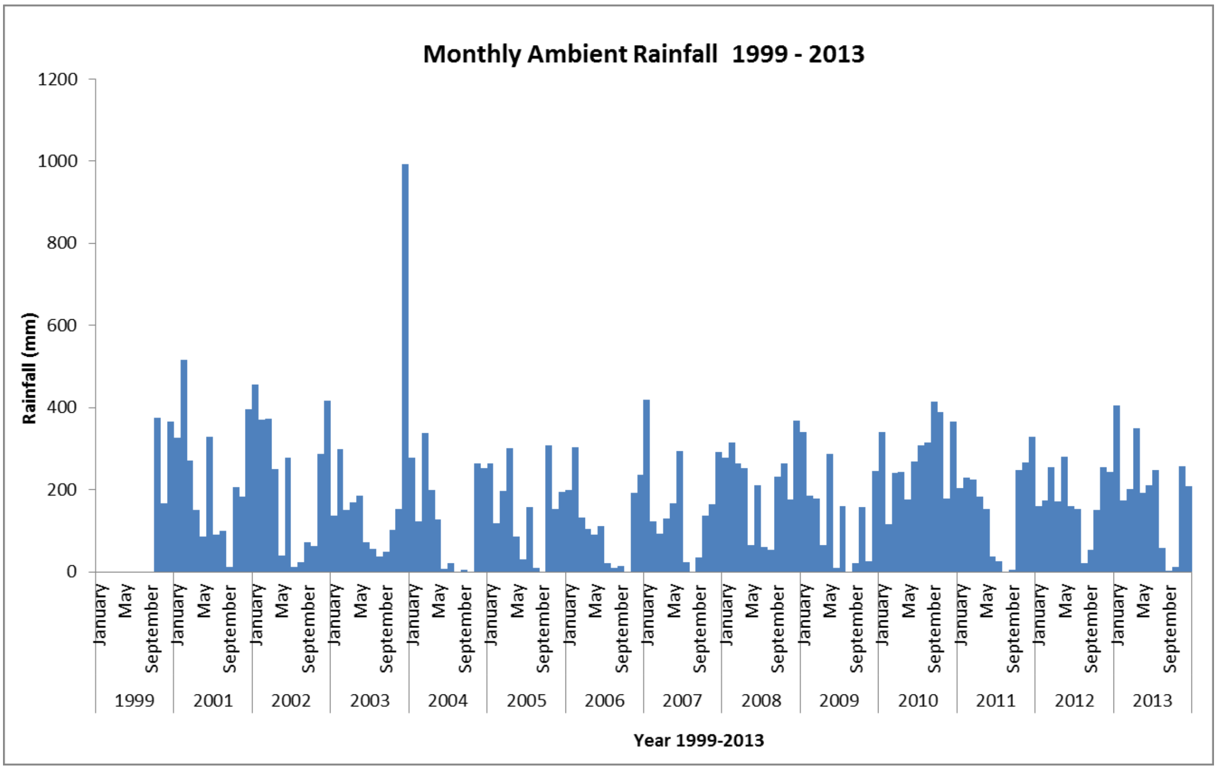

Figure 4-3 Monthly Rainfall Data (1999 – 2013)

4.2.2 Air Temperature

Secondary temperature data collected from the meteorological station BMKG Class II Panakukkang Maros, South Sulawesi shows that the monthly averages of air temperature for period of 2008 to 2012 in the study area was 26.93 ºC. (Table 4-3 and Figure 4-4)

Table 4-3 Average Air Temperature (2008-2012)

Month	2008	2009	2010	2011	2012
January	26.28	25.79	26.14	26.02	26.35
February	25.91	25.98	26.97	26.28	26.33
March	26.34	26.78	27.46	26.04	26.34
April	26.94	27.2	27.89	26.64	27.39
May	27.17	27.34	27.62	27.53	27.13
June	26.6	26.87	27.25	26.65	26.66

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Month	2008	2009	2010	2011	2012
July	26.21	26.15	27	26.07	26.22
August	27.07	27.15	27.2	27.08	26.72
September	27.43	27.62	27.05	27.79	27.33
October	28.09	28.2	27.47	27.8	28.16
November	26.87	28.3	27.06	27.29	27.59
December	26.26	27.08	26.22	26.4	27.09

Source: Meteorology Station Class I Panakukkang Maros. South Sulawesi

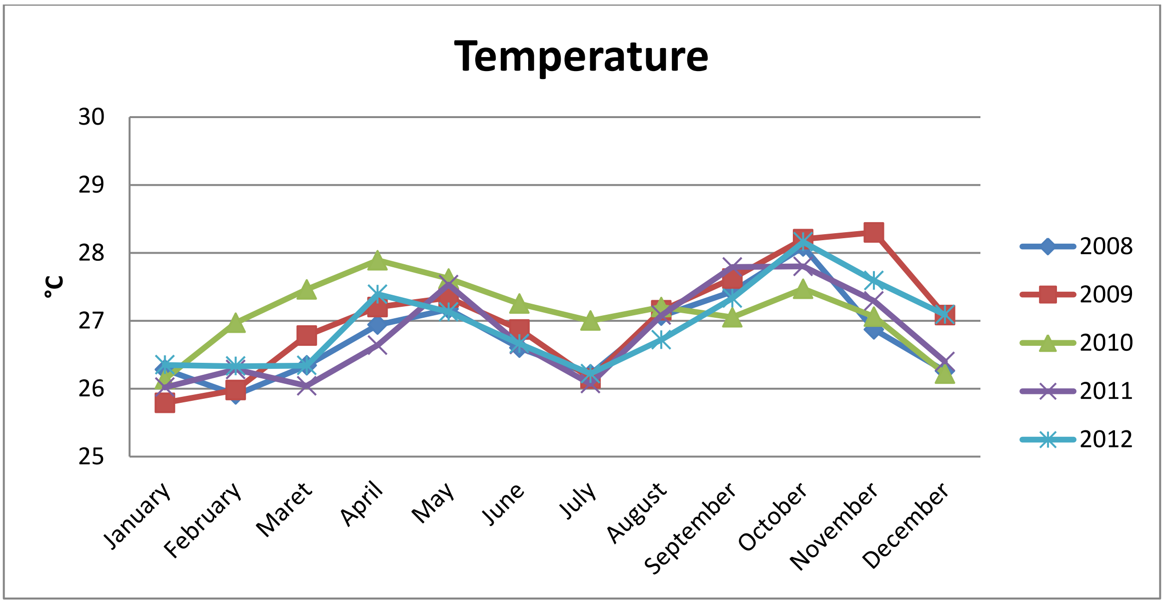

Figure 4-4 Monthly Temperature (2008-2012)

5.1.1.1. Relative Humidity

Based on the secondary data collected from Panakukkang Maros, South Sulawesi. 2008-2012. humidity in the project area is high throughout the year with an average of approximately 81.5 % (Table 4-4 and Figure 4-5)

Table 4-4 Average Relative Humidity (2008-2012)

Month	2008	2009	2010	2011	2012
January	87.29	90.6	90.32	86.13	86.13
February	88.52	88.83	88.16	84.75	86.76
March	85.74	83.57	85	87.39	87.32
April	82.434	83.52	83.97	86.90	82.77
May	79.19	83.42	86.74	80.74	82.35
June	81.17	79.65	84.37	79.45	81.27
July	76.16	79.26	83.68	78.06	79.55
August	69.61	71.03	80.74	66.42	70.43
September	71.23	70.7	83.77	66.53	67.83
October	76.67	71.42	82.65	78.45	74.03

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Month	2008	2009	2010	2011	2012
November	86.23	77.43	84.30	84.30	81.97
December	87.8	85.9	86.55	88.48	84.94

Source: Meteorology Station Class I Panakukkang Maros. South Sulawesi

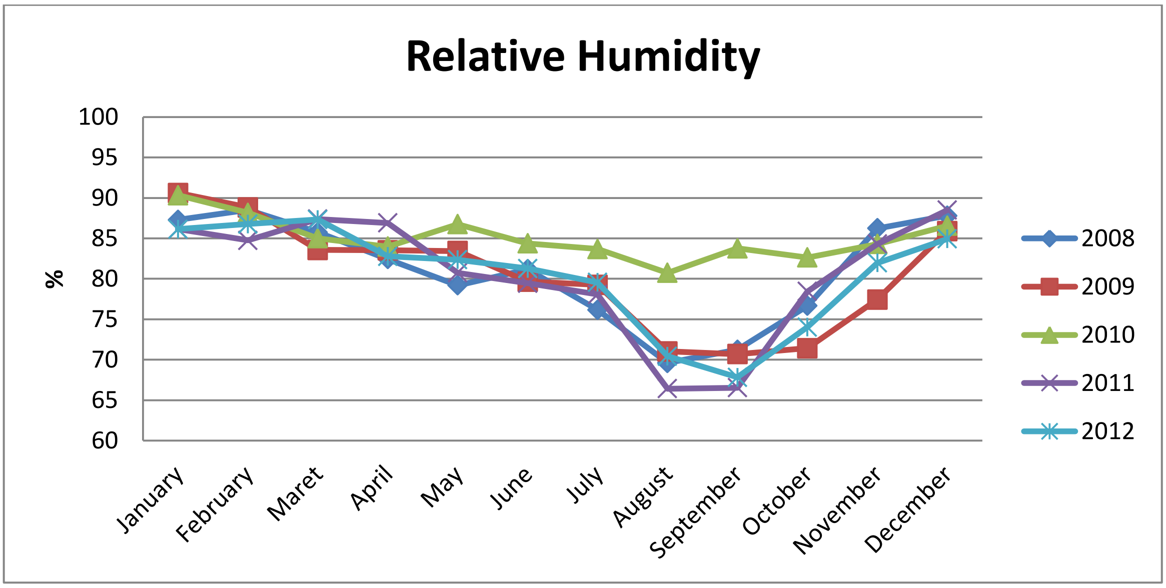

Figure 4-5 Average Relative Humidity (2008-2012)

4.3 Surface Water Quality

4.3.1 Surface Water Resource

Surface water quality sampling during wet season was undertaken in December 2013 and dry season on September 2015. Several streams where the surface water samples taken during wet season, were dry and there is not sufficient water to be sampled (SWQ 1, SWQ 3, SWQ 4, SWQ 5 and SWQ 9). Two samples are taken at two additional sampling points namely SWQ 10 and SWQ 11. SWQ 10 is located downstream of String 3 and reportedly never dry during the year. SWQ 11 is a stream which is proposed for water supply during WTG construction and future operation.

The sampling locations are summarized in Table 4-5 and shown in Appendix A.

Table 4-5 Surface Water Quality Sampling Locations during Dry Seasons

Sample ID	Remarks	Existing Function
SWQ 2	Pabberessang River -Downstream	Drinking water source for cattle
SWQ 6	Datae River	Clean water source for Lawawoi Villagers
SWQ 8	Lawawoi village (Upstream of Datae River)	Clean water source for Lawawoi Villagers
SWQ 10	Additional point - Downstream String-3	Drinking water source for cattle
SWQ 11	Additional point - Proposed water source for construction and future operation	Clean water source for Pabberessang Villagers

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4.3.2 Surface Water Quality

The standard used for surface water quality is based on Government Regulation No. 82 year 2001 and Local Regulation No. 69 year 2010. Some of the parameters at the sampling points which exceeded the standards are BOD, COD, DO, Phospate, Cu, Fe, Mn, NH_3 and oil and grease. The results are shown Table 4-6

BOD and COD results at all sampling points exceed the standard. BOD defines the amount of oxygen required by microorganism to break down the organic matter in the water body, and provide a good indication of level of organic pollution. Water with high BOD levels will typically have low oxygen levels as microorganisms use up available oxygen to breakdown the organic matter, leaving no oxygen for other organisms. COD is a measurement of oxygen demand for chemical oxidation. Similar with BOD, high COD give negative impact to the environment as the oxygen for living organisms is consumed for chemical oxidation.

Nutrients such as nitrites and phosphorus exist naturally in most surface water. High nutrient amount conditions in water body i.e. eutrophication, can cause anoxic conditions, causing death of aquatic fauna. From the result, all sampling points showed that these nutrients exceeded the standard.

Some metals, such as manganese, iron and copper are essential micronutrients but toxic in excess. Metals are introduced in aquatic systems as a result of the weathering of soils and rocks, from volcanic eruptions and from a variety of human activities. On SWQ 2 particularly the most sampling point which is exceeded these standards.

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Table 4-6 Analytical Results of Surface Water Quality

Parameter	Unit	Regulation		Results				
		PP 82/2001	Local Regulation No 69/2010	SWQ 2	SWQ 6	SWQ 8A	SWQ 10	SWQ 11
Physic								
Temperature	°C	±3	±3	30.5	30	28.9	29.6	30.6
TDS	mg/L	1000	1000	355	212	200	262	228
TSS	mg/L	50	50	59	17	30	26	23
Organic Chemical								
pH		6 – 9	6 – 8.5	7.2	7.2	7.5	7.9	6.4
BOD	mg/L	2	3	4.7468	14.7755	19.3831	3.4024	4.4831
COD	mg/L	10	25	31.6190	71.4316	95.5264	16.5334	21.4331
DO	mg/L	6	4	7.3	6.9	6.6	7.2	2.8
Phosphate Total as P	mg/L	0.2	0.2	0.2988	0.2458	0.7070	1.1708	0.3117
NO3 as N	mg/L	10	10	0.4838	1.2146	0.2546	0.2188	0.1080
NH3 -N	mg/L	0.5	-	<0.01	<0.01	<0.01	<0.01	<0.01
Arsenic (As)	mg/L	0.05	1	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Cobalt (Co)	mg/L	0.2	0.2	<0.054	<0.054	<0.054	<0.054	<0.054
Barium (Ba)	mg/L	1	-	<0.5	<0.5	<0.5	<0.5	<0.5
Boron (B)	mg/L	1	1	<0.031	<0.031	<0.031	<0.031	<0.031
Selenium (Se)	mg/L	0.01	0.05	<0.005	<0.005	<0.005	<0.005	<0.005
Cadmium (Cd)	mg/L	0.01	0.01	<0.003	<0.003	<0.003	<0.003	<0.003
Chromium Hexavalen (Cr6+)	mg/L	0.05	0.05	0.0125	0.0064	0.0106	0.0104	0.0034
Copper (Cu)	mg/L	0.02	0.02	0.2668	0.0390	<0.010	<0.010	0.0406
Iron (Fe)	mg/L	0.3	-	0.3734	0.1370	0.0666	0.0624	0.1555
Lead (Pb)	mg/L	0.03	0.03	<0.002	<0.002	<0.002	<0.002	<0.002
Mangannese (Mn)	mg/L	0.1	-	1.2070	0.0592	0.0730	0.0542	0.0532

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Parameter	Unit	Regulation		Results				
		PP 82/2001	Local Regulation No 69/2010	SWQ 2	SWQ 6	SWQ 8A	SWQ 10	SWQ 11
Mercury (Hg)	mg/L	0.001	0.002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Zinc (Zn)	mg/L	0.05	0.05	<0.022	<0.022	<0.022	<0.022	<0.022
Chlorida (Cl)	mg/L	600	-	19.6932	2.8133	1.4066	0.3517	2.8133
Fluoride (F)	mg/L	0.5	1.5	<0.02	<0.02	<0.02	<0.02	<0.02
Nitrite as N	mg/L	0.06	0.06	0.1574	0.2906	0.245	0.2892	0.3100
Sulphate	mg/L	400	-	<50	<50	<50	<50	<50
Free Chlorine	mg/L	0.03	0.03	<0.003	0.0332	<0.003	<0.003	<0.003
Sulphure as H2S	mg/L	0.002	0.002	<1.0	<1.0	<1.0	<1.0	<1.0
Microbiology								
Total coliform	Number/100 mL	1000	5000	3	33	17	5	33
Organic Chemical								
Oil and Grease	ug/L	1000	800	2000	3000	3000	4000	<1000

Notes:
SWQ 2 Downstream Pabberessang River
SWQ 6 Datae River Reservoir
SWQ 8APucuangin River
SWQ 9 Water storage tank at Kampung Baru sub-village (Upstream Datae River)
SWQ 10 Pangisoreng Stream
SWQ 11 Salasoe Stream, Pabberessang

Government Regulation No. 82 year 2001 Water Quality and Water Pollution Control for Water Type I (raw water treated for the purpose of drinking water)
South Sulawesi Governor Regulation No 69 year 2010 concerning Quality Standard and Criteria of Environmental Damage
(-) No standard or guideline has been established for given parameter
µg/L micrograms per liter
mg/L milligrams per liter (parts per million)
N/A not available data

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4.4 Groundwater

4.4.1 Groundwater Resource

Four groundwater samples were taken in September 2015 representing dry season. The sampling locations for groundwater quality within the study area are summarized on the table below.

Table 4-7 Groundwater Sampling Locations during Wet Season and Dry Season

Sample Names	Coordinate		Remarks
	Latitude	Longitude	
GWQ 1	03^0 59' 57.5" S	119^0 43' 11.5" E	Pabberessang Sub-village water storage
GWQ 2	03^0 56' 10.9" S	119^0 41' 24.7" E	Lainungan Village water storage
GWQ 3	03^0 56' 33.7" S	119^0 42' 13.8" E	Additional sampling point. Springwater upstream of GWQ 2
GWQ 4	03^0 58' 16.0" S	119^0 42' 45.7" E	Additional sampling point. Springwater upstream of SWQ 10

4.4.2 Groundwater Quality

Some parameters like hexavalent chromium (Cr6+), KMnO4 and microbiology exceeded the standards at some sampling points, particularly at GWQ 3 and GWQ 4. It may be due to these areas are not protected well. The open areas are also used for cattle grazing. The groundwater water quality results of dry season are presented in Table 4-8

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Table 4-8 Groundwater Water Quality Results

No.	Parameter	Unit	National Standard	GWQ 1	GWQ 2	GWQ 3	GWQ 4	Analysis Method
A.	**Physical**							
1.	Odour	-	Odourless	Odourless	Odourless	Odourless	Odourless	Organoleptic
2.	Total Dissolved Solid	mg/L	1000	224	220	152	224	SNI 06-6989.27-2005
3.	Turbidity	NTU	5	0.53	0.05	1.62	2.8	SNI 06-6989.25-2005
4.	Taste	-	Tasteless	Tasteless	Tasteless	Tasteless	Tasteless	Organoleptic
5.	Temperature	°C	±3°C	30.6	30.8	30.0	30.3	SNI 06-6989.23-2005
6.	Colour	TCU	15	2.5	2.5	2.5	5	SNI 06-6989.24:2005
B.	Chemical							
1.	Iron (Fe)	mg/L	1.0	0.0757	0.0516	0.1693	0.2320	SNI 6989.4:2009
2.	Fluoride (F)	mg/L	1.5	0.1866	0.2711	0.2850	0.1898	SNI 06-6989.29-2005
3.	Cadmium (Cd)	mg/L	0.005	<0.003	<0.003	<0.003	<0.003	SNI 6989.16:2009
4.	Hardness (CaCO3)	mg/L	500	79.200	77.616	56.232	76.032	SNI 06-6989.12-2004
5.	Chloride (Cl)	mg/L	600	1.7583	2.4616	1.4066	0.3517	SNI 6989.19:2004
6.	Chrom Hexavalent (Cr6+)	mg/L	0.05	0.0497	<0.0491	0.0582	0.0799	SNI 6989.71:2009
7.	Manganese (Mn)	mg/L	0.5	0.0576	<0.008	<0.008	0.1228	SNI 6989.5:2009
8.	Nitrate (NO3-N)	mg/L	10	<0.1	0.228	0.2602	0.2654	APHA 4500-NO2-2012
9.	Nitrite (NO2-N)	mg/L	1.0	<0.003	<0.003	0.0039	<0.003	SNI 06-6989.9-2004
10.	pH	-	6.5 – 9	6.6	6	7.2	6.7	SNI 06-6989.11-2004
11.	Arsenic (As)	mg/L	0.05	<0.0002	<0.0002	0.0002	<0.0002	SNI 06-2913.1992
16.	Selenium (Se)	mg/L	0.01	<0.005	<0.005	<0.005	<0.005	SNI 06-2475-1991
13.	Cadmium (Cd)	mg/L	0.005	<0.003	<0.003	<0.003	<0.003	SNI 6989.16:2009
14.	Mercury (Hg)	mg/L	0.001	<0.0005	<0.0005	<0.0005	<0.0005	SNI 06-2462-1991

D R A F T

No.	Parameter	Unit	National Standard	GWQ 1	GWQ 2	GWQ 3	GWQ 4	Analysis Method
15.	Zinc (Zn)	mg/L	15	0.3818	<0.022	<0.022	<0.022	SNI 6989.7:2009
16.	Cyanide (CN)	mg/L	0.1	<0.02	<0.02	<0.02	<0.02	SNI 19-1504-1989
17.	Sulphate (SO4)	mg/L	400	<0.10	<0.10	0.824	<0.10	SNI 06-6989.20:2004
18.	Lead (Pb)	mg/L	0.05	<0.002	<0.002	<0.002	<0.002	SNI 06-6989-8:2004
19.	Detergent as MBAS	mg/L	0.5	<0.05	<0.05	<0.05	<0.05	SNI 06-6989.51-2005
20.	Organic KMnO4	mg/L	10	2.3318	0.4007	17.1367	14.1022	SNI 06-6989.22-2004
C.	Microbiology							
1.	Total Coliform (MPN)	quantity/ 100 ml	0	17	4	34	90	SNI 19-2897-1992 point 3.1
2.	Fecal Coliform	quantity/ 100 ml	0	21	4	26	14	SNI 19-2897-1992 point 2.2

Source Baseline study, PT. UPC Sidrap Bayu Energy, 2015

Note: *) Regulation of Ministry of Health No. 416/MENKES/PER/IX/1990 (Annex II) on water quality requirement.

GWQ 1 Pabberessang Sub-village water storage
GWQ 2 Lainungan Village water storage
GWQ 3 Springwater upstream of GWQ 2
GWQ 4 Springwater upstream of SWQ 10

mg/L: milligrams per liter (parts per million)

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4.5 Air Quality

The dry season results (Table 4-9) are also low and all are well below standards. Even SO_2, PM_{10}, and $PM_{2.5}$ are below respected guideline values from the WHO.

Additional sampling was conducted to study dustfall baseline condition of the study area. Four locations were chosen for sampling. Sampling was undertaken within a period of one month (9th September to 9th October 2015, dry season) at each location. Government Regulation (GR) No 41 of 1999 regarding Air Pollution Control was used as the standard for dustfall measurement, especially dustfall in residential areas. Results of sampling are summarized in

Table 4-10. The dustfall in the study area ranges from 0.65 to 1.95 tons/km2/month which is still below the standard of 10 tons/km^2/month.

Table 4-9 Baseline Pollutant 24-Hr Average Concentrations ($\mu g/Nm^3$) Measured in Dry Season

Parameter	Quality Standard		Sampling Points***			
	GoI*	WHO**	AQ 1	AQ 2	AQ 3	AQ 4
NO2	150	-	28.1	16.0	19.0	24.6
SO2	365	125 (IT-1) 50 (IT-2) 20 (GD)	16.7	8.2	15.7	11.4
CO	10,000	-	973.2	801.9	915.6	1183.1
TSP	230	-	64.9	23.2	44.1	65.4
O3	235	-	13.1	5.1	9.1	16.8
Pb	2	-	<0.02	<0.02	<0.02	<0.02
PM10	150	150 (IT-1) 100 (IT-2) 75 (IT-3) 50 (GD)	43.2	16.3	30.0	48.8
PM2.5	65	75 (IT-1) 50 (IT-2) 37.5 (IT-3) 25 (GD)	14.2	5.1	11.2	13.1

Source: Baseline study, PT. UPC Sidrap Bayu Energy, 2015

Notes:
*) GoI Quality Standards are from the Indonesia Government Regulation No 41 of 1999
**) IFC Quality Standards are from Air Quality Guidelines Global Update (WHO, 2005). PM2.5 and PM10 values are in 99th percentile. Interim targets (IT-1, IT-2, IT-3) are provided in recognition of the need for a staged approach to achieving the recommended guidelines (GD).
***) AQ-1 = *Dusun Pabberessang*; AQ-2 = Sidrap Meteorological Tower 1; AQ-3: *Dusun Kampung Baru*; AQ-4: *Dusun Kulua*.

Table 4-10 Dustfall Level in Study Area

Sampling Location	Code	Dustfall Level* (tons/km2/month)
Pabbaresseng village	AQ 1	0.65
MT 1, Mattitotasi Village	AQ 2	1.37
Mattirotasi Village Office	AQ 3	1.02
Dusun Kulua, Lainungan Village	AQ 4	1.95

Source: Baseline Study, PT. UPC Sidrap Bayu Energy, 2015

Note: *) Based on Ambient Air Quality Standard Government Regulation No. 41 of 1999, maximum standard for residential area is 10 ton/km^2/month.

4.6 Noise

Four locations were chosen for noise sampling. Three represents nearby sensitive receptors (NL1, NL3, and NL4), and one represents non-sensitive receptor (NL2) which is an open area where a meteorological tower is built near to the wind turbine formation at the south. NL1 (*Dusun Pabberessang*) is the nearest sensitive receptor to the wind farm formation at the south, NL3 (*Dusun Kampung Baru*) is at the west and NL4 (*Dusun Kulua*) is at the northwest. Sampling was undertaken continuously within a 48-hour period at each location.

Results of sampling are summarized in Table 4-11. Indonesia Minister of Environment (MoE) uses five decibel penalty to night-time (10 PM to 7 AM) levels for estimating day-and-night noise level. Therefore the baseline Ldn is calculated according to this regulation. Certificate of noise analysis from the laboratory is provided as Appendix A.

There is consistency of the data for 48 hours sampling at each location. In this undeveloped area the wind is the predominant source of noise. The data shows diurnal pattern which is low at night and a curve with the highest levels around noon. This pattern is normally associated with the wind since wind speed follows a similar pattern. During the sampling time at all locations, the wind is low at night and begins to increase at 7 AM as temperature increases.

The results showed that, the LAeq day of the sampling locations ranges from 52 to 56 dBA, LAeq night ranges from 47 to 53 dBA as for GoI LAsm ranges from 52 to 56 dBA. With a tolerance of + 3 dBA, the GoI Ldn is still well below the noise standard.

Table 4-11 Noise level in Study Area (Dry Season)

Measurement Time(WITA)	Unit	NL 1		NL 2		NL3		NL 4	
		Day	Day	Day	Day	Day 1	Day	Day	Day
06.00-09.00	dBA	54.6	54.6	55.26	55.3	51.72	52.89	53.89	53.76
09.00-11.00	dBA	55.59	55.59	57.71	55.34	53.7	53.58	54.42	54.03
14.00-17.00	dBA	55.03	55.03	57.67	55.92	52.18	53.4	55.77	54.79
17.00-22.00	dBA	54.16	54.16	53.32	52.91	49.16	50.83	54.44	53.69
22.00-00.00	dBA	51.3	51.3	50.71	50.08	46.78	46.99	53.68	52.97
00.00-03.00	dBA	47.98	47.98	49.64	48.49	46.07	46.36	52.94	52.06
03.00-06.00	dBA	51.08	51.08	48.62	50.35	47.31	46.69	51.65	51.9
LAeq day	dBA	54.77	54.77	56.26	54.97	51.61	52.67	54.9	54.19
LAeq night	dBA	50.23	50.23	49.6	49.67	46.75	46.65	52.72	52.25
LAsm*)	dBA	54.93	54.93	55.78	54.87	51.66	52.35	56.05	55.46

Source: Baseline study, 2015

Note:
Maximum threshold for residential area according to South Sulawesi Governor Regulation No. 69 in 2010 is 55 dBA
**)The calculation of LAsm noise under Indonesian standards applies a 5 decibel penalty to nigh time noise levels. Maximum threshold for residential area according to Minister of Environment Regulation No. 48 of 1996 on Noise Level Standards and Regulations is 55 dBA, based on day and night time with tolerance level +3 dBA.*
Location code:
NL1: Dusun Pabberessang, Mattirotasi Village
NL2: Meteorological Tower 1, Mattirotasi Village
NL3: Dusun Kampung Baru, Mattirotasi Village
NL4: Dusun Kulua, Lainungan Village

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4.7 Terrestrial Biota

Bibliographic terrestrial biota information for Sidrap is not available, as the area is not well studied or reported in journals. The following discussion provides terrestrial baseline information based on field observation, interviews with local residents, and incidental observations undertaken during the baseline survey. Survey locations are identified in the map in **Appendix A**.

4.7.1 Flora

Based on dry season field observations, some grass and shrub vegetation were dry due to the influence of the dry season. It was evident from the leaf color changes to brown. In fact, there are also some vegetation not found as Corn (Zea mays), Kacang babi (Calopogonium sp)., Bandotan, rumputteki, Patikan Kebo, and Meniran. Corn is a crop that is classified as annuals so that the dry season is not found because it is not cultivated by the community, while Reed and beans pork is a plant that is difficult to survive in the dry season, but it will grow back in the rainy season. The recorded of flora observation is shown below.

Table 4-12 List of Vegetation within the Project Boundary

No.	Local Name	Common Name	Scientific Name	Conservation status			Remarks
				GR 7/1999	IUCN	CITES	
1	Jambu Mete/ Jampusemmeng	Cashew nut	*Anacardium occidentale*				Station. I, II, III & IV
2	Mahoni	American mahagony	*Swieteniamahagoni*				Station II & III
3	Jati	Teak wood	*Tectona grandis*				Station I & II
4	Jati putih	Goomar Teak	*Gmelina arborea*				Station I.
5	Sukun	Bread Fruit	*Artocarpus altilis*				Matirotasi Village
6	Kelapa	Coconut	*Cocos nucifera*				Station III.
7	Nangka/ panasa	Jack Fruit	*Artocarpus integra*				Station III
8	Kedondong	Plumlike fruit	*Spondias pinnata*				Village
9	Gamal	Sptted Gliricidia	*Gliricidia sepium*				Station II
10	Kemlaka	Indian gooseberry	*Phyllanthusemblica*				Station V
11	Kapuk/ kau kau	Silk-cotton tree	*Ceiba pentandra*				Village
12	Kemiri/Peleng	Candle nut	*Aleurites mollucana*	* (50)			Station II & III
13	Mengkudu hutan		*Morinda ellipticaridl*				Station III
14	Mangga	Mango	*Mangifera indica*				Station III & IV
15	Pisang	Banana	*Musa paradisiaca*				Village
16	Kayujawa	Jhingam-wodier	*Lannea sp*				Station I & II
17	Alang-alang	Blade grass	*Imperatacylindrica*		Insp		Station V
18	Putri malu/ jabe jabe	Cat claw mimosa	*Mimosa pudica*		Insp		Station I, II, III, & V
19	Pulai/lita	Blackboard tree	*Alstoniascolaris*				Station I.
20	Temblekan	Tick- berry	*Lantana camara*		Insp		Station I, II, III, IV & V
21	Kirinyu	Siam Weed	*Euphatorium odoratum*		Insp		Station I, II, III, IV & V
22	Sidaguri/Cnaguri	Angled sida	*Sida ronbifolia*				Station III
23	Rumputgajah	Broadleaf grass	*Axonopuscomprasus*				Station I, III & V

No.	Local Name	Common Name	Scientific Name	Conservation status			Remarks
				GR 7/1999	IUCN	CITES	
24	Jambu biji	Guava	*Psidium guajava*				Station II
25	Rumputmutiara	Blady grass	*Hedyotiscorymbosa*				Station V
26	Jeruk	Orange	*Citrus sp*				Station III
27	Angsana	-	*Pterocarpusindicus*				Village

**) endemic species*
P = Protected species by Indonesia as per Government Regulation No. 7 Year 1999 concerning Flora and Fauna Conservation
IUCN: Insp= Invasive Species Alien; LC= Least Concern: Vu = Vulnerable
CITES: A1 = Appendix I; A2 = Appendix II; A3 = Appendix III

Diversity

A diversity index of 27 species observed during dry season field survey is shown in Table 4-13. Diversity index (H') is to obtain a quantitative estimate of biological variability that can be used to compare biological entities, composed of discrete components, in space or in time. Evenness expresses how evenly the individuals in the community are distributed over the different species. The dominance index shows the proportional abundance of the commonest species.

The summary of analysis results of the diversity index, dominance index and evenness index at each sampling station is presented in Table 4-13. Based on the analysis, the highest diversity index (1.75) was obtained at Station III, while the lowest diversity index (0.63) was found at Station IV. On shrubs level, the highest diversity index (1.00) was found at Station III. The highest diversity index for grass/seedlings was found at Station V (1.32).

Table 4-13 Diversity Index, Evenness Index and Dominance Index of Each Station

Habitus	Station I			Station II			Station III			Station IV			Station V		
	H'	E'	D'	H'	E'	D'	H'	E'	D'	H'	E'	D'	H'	E'	D'
Tree	1.45	0.81	0.26	1.65	0.85	0.23	1.75	1.02	0.42	0.63	0.57	0.65	0.64	0.24	0.56
Srubs	0.69	0.38	0.67	0.35	0.57	0	1.00	0.91	0.39	0.69	0.99	0.50	0.69	0.63	0.50
Grass	0	0	1	0	0	1	0.73	0.46	0.24	0.64	0.46	0.56	1.32	0.95	0.28

Notes:
H' = Diversity Index (Shannon Wiener Index)
E' = Evennes Index
D' = Dominance Index

4.7.2 Fauna

Fauna survey was undertaken to observe the existing fauna within the study area. This survey is also focused on avian mammals (bats) and avian fauna (birds) which are potentially affected by the operation of WTG. Fauna observation was undertaken in certain days during wet and dry season. The wet season pre survey suggested that bat was observed very little in numbers when the most of fruit trees were not fruiting. Local residents also suggested that bats are very common when the fruit trees such as cashew nut are fruiting. It was suggested that they tend to live in areas which offer them plenty of food. Therefore, bat observation was conducted in dry season. Discussion on habitat and diversity of fauna is discussed below.

4.7.2.1 Birds

In the field observation, some species of birds recorded is a very wide spread type in the hills because it can be found in all Vantage Point (VP1 to VP7), such as White-breasted Woodswallow (*Artamus leucorynchus*), Sooty-headed Bulbul (*Pycnonotus aurigaster*), Oriental White-eye (*Zosterops sp.*), and Crow (*Corvus sp.*), which are the visitor of trees and shrubs. There are also a kind of Pied Bushchat (*Saxicola caprata*) and Collared Kingfisher (*Halcyon chloris*), which also frequently found to perch on twigs of trees and shrubs. In addition, it also found lathe reeds which are common inhabitants of secondary forest and shrubs that grow along the high grass, or grasslands mixed with scrub. Bird species that live in association with plants located in the vicinity of rural residential areas, such as Olive-backed Sunbird (*Cinnyris jugular*), Swallow (*Hirundo sp.*), Tree Sparrow (*Passer Montanus*), and others. There is a type of night bird species found in the location that is, Sulawesi Masked-Owl (*Tyto rosenbergii*).

In addition, there are also several species of birds that are not found in previous wet season study, such as the Purple-bearded Bee-eater (*Meropogon forsteni*), Blood-breasted Flowerpecker (*Dicaeum sanguinolentum*), Yellow-sided Flowerpecker (*Dicaeum aureolimbatum*), Crimson- crowned Flowerpecker (*Dicaeum nehrkorn*), Black Sunbird (Leptocoma sericea), Snowy-browed Flycatcher (*Ficedula hyperythra*), Black-naped Monarch (*Hypothymis azurea*), Green Pigeon (*Treron Sp.*), White-shouldered Triller (*Lalage sueurii*) and Himalayan Cuckoo (*Cuculus saturatus*). The existence of some birds newfound can be caused by the desire to find food on dried grass and shrub areas as a result of drought, thus these birds come to the location of the observation.

Some bird species found in previous research / monitoring activity did not longer exist in the present study. Birds in the marsh and rice field's areas, such as Javan Pond-Heron (*Ardeola speciose*) and Munia (*Lonchura sp.*), were not found. The dry season factors causing food source of birds such as paddy, fruit plants grains, and fish did not exist so that the birds were moved to another place.

<u>Habitat</u>

In general, bird habitats in the Sidrap wind farm project site covering the ecosystems of grassland, scrub, community gardens, and forests. Land status of limited production forests and community forests (HKM) can be seen on the Land Cover of Forestry Map. Community forests are generally planted with teak white, cashew, and teak of the Sidrap wind farm location. Meanwhile, community gardens were planted with corn. It was not found due to the lack of water availability during dry session. The most dominant ecosystems in the Sidrap wind farm site location are grassland and shrub and because of the dry season were experiencing drought. The drought factors affect the distribution of birds at the project site. Its existence in the ecosystem influences the presence of certain species of birds in the wind farm site location as well.

<u>Bird Diversity and Conservation Status</u>

Results of survey conducted on the wind farm project site identified 31 species of birds. Out of 33 species, 28 species of birds were identified during observation within the five Vantage Points (VPs) and 3 other species were identified based on local anecdotal information from the villages and that was found directly in the neighborhood of the study locations (presented in Table 1).

Results of the study noted that there are five (5) species of birds classified as protected by the Indonesian Government Regulation No. 7 of 1999 dated January 27, 1999 on Preservation of Plants and Animals, and five (5) types that are categorized as endemic, which are Sulawesi Masked-Owl (*Tyto rosenbergii*), Sulawesi Woodpecker (*Dendrocopos temminckii*), Crimson-crowned Flowerpecker (*Diceaum nehrkorni*), Purple-bearded Bee-eater (*Meropogon forsteni*), and Yellow-sided Flowerpecker (*Diceaum aureolimbatum*).

Under the Red List Data Book by IUCN (International Union for Conservation of Nature), generally species of birds found are listed as Least concern / LC, except for Sulawesi (Barn) Owl (*Tyto rosenbergii*) registered / classified as Vulnerable (VU). *Tyto rosenbergii* / Sulawesi Owl is endemic to Sulawesi, and it frequently visited the cultivated land, with slightly trees, grasslands, forest edges and coconut groves. Under the list of CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora), there are four species classified under Appendix II (A2).

Types and conservation status of birds in Sidrap wind farm project site is presented in Table 4-13.

D R A F T

Table 4-14 List of Birds in Study Area and Their Conservation Status

No.	Species	Common Name	Local Name	GR No.7/1999	IUCN	CITES	Remarks
1	*Haliastur indus*	Brahmini kite	Elang Bondol	P	LC		
2	*Butastur indicus*	Grey-faced buzzard	Elang kelabu	P			
3	*Falco moluccensis*	Spotted kestrel	Alap-alap Sapi	P	LC	A2	
4	*Artamus leucorhynchus*	White-breasted wood-swallow	Kekep babi		LC	A2	
5	*Nectarinia jugularis*	Olive backed sunbird	Burung madu Sriganti/ Cui-cui	P	LC	A2	
6	*Passer montanus*	Tree Sparrow	Burung gereja		LC		
7	*Gallus gallus*	Red jungle fowl	Ayam hutan merah/ manu ale		LC		
8	*Saxicola caprata*	pied bush-chat	Decu belang/Kanci-kanci dongi		LC		
9	*Columba vitiensis*	Metallic Pigeon	Merpati hutan metalik/Bekku dare		LC		
10	*Streptopelia chinensis*	Spotted dove	Tekukur/ Bekku lompo		LC		
11	*Corvus enca*	Crow	Gagak/Kao-kao		LC		
12	*Centropus bengalensis*	lesser coucal	Bubut alang-alang/ Kalukku		VU	A2	
13	*Tyto rosenbergii*	sulawesi owl	Serak sulawesi/ Serra		LC	A2	Endemic Sulawesi
14	*Collocalia Sp*	Swift led	Walet		LC		
15	*Halcyon chloris*	Collared king fisher	Cekakak sungai/ Jikki		LC		
16	*Dendrocopos temminckii*	sulawesi woodpacker	Caladi sulawesi / Tampali toto	P	LC		Endemic Sulawesi
17	*Hirundo Sp.*	swallow	Layang-layang/ Kori-kori		LC		
18	*Dicrurus Sp.*	drongo	Srigunting jambul/Patikko		LC		
19	*Pycnonotus aurigaster*	headded bul-bul	Kutilang		LC		
20	*Zosterops montanus*	montain white-eye	Kacamata gunung/ cui-cui		LC		
21	*Dicaeum sanguinolentum*	blood-breasted flower pecker	Cabai Gunung				
22	*Diceaum aureolimbatum*	yellow-sided flower packer	Cabai Panggul Kuning				Endemic Sulawesi
23	*Diceaum nehrkorni*	crimson-crowned flower packer	Cabai Sulawesi				Endemic Sulawesi
24	*Meropogon forsteni*	purple-bearded bee-earter	Cirik-Cirik Sulawesi				Endemic Sulawesi
25	*Apus affinis*	little swift	Kapinis rumah	P			
26	*Cuculus Sp*	Oriental cuckoo	Kangkok Ranting				

No.	Species	Common Name	Local Name	GR No.7/1999	IUCN	CITES	Remarks
27	*Ficedula hyperythra*	Snowy-browed fly catcher	Sikatan Bodoh				
28	*Nectarinia aspasia*	Black sunbird	Burung Madu Hitam				
29	*Hypothymis azurea*	Black-naped monarch	Kehicap ranting				
30	*Treron Sp.*	green pigeon	Punai				

Notes:

P = Protected species by Indonesia as per Government Regulation No. 7 Year 1999 concerning Flora and Fauna Conservation

IUCN: Vu= Vulnerable; LC= Least Concern

CITES: A1 = Appendix I; A2 = Appendix II; A3 = Appendix III

For this survey in the study area, the target species were raptors and migratory birds. During the study representing dry season, there were three species of raptor birds, which are Brahmini Kite (*Haliastur indus),* Grey-faced buzzard (*Butastur indicus*), and Spotted kestrel (*Falco moluccensis*). Brahmini Kite and Grey-faced buzzard were found flying around the hilly areas, while Spotted Kestrel was found either when perched in tress or on-the fly. The existence of Brahmini Kate and Grey-faced Buzzard in the study area was very little, only found one bird each. The small number of those birds found affected by the dietary factors which were reduced due to dry season, such as rats, snakes, and other small animals. Meanwhile, Spotted Kestrel was spotted at VP4, 4 were spotted. Those three raptor birds mentioned above are all protected under Government Regulation No. 7 of 1999, while according to the IUCN, those were classified as Least Concern (LC).

Fly Pattern

Brahmini Kite - - At the time of observation, Brahmini Kites were seen flying over the hilly area. These birds fly high enough above the ground. This bird occasionally carried to follow the direction of wind. It was seen flying around in circles while observing prey beneath it at a height of about 30 to 40 m.

Grey-faced Buzzard - -At the time of observation, Grey-faced Buzzard flew alongside the hills. The birds seem to like to avoid the strong winds in VP 5 so that birds flew low over the trees near the valley.

Spotted Kestrel - -This bird is more often found perched in treetops or twigs of tree, when flying, this bird usually fly low as high as the trees and move from one tree to another tree. At the time of perch, bird watching prey beneath it.

Other Birds- - During observations, generally the birds eating whole grains, fruits, and insects fly from tree to tree at a height of 10-20 m below, expect for Swallow (*Hirundo Sp.)* and Swiftled (*Collocalia Sp.) that* were expected to reach a height of up to 50 m with irregular flight pattern.

Populations of Concern

Birds are highly mobile and cover a wide range. According to Birdlife International, the threshold for inclusion as an “important population” is taken to be a complex of fields or a discreet area of land which regularly supports birdlife (i.e. recorded several times a year during the period when the birds are present) (Birdlife, 2013). In this case population justification was given to the target species (raptors and migratory birds).

The three raptors observed during the survey have a wide range, and hence do not approach the thresholds for Vulnerable under the range size criterion (Extent of Occurrence <20,000 km^2 combined with a declining or fluctuating range size, habitat extent/quality, or population size and a small number of locations or severe fragmentation). The population trend appears to be increasing, and hence the species does not approach the thresholds for Vulnerable under the population trend criterion (>30% decline over ten years or three generations). The population size may be moderately small to large, but it is not believed to approach the thresholds for Vulnerable under the population size criterion

D R A F T

(<10,000 mature individuals with a continuing decline estimated to be >10% in ten years or three generations, or with a specified population structure). For these reasons the species is evaluated as Least Concern.

The Black Eagles are approximately 10,000 to 100,000 birds spread from north-eastern Pakistan and the base of the Himalayas through Bhutan, India, and Sri Lanka, and down into Indochina, Malaysia and Indonesia, from 34° to 9°S. Adults are partial migrants (MacKinnon, et al., 1992). The local population appears to be decreasing. The spotted kestrel population is estimated to number in the tens of thousands and the local population appears to be increasing. The black-winged kite population is stable but threatened by the use of pesticides within its range. The key facts regarding these raptors are summarized below.

D R A F T

Table 4-15 List of Birds and Observed Locations in Study Area

No	Species	Common Name	Local Name	VP 1	VP 2	VP 6	VP 4	VP 7	Remarks
1	*Haliastur indus*	Brahmini kite	Elang Bondol			√			
2	*Butastur indicus*	Grey-faced buzzard	Elang kelabu					√	
3	*Falco moluccensis*	Spotted kestrel	Alap-alap Sapi	√	√	√	√		
4	*Artamus leucorhynchus*	White-breasted wood-swallow	Kekep babi	√	√	√		√	
5	*Nectarinia jugularis*	Olive backed sunbird	Burung madu Sriganti/ Cui-cui	√		√	√		
6	*Passer montanus*	Tree Sparrow	Burung gereja						Found at residential
7	*Gallus gallus*	Red jungle fowl	Ayam hutan merah/ manu ale	√				√	
8	*Saxicola caprata*	Pied bush-chat	Decu belang/Kanci-kanci dongi			√	√		
9	*Columba vitiensis*	Metallic Pigeon	Merpati hutan metalik/Bekku dare						Reported by residence
10	*Streptopelia chinensis*	Spotted dove	Tekukur/ Bekku lompo	√					
11	*Corvus enca*	Crow	Gagak/Kao-kao	√	√	√	√	√	
12	*Centropus bengalensis*	Lesser coucal	Bubut alang-alang/ Kalukku					√	
13	*Tyto rosenbergii*	sulawesi owl	Serak sulawesi/ Serra						Reported by residence
14	*Collocalia Sp*	Swift led	Walet	√			√	√	
15	*Halcyon chloris*	Collared king fisher	Cekakak sungai/ Jikki		√	√		√	
16	*Dendrocopos temminckii*	Sulawesi woodpecker	Caladi sulawesi / Tampali toto				√	√	
17	*Hirundo Sp.*	Swallow	Layang-layang/ Kori-kori		√				
18	*Dicrurus Sp.*	Drongo	Srigunting jambul/Patikko					√	
19	*Pycnonotus aurigaster*	Headed bul-bul	Kutilang	√	√	√	√	√	
20	*Zosterops montanus*	Mountain white-eye	Kacamata gunung/ cui-cui	√	√	√		√	
21	*Dicaeum sanguinolentum*	Blood-breasted flower pecker	Cabai Gunung	√					
22	*Diceaum aureolimbatum*	Yellow-sided flower packer	Cabai Panggul Kuning			√	√	√	
23	*Diceaum nehrkorni*	Crimson-crowned flower packer	Cabai Sulawesi					√	
24	*Meropogon forsteni*	Purple-bearded bee-eater	Cirik-Cirik Sulawesi		√		√		
25	*Apus affinis*	little swift	Kapinis rumah		√				

D R A F T

26	*Cuculus Sp*	Oriental cuckoo	Kangkok Ranting		√					
27	*Ficedula hyperythra*	Snowy-browed fly catcher	Sikatan Bodoh		√					
28	*Nectarinia aspasia*	Black sunbird	Burung Madu Hitam		√					
29	*Hypothymis azurea*	Black-naped monarch	Kehicap ranting		√					
30	*Treron Sp.*	Green pigeon	Punai	√				√		
31	*Lalage sueurii*	White-shouldered triller	Kapasan Sayap Putih	√						
	Species Richness			12	13	10	9	14		
	Species Diversity			2.16	1.89	2.06	1.57	2.18		
	Evenness			0.98	0,86	0.93	0.64	0.99		

4.7.2.2 Bats

Bat surveys used five different size mist nets (one of 18m x 1.7m, three of 12m x 1.7m and two of 9m x 1.7 m) and were carried out in the dry season at three different sites. The mist nets were set over two nights at each appropriate location which is considered as flying paths of bats or at the areas where the bats were concentrated, such as: track-hacker, creeks, and the vicinity of flowering and/or fruiting trees. During mist netting, the observation was conducted at 11 pm and 06.00 am. Trapped bats were released from the nets and then identified individually. Observation was focused on species, age, and sexuality, length of forearm, body weight, and reproductive condition. In addition, location, date, time, number and size (length and width) of nets were recorded. All captured bats were released when the observation was completed.

Three sites were selected for bat mist netting. Two sites are located in similar points for bird surveys (VP 2 and VP 6) and one additional site (VP8) which is located in Pabberesseng Sub-village VP 6 was subjected to be a control area where the Project impact is expected to be less. VP 2 is located adjacent to UPC Met Tower and VP 3 is located nearby proposed WTG sites (String 3). Habitat types at VP 2 and VP 3 are similar which are characterized with savanas, herbs, plantations, and community forests. Plantations and community forests are cultivated with sseveral commercial trees including cashew nut trees, candle nut trees, and white teak trees. During the wet season, the areas around plantations and community forests are cultivated with maize and those of them are left bare during dry season. VP 8 is located in within limited production forest with various plants which is combination of forest and plantation plants. Type of vegetation are cultivated within this area including cashew nut trees, candle nut trees, teak trees, coconut trees, manggo trees, banana, guava trees, orange trees, jack fruit, papaya, breadfruit trees, and kapok trees. The diversity of fruiting trees in VP 8 is high compared to VP 2 and VP 3.

<u>Bat Species Diversity and Abundance at VP 2 and VP 3</u>

During four night-surveys,72 and 64 individual bats of Common or Geoffroy's Rousette (*Rousettus amplexicaudatus*) and Sulawesi stripe-faced fruit bat (*Styloctenium wallacei*) were captured and released at VP2 and VP3, respectively (see Table 4-16). The mist netting results at these two differen sites were relatively high in terms of total individual caught, but relatively low in species diversity. High numbers of total individual caught at these sites might be in correlation with the availability of the food where the most of cashew nut trees (main food sources of both species) were in such a fruiting condition that has been attracted bats to visit these locations. Low species variety at these two locations, however, might be related to lack or limited variety of fruiting plants. During the observation, only cashew nut trees and candle nut trees were fruiting. However, most bats visited cashew nut trees only.

Rousettus amplexicaudataus was predominant at VP2 and VP3 compared to *Styloctenium wallacei* where their frequency is 98% of the total number of bats captured. *R.amplexicaudatus* is a pollen-, flower-, and fruit-eating-bat species. Like other fruit bats, *Rousettus amplexicaudatus* have sensitive hearing and sense of smell and good eyesight which help them to manoeuvre well during flight, specifically at night. What makes them different from other fruit bats is their echolocating ability. It can be distinguished by their grey-brown to brown upperpart which is darker on top of their head and paler underpart which is usually grey-brown. They have long pale hairs on the chin and neck despite having short and sparse fur. They sometimes have pale yellow tufts of hair on the side of the neck which occur in adult for this species, especially males. Most males are substantially larger than females. The most distinguishable figure of this bat besides producing a distinctive, audible clicking call is their wings.[1] It is attached to the sides of the back and separated by a broad band of fur. The lower incisors are bifid, the canines have a longitudinal groove on the outer surface which is slightly medial to center and the first premolars are smaller than second premolars, especially on the upper jaw. This is a colonial species which forms cave roosts of several thousand animals including *Eonycteris spelaea* and a few genuses of insect-eating-bats such as *Rhinolophus, Miniopterus* and *Hipposideros*. Roosts are known from caves, rock crevices, and old tombs. It can be found in a wide variety of habitat types including secondary forest, agricultural areas, and other disturbed habitats like rural gardens, fruit orchards and at the forest edge (Heaney *et al*. 1991, 1998; Heideman and Heaney 1989; Lepiten 1995; Rickart *et al*. 1993). According to villagers, there are no caves in the vicinity of Sidrap Wind Farm Project either at Sidrap or Pare-Pare. It is reasonable that they may travel long distances

D R A F T

each night in search of appropriate site that offering plenty of fruits. *R.amplexicaudatus* flies as high as trees' canopy even higher when accross the areas without plants.

The Wallace's or Sulawesi stripe-faced fruit bat (*Styloctenium wallacei*) is a species of megabat in the Pteropodidae family with wing span nearly 1 m and weight of 200 gr, goldy light brown hairs, doggy face with white stripe around mouth and white spot above the eyes, interesting looking. It is endemic to Sulawesi. It can be found in primary forest of low land up to 1,000 m a.s.l., individually or in a small group distributed in the whole Sulawesi Island. Cave paintings resembling these bats have been found in Australia, where bats of this kind are not otherwise known (Geographic, 2008). A mature female Stipe-faced fruit bat was captured at cashew nut garden at VP4, while three mature male and a mature female bat were caught at VP2. The presence of this species at both locations is assumed that it was strongly related to the presence of fruiting cashew nut trees. As other Pteropodidae family which have wide wing span, Sulawesi stripe-faced fruit bat may fly in a long distance acrossing lake, sea, bare land, or searching area with plenty of food.

Bat Species Diversity and Abundance at VP 6 (Pabberesseng Sub-village)

A total of 101 individuals of seven bat species including *R.amplexicaudatus* and *S.wallacei*, *Eonycteris spelaea*, *Dobsonia viridis, Macroglossus minimus*, *Cynopterus brachyotis*, and *Myotis muricola* (were captured during observation at this site (see Table 4-16). Those of them are flower/nectar and fruit eating bats, except *M. muricola* which is an insect-eating bat.

As *R.amplexicaudataus* does, *E. spelaea* also lives at moist caves and stone cliff. Besides hanging individually or in small group in the forest, *D. viridis* was found at Saumlaki (West South-East Maluku) to live in the caves together with *R. amplexicaudatus* and a few Genus of insect-eating-bats; such as *Rhinolophus, Miniopterus* and *Hipposideros.*

R.amplexicaudatus, *S. wallacei*, *E. spelaea* and *D. viridis* are assumed to come from areas far away from Pabberesseng. The only reason they came to the sampling location is to find food abundant at the area.

While the other two bat species, *C. brachyotis* and *M. minimus* are known to have a relatively low cruising power. *C. brachyotis* can fly as far as 5-10 km, while *M. minimus* can only fly about 3-5 km. These two species are known to strickly live in their habitat. Hence, it is resonable to assume that these two bat species live at the areas`around limited production forest Pabbaresseng sub-village. Beside relatively low cruising power, fly altitude of these two bat species is about trees canopy.

The only caught insect-eating-bat was *M. muricola*. This bat species usually lives in banana leaf, therefore this bat is assumed to come from areas in the vicinity of Pabbaresseng sub-village where plenty of banana trees were growing.

As limited production forest with combination between forest and plantation plants. community forests at Pabbaresseng sub-village have a very important role on bat ecology. This is due to most of the plants at the area are sources of bat food. Hence. this area can be an alternative location for bat food source when food supply at main locations closed to wind turbine is unavailable. Moreover. if locations around wind turbine are disturbed and not confortable to visit. control location like Pabbareseng can be an alternative food source.

Distribution

In general, the species of captured bats are widely distributed in Indonesian main islands as well as other islands outside Indonesia, except *Styloctenium wallacei* which is endemic to Sulawesi Island (see Table 4-16). There is no study of migration in any taxonomic group of those species and geographical area specifically surrounding the study area. Understanding altitudinal bat migration is important to assess potential impact of wind turbine to bats. However, the study literatures suggested that the patterns of altitudinal bat migration can be relatively complex and it was not easy to understand. Understanding the underlying ecological and evolutionary causes of bat migration patterns requires answers of two related but district questions: why do bats migrate at all (i.e. why do they not just stay in the same location year-round?) and why do some individuals (typically one sex) in a population or species migrate, or migrate different distances than the others? To fully explain migratory patterns, hypotheses must address both questions. Ultimately, hypotheses explaining migration rely on variation in a few ecological factors, including food availability, physiological (especially energetic) consequences of weather, predation risk, habitat limitation, and/or competition

D R A F T

for mates. This bat observation is not subjected to test those hypotheses, but this observation is expected to understand the bat abundance and altitudinal migration pattern specifically at the area nearby proposed WTG sites. As mentioned previously, two sites were selected as representative of area nearby proposed WTG sites, VP 2 and VP 3. One area outside of them was selected to be a comparative between area offering less food and area offering plenty of food.

It was reported by local villagers that there is no cave or other site in Sidrap Regency which would be appropriate site for bat nesting. It was suggested that bats might do long travelling from areas outside the Sidrap Regency to study area for searching appropriate site that offering plenty of food. The different bat abundances between VP2/VP3 (nearby proposed WTG sites) and VP 6 (outside proposed WTG sites) advised that bats do migration due to food availability. It might be any correlation between fruiting trees diversity and bat abundance where the bat abundance at VP2/VP3 having low fruiting trees diversity is low compared to VP 6 which is having high fruiting trees diversity. Given the uphill where the most WTG sites proposed to be built is predominantly grass land, it was not expected that bats will do migration to higher altitude where the food is less.

<u>Conservation Status</u>

Of seven bat species captured during the observation are not categorized as protected species by Indonesian Government regulation, but only *Styloctenium wallacei* (Sulawesi stripe- faced fruit-bat) has significant conservation value and considered by IUCN as near threatened (NT) species. Beside its NT status, the presence of this species at the area of Sidrap Wind Farm Project becomes meaningful as *S. wallacei* is endemic to Sulawesi. Serious common threatens on this species is massive destruction on their main habitats including low land tropical rain forest, forest conversion into agriculture land, and in some other places the bats are hunted for consumption. The other six species are considered as Least Concern (LC).

D R A F T

Table 4-16 Total Individuals and Density of Captured Bats at VP2, VP3 and VP8 during Dry Season Observation

No,	Species	Common Name	Total Individual			Remarks	Distribution		Conservation Status		
			VP2	VP3	VP8		Indonesia	Global	IUCN	CITES	IP
1	*Rousettus amplexicaudatus*	Geoffroy's Rousette	63	68	87	Fruitivorous bat	Kl. Sm. Jv, Ls, Sw, Mk, P	As Ph	LC	-	-
2	*Eonycteris spelaea*	Cave nectar-bat	-	-	6	Fruitivorous bat	Kl, Sm, Jv, Ls, Sw, Mk	As Ph	LC	-	-
3	*Styloctenium wallacei*	Sulawesi Stripe-faced Fruit-bat	1	4	3	Fruitivorous bat	Sw (endemic)	-	NT	-	-
4	*Dobsonia viridis*	Greenish Bare-backed Fruit-bat	-	-	2	Fruitivorous bat	Sw, Mk	-	LC	-	-
5	*Macrglossus minimus*	Lesser Long-tongued Fruit-bat	-	-	1	Fruitivorous bat	Kl, Jv, Ls, Sw, Mk, P	As Ph Au	LC	-	-
6	*Myotis muricola*	Muricof's Bat	-	-	1	Insectovorous bat	Kl, Sm, Jv, Ls, Mk	As Ph		-	-
7	*Cynopteris brachyotis*	Lesser Dog-faced Fruit-bat	-	-	1	Fruitivorous bat	Kl, Sm, Jv, Ls, Mk	As Ph	LC	-	-
	Total		64	72	101						
	Density based on capture rate (bats/sq. m)		0,308	0,371	0,521						

Note: Kl: Kalimantan; Sm: Sumatera; Jv: Java; Ls: Lesser Sunda; Mk: Maluku Island; Sw: Sulawesi; P: Papua; As: South-east Asian continental area; Ph: Philippine; Au: Australia, LC: Least Concern;

D R A F T

4.7.2.3 Others

Mammals

Habitat

In general, mammal habitats within study area are divided into several types of habitat as follow:

- Grass land/savanna;
- Cashew nut plantation; and
- Mixed shrubs and trees.

Grass land is predominantly distributed in the top of ridge and ridge side, while cashew nut is distributed in the valley where its topography is flat. Mixed shrubs and trees were observed mostly in the area that was determined by law as protected forest.

In terms of seasonal conditions of habitat which may influence to the mammals are living, cashew nut plantation is the only habitat that might be affected by seasons compared to other habitats. Cashew nuts are fruiting during dry season and they provide plenty of food for fruit eater mammals such as fruit bats.

Diversity

Mammals in the study location are primarily domesticated livestock such as cows and buffalo. Wild mammals were sparse and likely live quite far from the local community and avoid open areas. Only a Celebes Macaque (*Macaca maura*) was identified in the border of protected forest nearby VP4. This primate is endemic to Sulawesi Island.

Table 4-17 List of Mammals observed within the Project Boundary during Wet Season

No.	Local Name	Common Name	Scientific Name	Conservation status		
				GR No.7/1999	IUCN	CITES
1	Sapi/Saping	Cow	*Bos indicus*			
2	Babi /Bawi	Wild pig	*Sus scrofa*		Insp	
3	Monyet/Ceba	Celebes Macaque	*Macaca maura**	P	EN	A2
4	Tikus/ Balao	Mouse	*Mus musculus*		Insp	
5	Kerbau	Kerbau/Tedong	Buffalo	*Bubalus bubalus*		-

Notes:
*) endemic species
P = Protected species by Indonesia as per Government Regulation No. 7 Year 1999 concerning Flora and Fauna Conservation
IUCN: Insp= Invasive Species Alien; LC= Least Concern
CITES: A1 = Appendix I; A2 = Appendix II; A3 = Appendix III

Reptiles and Amphibians

Reptiles are relatively little known species, but ecologically, the group also has a role in the chain and food nets. There is one species of reptiles that includes protected in this area, namely Python molurus, while for the endemic does not exist in this area. Types and conservation status of reptiles and amphibians within the study area are presented in Table 4-18. During the observation, the reptile was not found directly, but this information was obtained from the local communities. Species of reptiles found in the street at the time of observation of Lizard Varanus salvator, and lizards are sometimes found in the grass at the edge of the village. Amphibians are fauna that are not found in these observations, it is caused by the drought.

D R A F T

Table 4-18 Reptiles and Amphibians within the Study Area

No.	Local Name	Common Name	Scientific Name	Conservation status			Remarks
				GR	IUCN	CITES	
Reptilian							
1	Ular sawah	Black tailed python	*Python molurus**	P	LC	A2	Not found
2	Kadal /Bucili	Many striped skink	*Mabouya multifasciata*		LC		
3	Kadal ekor biru/Bucili	Pacific bluetail skink	*Emoia caeruleocauda*		LC		Not found
4	Biawak/ Pararang	Water monitor	*Varanus salvator*		LC		
Amphibian							
1	Katak Air	Crab-eating frog	*Rana cancrivora*		LC		Not found

Source: Ground truthing result Octoberr, 2015)

Notes:
*) Protected species based on Government Regulation No. 7 Year 1999 concerning Flora and Fauna Conservation

4.8 Freshwater Aquatic Biota

The following sections describe the analysis results of plankton and benthos samples taken during the field survey and observation as well as interview results on fish species in the major rivers. The aquatic biota sampling locations are shown in **Appendix A**

4.8.1 Plankton

Phytoplankton and zooplankton have fast growth rates and can be used as indicators of ecological change in short timescales. These organisms are quite sensitive to low levels of pollutants such as pesticides, which are a major anthropogenic stress on natural communities.

Samples were taken at the same locations as the surface water quality samples. A 12 phytoplankton species and 13 zooplankton species were identified from dry season sampling. The details are presented in Table 4-19.

D R A F T

Table 4-19 Plankton Identification Results

Phytoplankton		Zooplankton	
Phylum	**Species Number**	**Phylum**	**Species Number**
Chrysophyta	1	Cilliata	2
Chlorophyta	2	Rotatoria	1
Cyanophyta	1	Entromastrata	6
Pyrrophyta	2	Mollusca	1
Diatomae	3	Rhizopoda	2
Desmidiceae	2	Ctenopora	1
Rotaria	1		2

Abundance

A total of 675 phytoplankton individuals were collected. The most abundant class was Diatomae (44%), Pyrrophyta (19%), Desmidiceae (15%), each Chlorophyta & Rotaria (7%) and each Chrysophyta & Cyanophyta (4%).The relative abundance of the phytoplankton taxa observed during this baseline survey is presented in Table 4-20.

Based on abundance, the composition of phytoplankton of each sampling locations is dominated by Chrysophyta.Chrysophyta mainly occurs in oligotrophic (low nutrient) waters low in calcium.

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Table 4-20 Phytoplankton Abundance by Sampling Location

		Abundance of Phylum						
Sampling Location ID	Abundance (Individual/l)	Chryso phyta	Chloro phyta	Cyano phyta	Pyrro phyta	Diatomae	Desmidiceae	Rotaria
SWQ2	125	-	-	-	50	75	-	-
SWQ6	225	-	25	-	-	100	50	50
SWQ8A	75	-	-	-	-	75	-	-
SWQ10	100	-	25	-	75	-	-	-
SWQ11	150	25	-	25	-	50	50	-
Total	**675**	**25**	**50**	**25**	**125**	**300**	**100**	**50**

Notes:
SWQ 2 Downstream Pabberessang River
SWQ 6 Datae River Dam
SWQ 8A Pucuangin River, Lawawoi-Lainungan
SWQ10 Pangisoreng Stream, Lainungan
SWQ11 Salassoe Stream, Pabberresang River

Based on abundance, the composition of phytoplankton of each sampling locations is dominated by Diatomae.

The zooplankton abundance recorded in the study area at dry season the abundance was 875 individuals/l, where Rotatoria was the most dominant class (38%), followed by each Cilliata and Entromostraca (31%), Rhizopoda and then each Molusca & Ctenopora.

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Table 4-21 Zooplankton Abundance by Sampling Location

Sampling Location ID	Abundance (Individual/l)	Abundance of Phylum					
		Cilliata	Rotatoria	Entromostraca	Mollusca	Rhizopoda	Ctenopora
SWQ2	675	200	250	200	25	N/A	N/A
SWQ6	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SWQ8A	N/A	N/A	N/A	75	N/A	N/A	N/A
SWQ10	N/A	N/A	75	N/A	N/A	N/A	N/A
SWQ11	200	25	N/A	25	25	100	25
Total	**875**	**225**	**250**	**225**	**50**	**100**	**25**

Notes:
SWQ 2 Downstream Pabberessang River
SWQ 6 Datae River Dam
SWQ 8A Pucuangin River, Lawawoi-Lainungan
SWQ10 Pangisoreng Stream, Lainungan
SWQ11 Salassoe Stream, Pabberresang River

Species Diversity, Richness, Evenness, and Dominance Index

The purpose of a diversity index (H') is to obtain a quantitative estimate of biological variability that can be used to compare biological entities, composed of discrete components, in space or in time. Two different aspects are generally accepted to contribute to the intuitive concept of diversity of a community: species richness and evenness. Species richness is the total number of species in the community (but note already that the actual number of species in the community is usually unmeasurable). Evenness expresses how evenly the individuals in the community are distributed over the different species. The dominance index shows the proportional abundance of the commonest species.

Odum divided the variables of the Shannon Wiener diversity index (SDI) into high (H'>4), moderate (2<H'<4) and low (H'<1) (Odum, 1971 (3rd Edition)). Based on the SDI, Sastrawijaya (1991) categorized the pollution levels are as follows:

Shannon Wiener diversity index	Pollution Level
H' > 2	Not polluted
1.6<H'<2	Low
1<H'<1.6	Moderate
H'<1	High

Evenness indices standardize abundance and range from near 0 when most individuals belong to a few species, to close to 1, when species are nearly equally abundant (Smith & Wilson, 1996). Conversely, dominance index will be high (approximately 1) when there is dominance species within the community and will be low (approximately 1) if there is no dominance species within the community. In theory, the diversity index and evenness index are high when the dominance index is low and vice versa.

The biology indices calculation results are presented in Table 4-24. Generally, the phytoplankton diversity index ranges between 2.80 – 2.83 at wet season and 0.56 – 1.79 at dry season, while evenness index ranges between 0.97 – 0.98 (approximately 1) at wet season and 0.81 – 1 at dry season.

D R A F T

Table 4-22 Biological Indices of Water Quality

Sampling Location ID	Number of Taxons	Diversity Index (Shannon Wiener Index)	Evenness Index	Dominance Index	Pollution Level
Phytoplankton					
SWQ2	2	0.67	0.97	0.52	High
SWQ6	3	0.96	0.87	0.43	High
SWQ8A	3	1.05	0.96	0.36	Moderate
SWQ10	2	0.56	0.81	0.63	High
SWQ11	6	1.79	1	0.17	Moderate
Zooplankton					
SWQ2	10	1.82	0.79	1.23	Moderate
SWQ6	0	N/A	N/A	N/A	N/A
SWQ8A	0	N/A	N/A	N/A	N/A
SWQ10	0	N/A	N/A	N/A	N/A
SWQ11	6	1.73	0.97	0.19	Moderate

Notes:
SWQ 2 Downstream Pabberessang River
SWQ 6 Datae River Dam
SWQ 8A Pucuangin River, Lawawoi-Lainungan
SWQ10 Pangisoreng Stream, Lainungan
SWQ11 Salassoe Stream, Pabberresang River

4.8.2 Macro Benthic

A total of 480 macro benthos founded during dry season sampling (Table 4-23). The observation of these macro benthic fauna advised that the rivers in the study area are populated mainly Gastropod (77.7%) followed by malacostraca (15.8%), Insecta (4.6%) and Bivalvia (1.9%). The relative abundance of the macro benthic taxa observed during this baseline survey is presented in Table 4-23.

Table 4-23 Macro Benthic Community Structure by Percentage of Abundance

Sampling Location ID	Abundance (Individual/m2)	Abundance of Phylum			
		Gastropoda	Bivalvia	Insect	Malacostraca
SWQ2	185	175	N/A	5	5
SWQ6	315	280	30	5	N/A
SWQ8A	115	110	N/A	5	N/A
SWQ10	35	15	N/A	5	15
SWQ11	15	10	N/A	N/A	5
Total	**665**	**590**	**30**	**20**	**25**

Notes:
SWQ 2 Downstream Pabberessang River
SWQ 6 Datae River Dam
SWQ 8A Pucuangin River, Lawawoi-Lainungan
SWQ10 Pangisoreng Stream, Lainungan
SWQ11 Salassoe Stream, Pabberresang River

D R A F T

Table 4-24 Biological Indices of Water Quality

Sampling Location ID	Number of Taxons	Diversity Index (Shannon Wiener Index)	Evenness Index	Dominance Index	Pollution Level
SWQ2	3	0.36	0.23	0.90	High
SWQ6	4	0.68	0.34	0.77	High
SWQ8A	2	0.26	0.26	0.92	High
SWQ10	3	1.45	0.91	0.39	Moderate
SWQ11	2	0.92	0.92	0.56	High

Notes:
SWQ 2 Downstream Pabberessang River
SWQ 6 Datae River Dam
SWQ 8A Pucuangin River, Lawawoi-Lainungan
SWQ10 Pangisoreng Stream, Lainungan
SWQ11 Salassoe Stream, Pabberresang River

4.9 Traffic and Transport

The traffic survey was conducted by taking the photograph using digital camera and tracking the route using GPS handheld. The tracking route is followed the proposed route for the mobilisation equipment start from Pare-pare port to Matirotasi village. Equipment mobilisation will pass the public road (local and provincial road). The vehicle mobilisation schedule plan start from 12 am until 5 am escorted by police car from police or transportation department. Approximate width of the mobilisation road is range between 6 – 8 m. The main issue for the vehicle mobilisation is the mobilisation will pass over the local road in Pare-pare city and it predicted need the road widening especially at intersection road for vehicle truning. The other issue is there are two monuments in 2 road intersections, based on the information from client the monuments will be moved in order to turning vehicle during the vehicle mobilisation phase. On the dry season, visual observation more focused from Pare-pare to Sidrap.

<u>Road Condition</u>

The road condition of the access road from Pare-pare Port to the project location is shown in photographs in Figure 4-6, Figure 4-7 and Figure 4-8.

Figure 4-6 Pare-Pare Port– (left) and road condition around the port (right)

D R A F T


Figure 4-7 Intersection road at Pare-pare (Potential Access to Site)


Figure 4-8 Road intersection. The turning corner is hairpin curve and uphill road

4.10 Cultural Heritage

4.10.1 Physical Cultural Resources

Physical cultural resources (a form of tangible cultural heritage) may be impacted through both direct and indirect means, for example removal or accidental damage during site clearing, restriction of access allowed to members of the host community or loss of amenity value of the site through increased noise or dust generation by project.

As shown in Figure 4-9, and Table 4-25, four (4) sites of cultural significance were noted, these being a cemetery (CH1), a worship house (CH2), and two (2) outdoor worship sites (CH3 and CH4). Three (3) of these sites (CH1, CH2 and CH3) are located within the permit area. Sites CH1 and CH2 are located some 1.5km and 2km respectively from the project infrastructure, and are therefore unlikely to be impacted by the proposed activities during either construction or operations.

Site CH3 is located some 0.6 km to the east of the turbine string (between WTGs 3 and 4). It is not within the turbine or transmission line footprint so is unlikely to be impacted directly, however it may be indirectly impacted for example if noise generated during construction interferes with ceremonies undertaken at the site. There is potential for the amenity of the site to be impacted as a result of increased noise during the operations phase of the project, however noise modelling presented in Section 6.8 indicates that ambient noise levels in the area are only expected to rise by some 0.1-0.2 dBA during the day time, and 0.3dBA at night[1]. As such the impact is not expected to be significant. Nonetheless, if complaints about noise are about by members of the community (during either construction of operations), then noise monitoring should be undertaken to objectively assess the issue. Further action, if any, can be determined based on the outcomes of this monitoring.

[1] It has been assumed that site CH3 will have similar baseline noise characteristics as receptor site “G”

D R A F T

Site CH4 is located outside of the permit area, and is therefore unlikely to be impacted.

Additional cultural resources include mosques and temples within the villages surrounding the project site. These are well away from the disturbance envelope, and so are unlikely to be impacted directly, however sermons or other ceremonies held at these locations may be affected by construction or operations-phase noise. As with potential noise impacts to site CH3, the potential likelihood of this occurring is low, however noise monitoring at these sites is to be conducted if community complaints are received, and action taken accordingly if noise is found to be an issue.

D R A F T

Table 4-25 Physical Cultural Resources Located within the Project Study Area

ID	Notes	Image
CH 1	Tolotang Towanii Cemetery located south-east of Lawawoi Village (also used as a place of worship).	
CH 2	Worship house located south-east of Lainungan Village (reported to be used by community members from various religious backgrounds)	
CH 3	Place of worship to request a rain blessing (located in the south-east of the permitting area)	
CH 4	Place of worship to request a rain blessing (located outside the southern boundary of the permitting area, adjacent the Salo Cake river (Local name: Salasoe)	*Image not available*

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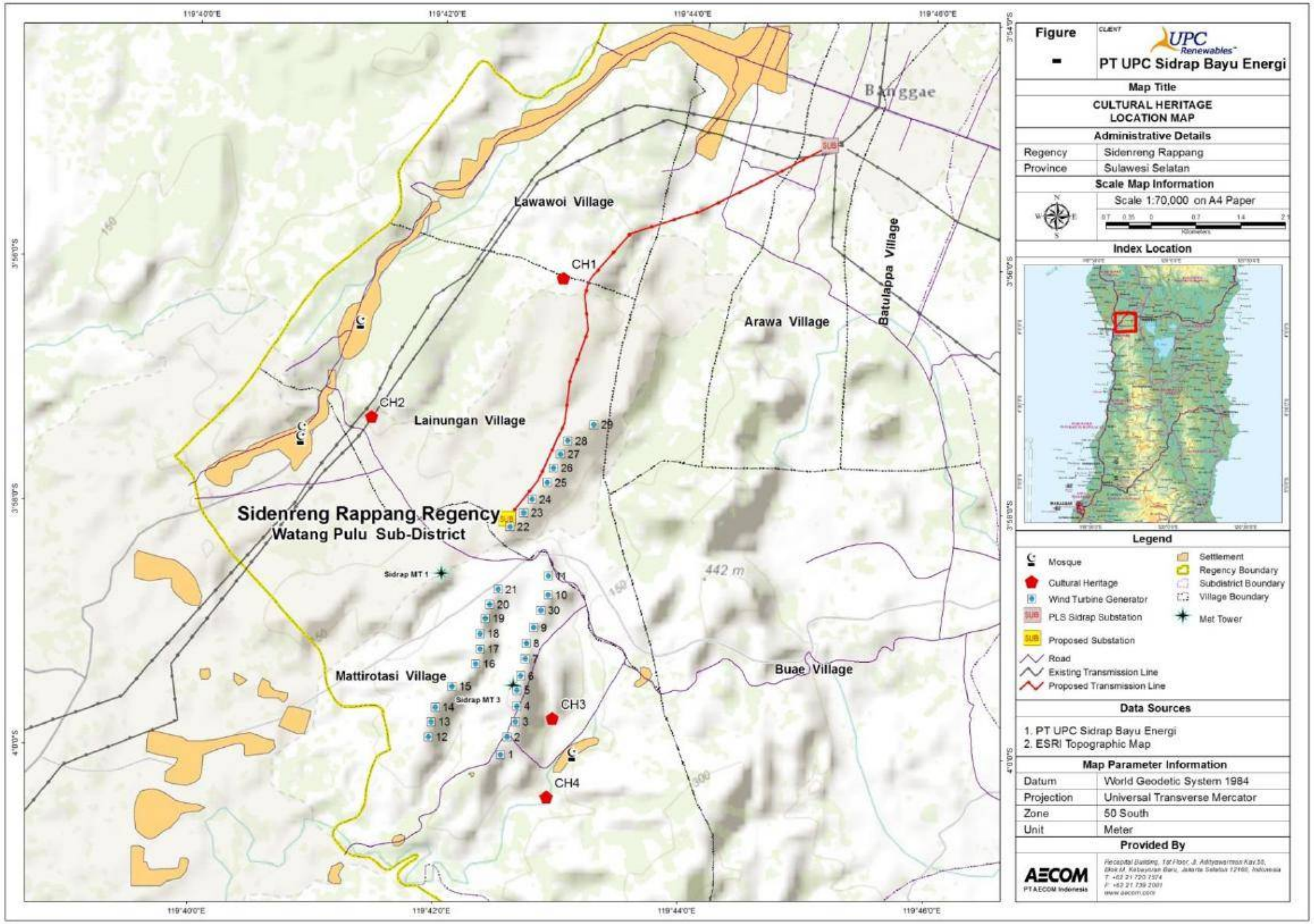

Figure 4-9 Physical Cultural Resources Located within the Project Study Area

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4.10.2 Intangible Cultural Heritage

Impacts to intangible cultural heritage may occur when project actions or activities prevent the local community from engaging in their unique cultural practices, or hamper the ability of the community to pass these practices on to future generations.

As previously noted in Section 5.3.3, the religious beliefs practiced in the study area are diverse. While the majority of residents (80%) identify as Muslim, a significant proportion (17%) are Tolotang Hindu, with an additional small minority of Buddhists and Christians. Within these groups, there are frequently traditional cultural practices and ceremonies which are adhered to alongside the official religious beliefs; this is particularly notable for the Tolotang Hindus. During interviews, the local community identified two (2) important community rituals which are routinely undertaken, these being:

- **Sipulung Ritual:** This ritual is practiced annually at the Pabbere Tomb site in Perrinyameng, Amaprita. This site is approximately 12km east of the permit area. This is practiced by Tolotang households only.
- **Mappadendang Ritual**: This ritual is a tradition harvest thanksgiving ceremony which may be practiced at a local home or in a rice paddy (this ritual is not confined to a single location). This is widely practiced in the local area, and typically includes participants from the various religious groups.

Given the distance of the site for the Sipulung Ritual from the permit area it is unlikely that the community's ability to participate in this activity will be impacted by the project. Impacts to the Mappadendang Ritual are also unlikely as this ritual does not appear to be confined to a specific location.

4.10.3 Chance Finds

It is possible for undocumented cultural resources to be uncovered during site clearing and construction works, for example unmarked graves or historical artefacts. As such, it will be necessary for a Chance Finds Procedure to be developed in consultation with the local community, religious leaders and Cultural Heritage Preservation Makassar, South Sulawesi. This procedure will provide a documented process for dealing with any chance cultural finds, and would typically include stopping all works in the area until the find has been assessed by a competent specialist who can then advise on the best course of action dependant on the nature of the find. The chance finds procedure is to be developed prior to commence of any earthworks or site clearing, and site personnel are to be given training in the application of the procedure.

4.11 Indigenous People

Baseline surveys of ethnic composition of the study area[2] yielded the following results:

- **Bugis, including Tolotang Bugis** (98.04% of people in the study area) – Bugis are the dominant ethnic and linguistic group in South Sulawesi. Tolotang Bugis, who also reside in the study area, are different in the sense that they have retained their pre-Islam animistic religious beliefs and do not practice Islam.
- **Makassar** (0.04% of people in the study area) – these are the other dominant ethnic and linguistic group in South Sulawesi (after the Bugis) who tend to reside in the far south of the southwestern peninsular of Sulawesi, predominantly in-and-around Makassar.
- **Javanese transmigrants** (1.92% of people in the study area) – the most dominant ethnic group in Indonesia, both by population and politically. This ethnic group originates in Java (AECOM, 2014).

None of these groups would be considered IPs based on the definition provided by PS7.

[2] Values only account for ethnic composition in Mattirotasi and Uluale, as data was only available for these villages.

In addition to the ethnic composition survey, a focused IP study was also completed in 2015.Findings of this study, were that no IPs were found to reside within the study area or to hold interests in lands / natural resources therein (Dugardi, 2015).

D R A F T

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Sidrap Wind Farm Environmental Consultancy

PT. UPC Sidrap Bayu Energi

17 February 2014

Environmental and Social Baseline Study

Field Survey and Sampling Campaign

D R A F T

Environmental and Social Baseline Study

Field Survey and Sampling Campaign

Prepared for

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17 February 2014

JKTD14001 Sidrap Wind Farm AMDAL

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Quality Information

Document Environmental and Social Baseline Study

Ref JKTD14001 Sidrap Wind Farm AMDAL

Date 17 February 2014

Prepared by Novianto Hadi Suwito

Reviewed by Kimberlee Myers

Revision History

Revision	Revision Date	Details	Authorised	
			Name/Position	Signature
00	17 Feb 2014	Draft for submission	Kimberlee Myers Associate	

D R A F T

Table of Contents

D R A F T

DRAFT

List of Tables

D R A F T

List of Figures

Appendix

Appendix A Photolog of Land Use Survey

Appendix B Physical and Chemical Sampling Locations / Vantage Point Locations / Aquatic Sampling Locations

Appendix C Photographs of Water Bodies

D R A F T

1.0 INTRODUCTION

1.1 Study Background

PT UPC Sidrap Bayu Energi (UPC) appointed PT AECOM Indonesia (AECOM) to undertake a Baseline Study Program and assist UPC on AMDAL preparation for the 28 x 2.5 MW Wind Turbines Sidrap Wind Farm Project (the Project), located in Sidenreng Rappang (Sidrap) Regency, South Sulawesi Province.

The objective of AECOM's work is to provide a comprehensive AMDAL that will meet local requirements. Furthermore, the AMDAL baseline studies meet international standards in their execution, making them available as a baseline in the future should an Environmental and Social Impact Assessment (ESIA) be required.

1.2 Study Objective

The key objective of this study and this report is to provide baseline data that would meet local requirements for an AMDAL and the requirements of IFC guidelines for the purposes of preparing an ESIA in the future (IFC, 2012). The bulk of the field survey and sampling for this study was undertaken from the 10-20 December 2013. Follow up studies (flora/fauna and noise/air) were conducted in January 2014. Lab results were received on 28 January 2014.

2.0 SCOPE OF STUDY

This scope of study was based on the proposal and contract signed in September 2013. Details of the scope of study are discussed below.

2.1 Geographical Study

The study area is located in Mattirotasi Village, Lainungeng Village, Lawawoi Village and Uluale Village, Wattang Pulu Sub District, Sidrap Regency, South Sulawesi Province (Figure 2-1).

2.2 Sub Studies

This study covers the environmental and social components which could be affected by the Project. The following areas were studied:

- Land Use and Planning;
- Climate
- Surface Hydrology and Hydraulics;
- Groundwater;
- Air Quality
- Noise;
- Terrestrial Biota;
- Freshwater Aquatic Biota;
- Waste Management;
- Traffic and Transport; and
- Socio Culture, Socio Economy and Public Health.

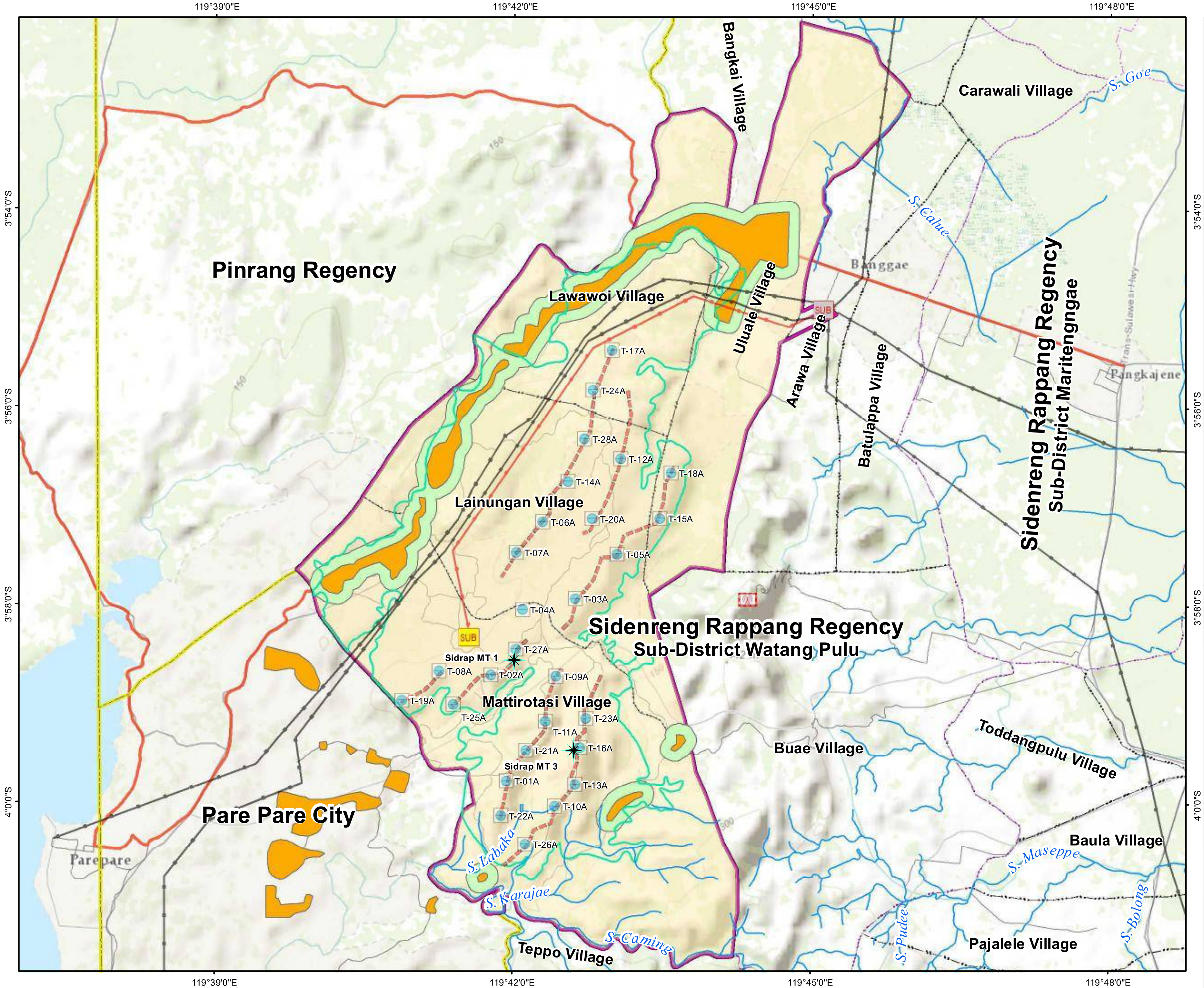

FIGURE 2-1

CLIENT

PT UPC Sidrap Bayu Energi

Map Title

MAP OF STUDY AREA

Administration Detail

Regency	Sidenreng Rappang
Province	Sulawesi Selatan

Scale Map

Scale 1:100,000 on A4 paper

0.8 0.4 0 0.8 1.6 2.4 Kilometers

Map Location

Legend

- Met Tower
- Proposed WTG
- PLN Substation
- Proposed UPC Substation
- River
- Existing Transmission Line
- Proposed Transmission Line
- Proposed WTG Strings
- Comm Tower
- Regency Boundary
- Sub-District Boundary
- Village Boundary
- Arterial Road
- Local Road
- Ecology Study Bounadary
- Settlement
- Social Study Boundary
- Adminitration Study Boundary
- Study Boundary

Data Source

1. PT UPC Sidrap Bayu Energi
2. ESRI Topographic Map

Parameter

Datum	World Geodetic System 1984
Projection	Universal Transverse Mercator
Zone	50 South
Unit	Meter

Rev.	BY	DATE	DESCRIPTION	CHKD	APPD
0	IDR	22 Jan 2014	Draft of biological sampling location		

Revision: 0

Created: IDR	Date: 22 Jan 2014	Project ID: IDJKT14001	
Checked:	Date:	File Name: Fig2-1-Study Area	
Approved:	Date:	Status: DRAFT	

Note

Provided by

CONSULTANT

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3.0 METHODOLOGY

3.1 Land Use and Planning

Both the AMDAL and the future ESIA require a detailed and accurate map of the current land use in the study area. A full ground truthing of the study area was undertaken to provide a land use map and a photographic database. A handheld GPS and a digital camera were used during the ground truthing.

Results obtained from ground truthing were photo and GPS tracked, which were then synced to get geotagged photos. The geotagged photos are used to identify the type of land use.

Planning regulations refer to the local regulations for Sidrap, which include Sidenreng Rappang No. 5 of 2012 concerning Spatial Plan Sidenreng Rappang period year 2012-2032.

3.2 Climate

Climate data was collected from rainfall station Pabbaresseng, Mattirotasi Village. The rainfall data was recorded from 1999-2013.

3.3 Surface Hydrology and Hydraulics

3.3.1 River Characteristic

The AECOM field team conducted ground truthing to examine the characteristics of rivers within the project area. There are seven ephemeral and periodic streams/rivers within the study area, four of which were identified as potentially impacted water bodies. These were traced downstream to the upstream area where water samples were taken. A handheld GPS and digital camera were used during ground truthing to identify all sampling points for future reference.

3.3.2 Surface Water Quality

The surface water quality sampling targeted the relevant parameters currently listed in the Indonesian government guidelines for water quality (Government Regulation No. 82/2001). The surface water samples were collected using a small bucket. Field measurements of temperature, dissolved oxygen (DO), and pH were obtained from the surface water samples using a HI 9145 DO meter and HI 98130 pH/EC/TDS meter, respectively. The remaining surface water was drained into the appropriate sub-sample bottles containing predetermined quantities of preservatives. The sub-samples were kept at 4°C during transport to the laboratory for subsequent physical and chemical analysis.

Following the field collection, the samples were sent to an accredited laboratory (by KAN – *Komite Akreditasi Nasional* or Indonesian National Accreditation Committee), *Balai Besar Keselamatan dan Kesehatan Kerja* in Makassar. In the lab the physical and chemical parameters were analysed.

3.4 Groundwater

Groundwater is typically sampled from existing groundwater wells. During the survey, the AECOM field team observed two groundwater wells in the study area; however they were not suitable for sampling Thus, the only samples that could be taken were from two water storage tanks which are supplied from natural springs.

3.5 Air Quality

Site specific baseline data on air quality was collected for assessment of potential impacts on nearby communities and for project site monitoring during the operation and eventual decommissioning of the Project. Data is required for comparison with government regulations and decrees with respect to human settlements and occupational health standards.

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Air quality samples were collected during discrete sampling periods, the frequency of which will coincide with regulatory requirements of the South Sulawesi Governor Regulation No 69 year 2010 concerning Quality Standard and Criteria of Environmental Damage, annex III.A Ambient Air Quality Standards.

3.6 Noise

Noise is a potential impact resulting from project implementation and WTGs. Thus, the noise baseline levels should be determined in all of the potentially affected communities. IFC requirements for noise differ from Indonesian standards, and IFC compliant baselines will satisfy AMDAL requirements.

Baseline data on ambient noise levels are required to quantify potential effects on nearby inhabitants and settlements. Ambient noise levels were measured at the same sites as air quality monitoring locations. Noise data was compared to noise standards of the State Minister of Environment Decree No.48/1996 and can be used to assess the future impacts on nearby habitations/settlements. Noise measurements were only taken over a 1-hour period. The samples should have been taken over a 24-hour period and will be redone next month.

3.7 Terrestrial Biota

3.7.1 Flora

A qualitative survey was undertaken by walking the area and documenting the dominant flora using a handheld GPS and digital camera. The output of this survey is a habitat map.

3.7.2 Fauna

The key objective of the terrestrial fauna field survey is to provide sufficient information to allow assessment of potential for impacts arising from habitat loss, displacement of wildlife, collision risk, and cumulative impacts of the proposed wind farm development. Information was gathered through walking field observations and interviews with the local residents regarding the avian, mammal, reptile, and amphibian populations in the area.

Bird will be the most impacted fauna due to project activity. Quantitative data is required to study the bird populations since wind energy developments have the potential to cause harm through direct habitat loss or damage, disturbance and displacement of species from feeding, nesting and migration and direct collision with turbines

An initial walkover survey was undertaken inside the project boundary. Features of interest with regard to conservation of ecological values were noted and general habitat type was mapped. An appraisal of the suitability of the habitat for target bird species and species known to the area was carried out. The survey also aimed to identify suitable locations for Vantage Point (VP) surveys as detailed below and the extent of the survey area for walkover Common Bird Census (CBC) work.

The survey area includes land within the proposed site (which includes the turbine location, access roads, and other associated installations), and up to 500 meters in each direction from this point – where safe access can be obtained. Vantage points were chosen so that data collected also covers potential alternative locations for turbines.

Vantage Point Surveys

In order to identify flights at potential collision-risk height (i.e. not at ground level), Vantage Point (VP) surveys were conducted to observe the flight patterns and behavior of target species within the survey envelope. The list of target species was compiled from protected species or those of conservation concern and thought likely to be subject to impact from a wind turbine development. Target species were chosen carefully, as too many target species may dilute the survey effort to concentrate on the species most at risk. Each VP survey lasted no longer than 2 hours. The number of VP locations

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needed to cover the site adequately was established during the initial scoping survey and was based on the topography of the land, the presence of obstructions to views into and around the site, and the visual envelope from the selected VP location(s).

During the surveys, details of all target species seen or heard were recorded. Information recorded included: species, sex (if possible), number, flight direction, location, and flight zone (below/ within/ above turbine height). If no target species were present within the VP, information on secondary species was collected, and summarized at ten-minute intervals. Secondary species are those not included on the target species list, but still thought to be of some risk from a wind turbine development. Observation of target species takes priority over secondary species. As well as the internationally important assemblage of migratory and over wintering water birds, the estuary situated at the south of the proposed WTGs was also be surveyed to recognize the important bird area (IBA) for other assemblages of other birds at specific times of year. Ideally, VP surveys will be specifically scheduled when the weather is favorable to record the movements of these specific groups of birds.

Nocturnal Surveys

The site and the surrounding area is used by a range of birds during hours of darkness. These include waders and wildfowl foraging at adjacent aquatic habitats, as well as nocturnal species such as owls and bats. Survey techniques include:

- The use of mist nets to capture birds foraging at night;
- The use of high powered lights to observe birds; and
- Listening for migrants overflying the site and nearby foraging/roosting water birds.

Location

Vantage Point (VP) surveys were conducted within the study area. The study area includes the area within 500 meters of the proposed turbine locations, and all aquatic habitats adjacent to the site if not already within the 500 meter zone. Given the study area is less likely to be part of migration route; therefore the survey envelope will not be extended.

Equipment

The following equipment will be used at all locations:

- Handheld GPS
- High power lights
- Binoculars
- 50 m measuring tape
- Digital camera

3.8 Freshwater Aquatic Biota

This survey was undertaken at flowing rivers, especially any nearby rivers that are likely to receive run-off from project activities. Samples of plankton and macro benthos were taken during surveys. Information regarding other aquatic biota including fish was obtained through interviews and incidental observation.

3.9 Waste Management

The future ESIA will need to describe existing waste management facilities and procedures. Given the nature of the area, it appears unlikely that there are any effective or systematic waste management systems in place, which is not uncommon in Indonesia. A survey of the community as well as interviews with villagers and local government staff was undertaken to verify this.

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3.10 Traffic and Transport

Transporting the main components of the WTGs (towers, turbines, rotors/blades) to site during construction will be one of the more significant activities of the project. Therefore it is important to identify local the traffic patterns. The transportation analysis was undertaken on Pare Pare-Sidrap Main Road (Km 168) and the Mattirotasi Main Road. These roads will be used as transportation road during mobilisation and also as connecting road between the wind farm area and the PLTB (*Pembangkit Listrik Tenaga Bayu*) substation. All relevant field findings were documented using a handheld GPS and Digital Camera.

Data collected on-site for the technical traffic assessment included the following:

- Road network surveys (type of roads, record of access from/to);
- Receptors located on project-utilized road corridors;
- A traffic movement survey accounting for traffic count;
- Turning movement counts at key junctions and use of public transportation (a.m. peak, p.m. peak, off peak);
- Pedestrian survey at critical junctions or crossings (e.g. schools), accident data (typically acquired from the police), type of junctions, and car parking area if any; and
- Schedule of community activities, alternative traffic routes.

Several traffic parameters will be calculated, including:

1) Traffic Volume

Traffic volume is a number of vehicles passing the road in the particular time. It is expressed in (passenger car unit) pcu/hour. Due to roads being traversed by several vehicles types, it is necessary to convert the vehicle types in pcu. Below are the conversions of several vehicle types in pcu:

- Motorcycle : 0.5
- Passenger vehicle : 1.0
- micro bus : 2.0
- Medium truck (> 5 ton) : 2.5
- Bus : 3.0
- Heavy truck : 3.0

2) Traffic Speed

Traffic speed is defined as the ratio of distance travelled by the vehicle with a unit of time required to cover the distance. Average speed can be calculated through two different approach, including

<u>Time Average Speed</u>

Time Average Speed is defined as the arithmetic speed average from speed measurement of various vehicles on one part of a road during a certain time, also known as spot speed. It is calculated by

$$\mathbf{V} = \frac{\mathbf{1}}{\mathbf{n}} \sum_{\mathbf{i=1}}^{\mathbf{n}} \mathbf{Vi}$$

Where:

V = time average speed

Vi = the speed of i-vehicle

<u>Space average speed</u>

Space average speed is the vehicles average speed obtained by dividing the travelled distance with travelled time through formula below:

D R A F T

$$\boldsymbol{u = \frac{\sum_{i=1}^{n} Si}{\sum_{i=1}^{n} mi}}$$

Where:

u = space average speed

n = number of observed vehicles

Si = travelled distance of i vehicles

mi = travelled time of i vehicles

Road Capacity

The capacity calculation formula of road with median is different with calculation in road without median. Referring to MKJI, road capacity can be calculated by:

$$C = Co \times FCw \times FCsp \times FCsf \times FCcs$$

Where,

C = road capacity (pcu/hour)

Co = basic capacity

FCw = correction factor for road width

FCcs = correction factor caused by two way direction

FCsf = correction factor caused by side friction

FCcs = correction factor caused by area

Degree of Saturation

Degree of saturation is the ratio of traffic total volume (C) with road capacity (Q).

$$\boldsymbol{DS = \frac{Q}{C}}$$

Where:

DS = degree of saturation

Q = traffic total volume (pcu/hour)

C = road capacity

Traffic manner can be determined based on observed DS. DS is classified as below:

- DS ≤ 0.75 = good road service quality
- DS > 0.75 = bad road service quality

Road Service Level

Indeks Tingkat Pelayanan Jalan (ITP) or Road Service Level Index (RSLI) on road shows the overall condition of the roads. The service level is determined based on quantitative value as Volume Capacity Ratio (VCR), travel speed and other factors determined by quantitative value e.g. the driver freedom to choose their speed, the degree of traffic jams, and convenience. In general, the level of service can be distinguished as follows:

a. RSLI A : traffic condition where traffic flow freely from one vehicle to another vehicle. Speed is entirely determined by the driver and in accordance with applicable speed limit.
b. RSLI B: stable traffic conditions, speed is limited by other vehicles and obstacles occurred by the surrounding vehicles.

D R A F T

c. RSLI C: stable traffic condition with bigger obstacle than SLI B.
d. RSLI D: unstable traffic condition where the speed is significantly decreased caused by occurred obstacle and free space is relatively small.
e. RSLI E: traffic volume is approach the road capacity and speed is below 40 km/hr. traffic movement is hampered.
f. RSLI F: the traffic condition is forced, relative speed is low and traffic movement is jam and caused a long vehicle queue.

The traffic condition of several arteries is shown in Table 3-1,

Table 3-1 RSLI Based on Average Speed

SLI	Artery Class		
	I (72 – 56 km/hour)	II (56 – 48 km/hour)	III (56 – 40 km/hour)
	Average Speed (km/hour)		
A	≥56	≥48	≥40
B	≥45	≥38	≥31
C	≥35	≥29	≥21
D	≥28	≥23	≥15
E	≥21	≥16	≥11
F	<21	<16	<11

Source: (Tamin, 2000)

Table 3-2 RSLI Based on Free Speed and Degree of Saturation

Service Level	% from free speed	Degree of Saturation
A	≥ 90	≤0,35
B	≥70	≤0,54
C	≥50	≤0,77
D	≥40	≤0,93
E	≥33	≤1,0
F	<33	<1

Source: (Tamin, 2000)

3.11 Socio Culture, Socio Economy and Public Health

Villages potentially within the area of influence of the proposed project were addressed in the socio-economic and socio-cultural survey, including four villages in Wattang Pulu Sub-district. The project has the potential to influence the socio-economic and socio-cultural aspects of the project area. A socio-economic and socio-cultural survey identifies the current conditions that may be affected by future project consequences. A total of 120 residents were involved in the survey activity.

General socio-economic and socio-cultural information were collected during the secondary data review. To develop a baseline of socio-economic and socio-cultural conditions in the Wattang Pulu Sub-district, primary data including social, economic, cultural, and health components were gathered primarily through interviews and socio-economic surveys with the local communities in Mattirotasi Village, Lainungan Village, Lawawoi Village and Uluale Village.

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4.0 STUDY RESULTS

4.1 Land Use and Planning

Based on ground truthing result, the predominant land use within the project boundary is non-cultivated areas which consist of grassland and some hardwood trees that function as land boundary markers. The coverage area of non-cultivated areas reaches 66.59% of the total area of the project boundary and the remaining is cultivated area which consists of corn, teak wood, cashew, paddy field.

In terms of the proposed WTG locations, it was found that most of the proposed WTG locations (17 of 28) are in cultivated areas. This is because many communities/farmers prefer to locate cultivated areas on ridgelines, and similarly, the prime locations for placement of the WTGs are along the ridgeline. Table 4-1 shows the percentage of land use in the project area.

The location and photograph of each WTG that has been surveyed is described in **Appendix A.**

Table 4-1 Land Use in the Project Area

Land Use Identification	Land Use Classification	Area (Ha)	%	WTG ID
Paddy Field	Cultivation	18.98	0.84%	-
Corn & Cashew	Cultivation	302.62	13.44%	T02A, T03A, T04A, T06A, T12A, T14A, T24A, T20A
Teak Wood & Wooden Trees	Cultivation	274.89	12.21%	T01A, T08A, T11A, T19A, T21A, T22A, T25A
Cashew, Teak Wood, Wooden Trees	Cultivation	155.75	6.92%	T10A, T26A
Grassland & Hardwood Trees	Non-Cultivation	1499.60	66.59%	T05A, T07A, T09A, T13A, T15A, T16A, T17A, T18A, T23A,T27A, T28A

Source: Ground truthing result (December, 2013) and imagery interpretation (January, 2014)

It should be noted that none of the WTGs are located on a paddy field; however the substation and the high voltage transmission line are located in paddy field area.

Referring to the Spatial Plan Map from Sidenreng Rappang Government Regulation No. 5/2012 (Figure 4-1), the entire project boundary is located in cultivated area. The cultivated area is divided into various sub-areas. The project area consists of two sub-areas, including agricultural area and limited production forest. The predominant spatial pattern within the project boundary is agricultural at 69.14% of the total project area. The agricultural areas consist of paddy field, corn, cocoa, palm oil, coffee, cashew, castor oil, pepper and hazelnut. Table 4-2 shows the percentage of land use in the project area. The land use map is shown in Figure 4-2.

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Table 4-2 Percentage of Land Use in the Project Area

No	Spatial Pattern	Spatial Pattern Classification	Area (Ha)	Percentage	WTG ID
1	Agricultural	Cultivation	1555.69	69.14%	T03A, T04A, T05A, T06A, T07A, T09A, T11A, T12A, T14A, T15A, T16A, T17A, T18A, T20A, T23A, T24A, T28A
2	Limited Production Forest	Cultivation	694.30	30.86%	T01A, T02A, T08A, T10A, T13A, T19A, T21A, T22A, T25A, T26A, T27A

Source: Interpretation of Spatial Plan Map as per Sidenreng Rappang Government Regulation No. 5/2012

Based on the spatial plan, there is overlap between cultivated area, mining area and livestock area. Figure 4-1 shows the spatial pattern near the project area map based on Sidenreng Rappang Government Regulation No. 5/2012.

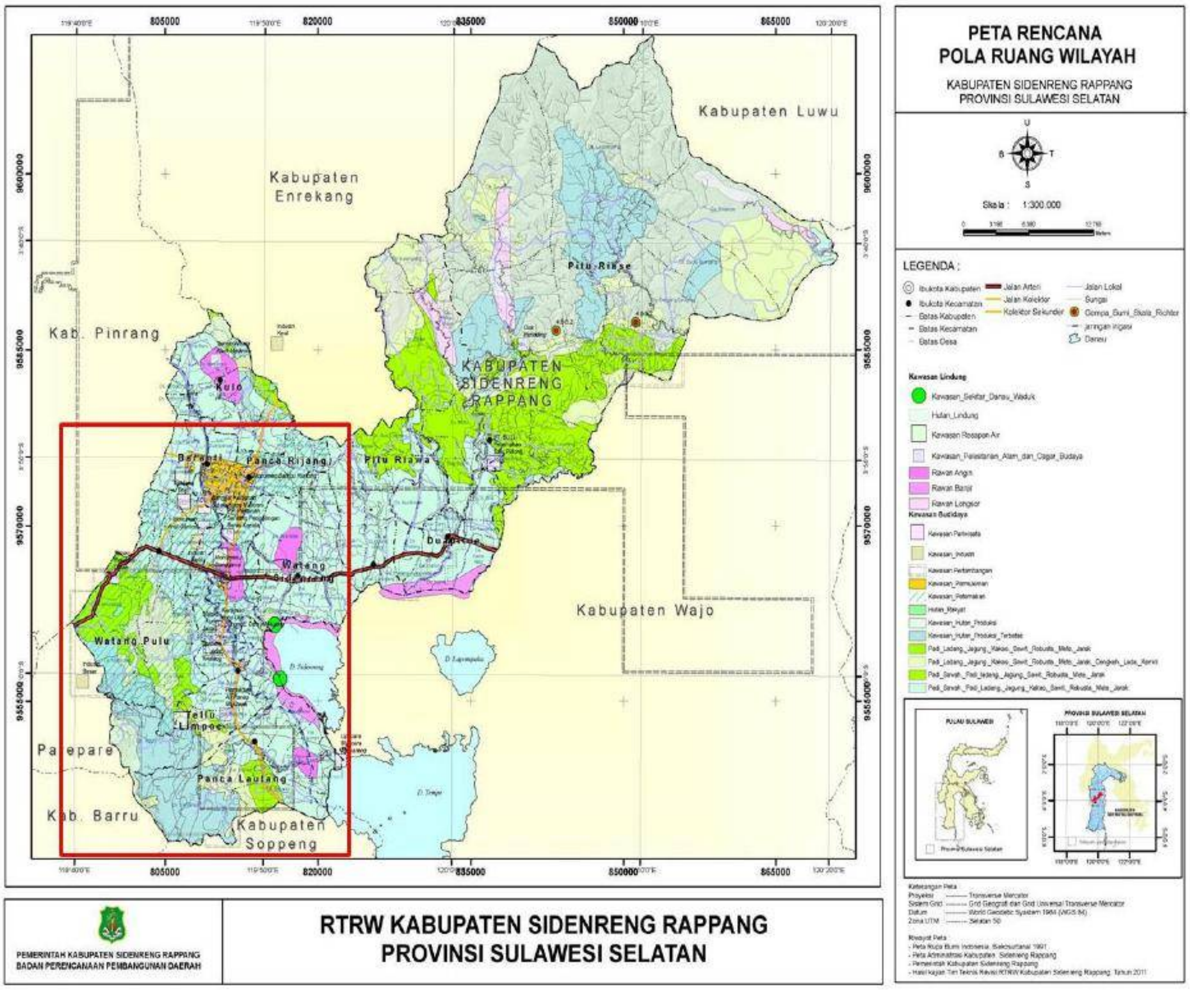

Figure 4-1 Spatial Map of Sidenreng Rappang (Sidenreng Rappang Government Regulation No. 5/2012)

Based on the field survey, the project area complies with the applicable spatial pattern.

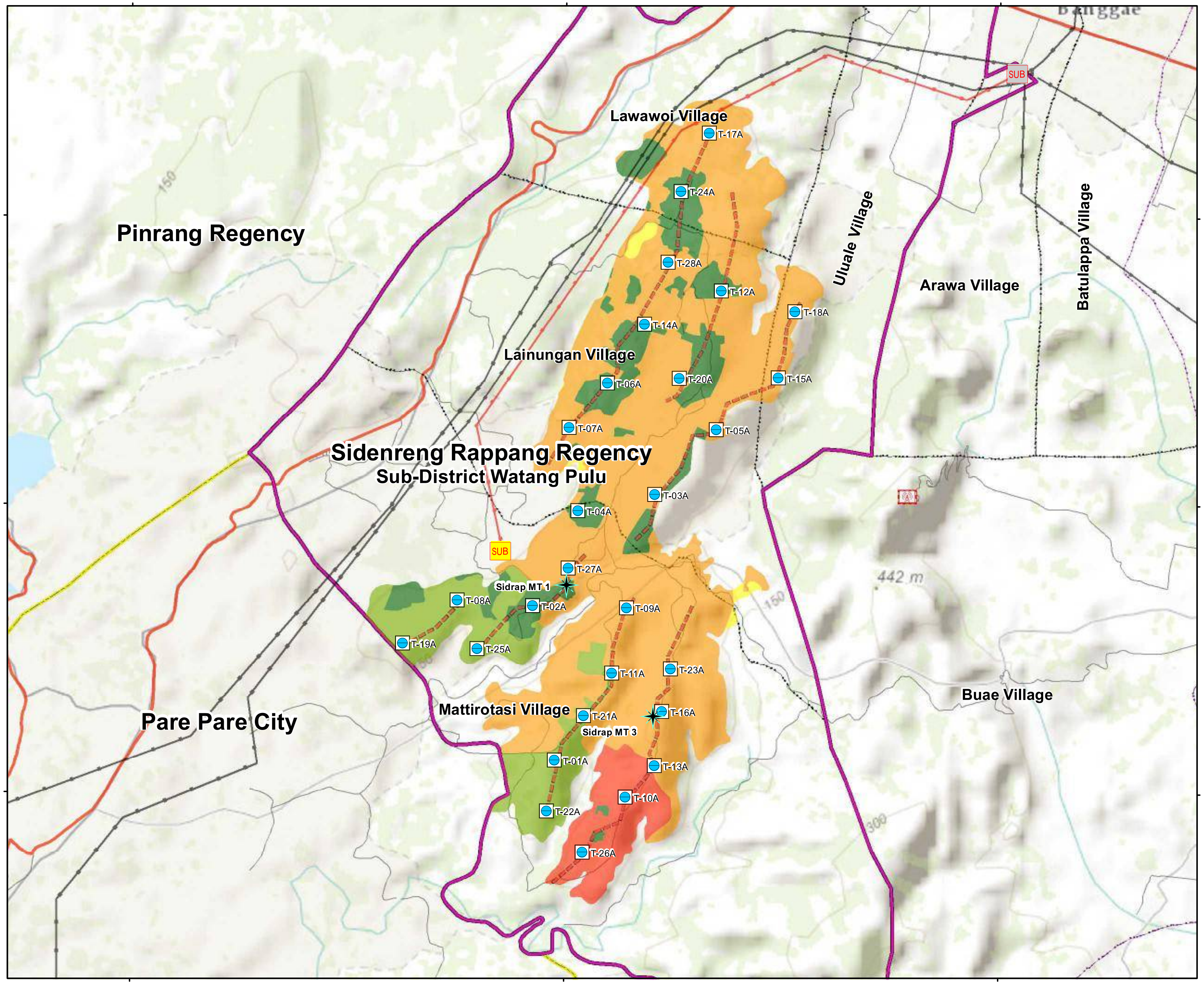

FIGURE
4-2

CLIENT

UPC Renewables

PT UPC Sidrap Bayu Energi

Map Title

LAND USE MAP OF STUDY AREA

Administration Detail

Regency	Sidenreng Rappang
Province	Sulawesi Selatan

Scale Map

Scale 1:70,000 on A4 paper

0.55 0.275 0 0.55 1.1 1.65
Kilometers

Map Location

Legend

- Met Tower
- Proposed WTG
- PLN Substation
- Proposed UPC Substation
- Existing Transmission Line
- Proposed Transmission Line
- Proposed WTG Strings
- Comm Tower
- Study Boundary
- Regency Boundary
- Sub-District Boundary
- Village Boundary
- Arterial Road
- Local Road

Land Use

- Paddy Field
- Corn& Cashew
- Cashew, Teak Wood, Wooden Trees
- Teak Wood& Wooden Trees
- Grassland & Wooden Trees

Data Source

1. PT UPC Sidrap Bayu Energi
2. ESRI Topographic Map
3. Land Use Survey Dec 2013

Parameter

Datum	World Geodetic System 1984
Projection	Universal Transverse Mercator
Zone	50 South
Unit	Meter

Rev.	BY	DATE	DESCRIPTION	CHKD	APPD
0	IDR	22 Jan 2014	Draft of land use mapping		

Revision: 0

Created: IDR	Date: 13 Jan 2014	Project ID: IDJKT14001
Checked:	Date:	File Name: Fig4-2-Land Use
Approved:	Date:	Status: DRAFT

Note

Provided by

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4.2 Climate

The climate of the study area is affected by the local geography, such as the altitude of the study area, land cover, soil surface and soil condition. The microclimate helps to describe the climatic condition of a particular study area. In the study area, there are a variety of land uses that may affect the climate. The only data collected related to climate for the area was monthly rainfall. Data from 1999 – 2013 was collected from the rainfall station at Pabbaresseng, Mattirotasi Village (Figure 4-3). Generally, the rainfall is higher at the beginning and end of the year, corresponding with the rainy season.

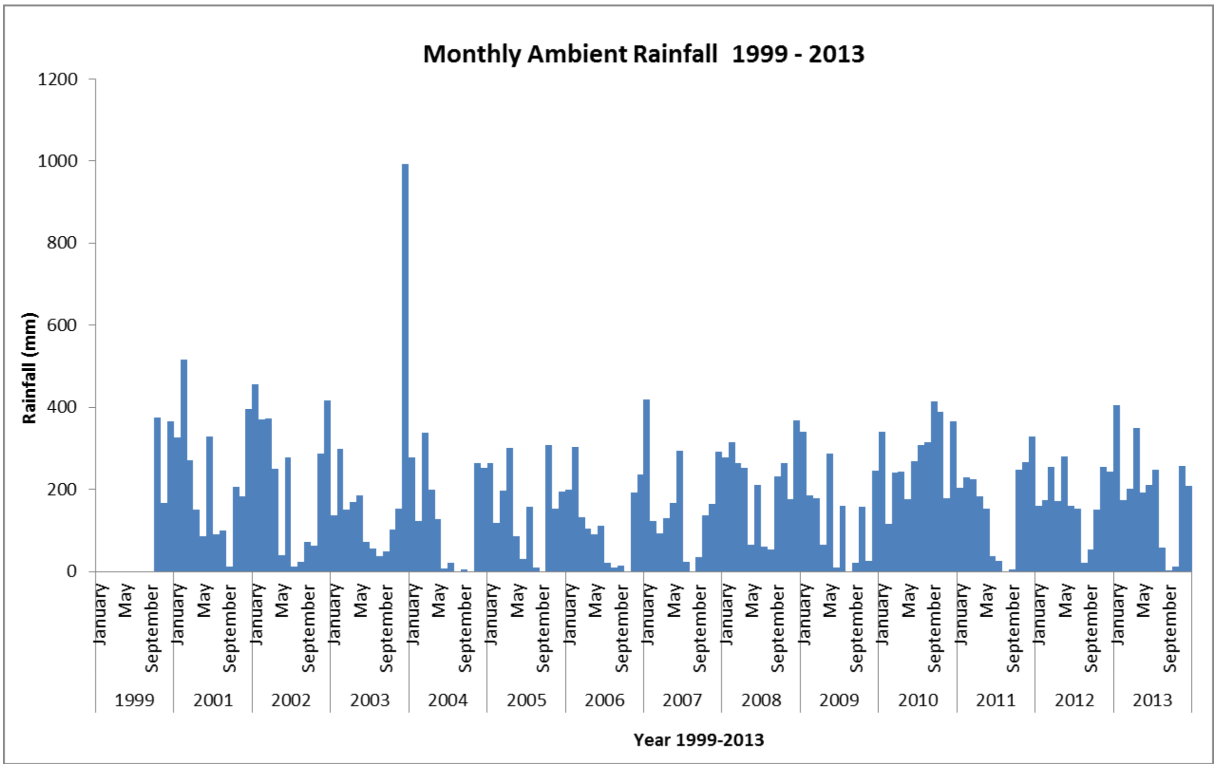

Figure 4-3 Monthly Rainfall Data (1999 – 2013)

4.3 Surface Hydrology and Hydraulics

4.3.1 Watershed

There are two national watershed areas in Sidrap Regency including:

1. Walanae Cenranae Watershed as national strategic watershed that covers Walanae – Cenranae Watershed, Bila Watershed, Siwa Watershed and Gilireng Watershed;
2. Saddang Watershed as a cross-provincial watershed that covers Kariango Watershed, Rappang Watershed, and Karajae Watershed.

The details of each watershed are presented in Table 4-3.

Table 4-3 Watershed Area in Sidrap Regency

No.	Watershed	Area (Km2)
1	Walanae – Cenranae Watershed	7,924
2	Bila Watershed	1,368
3	Siwa Watershed	268.40
4	Gilireng Watershed	518
5	Kariango Watershed	466.20
6	Rappang Watershed	379

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No.	Watershed	Area (Km2)
7	Karajae Watershed	142.45

The project location is included into Saddang - Kariango watershed. The watershed map can be seen in Figure 4-4.

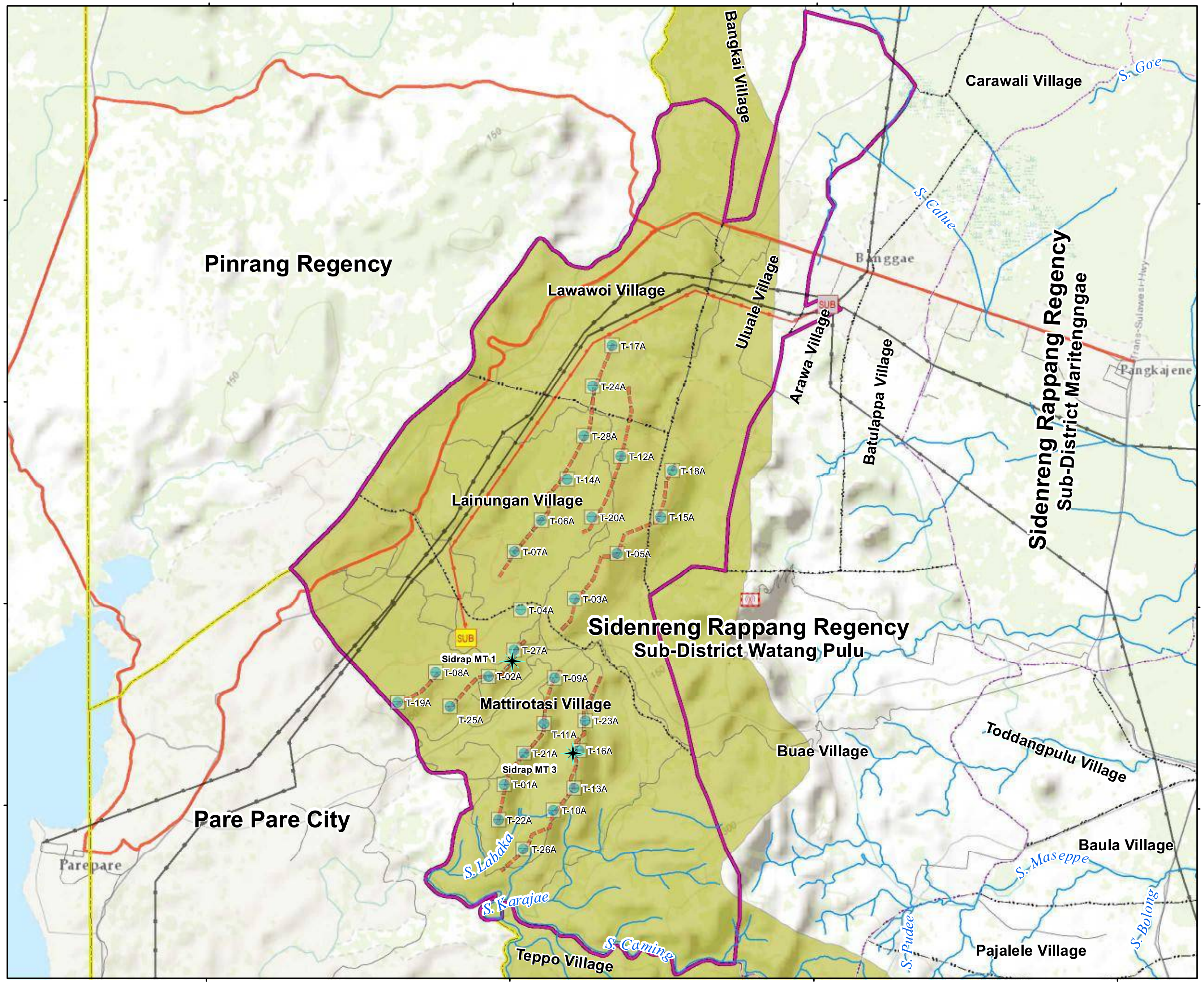

FIGURE 4-4	CLIENT: UPC Renewables — PT UPC Sidrap Bayu Energi

Map Title

WATERSHED AREA OF PROJECT LOCATION

Administration Detail

Regency	Sidenreng Rappang
Province	Sulawesi Selatan

Scale Map

Scale 1:100,000 on A4 paper

0.8 0.4 0 0.8 1.6 2.4 Kilometers

Map Location

Legend

- Met Tower
- Proposed WTG
- PLN Substation
- Proposed UPC Substation
- River
- Existing Transmission Line
- Proposed Transmission Line
- Proposed WTG Strings
- Comm Tower
- Study Boundary
- Regency Boundary
- Sub-District Boundary
- Village Boundary
- Arterial Road
- Local Road
- Watershed
- Saddang - Kariango

Data Source

1. PT UPC Sidrap Bayu Energi
2. ESRI Topographic Map

Parameter

Datum	World Geodetic System 1984
Projection	Universal Transverse Mercator
Zone	50 South
Unit	Meter

Rev.	BY	DATE	DESCRIPTION	CHKD	APPD
0	IDR	22 Jan 2014	Draft of biological sampling location		

Revision: 0	Created: IDR	Date: 22 Jan 2014	Project ID: IDJKT14001
	Checked:	Date:	File Name: Fig4-3-Watershed
	Approved:	Date:	Status: DRAFT

Note

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4.3.2 River Characteristics

The surface water in the proposed project area is comprised of several types of river. Based on the seasonal water quantity, the rivers observed during field survey can be categorized into two types, including:

- The periodic river type that has high water levels during the rainy season, and low levels during the dry season; and
- The episodic/ephemeral river type that only flows during and after rain events.

Table 4-4 below shows the river types observed within the study area, showing four ephemeral rivers and three periodic rivers. The river identified within study area is shown in Figure 4-5.

Table 4-4 Rivers in the Study Area

Rivers	Location	Type	Water Condition
Kamirie	Lainungan Village	Ephemeral	Flowing, Turbid
Pangepange (Abbeka*)	Lainungan Village	Ephemeral	Flowing, Turbid
Lempongpusae (Kulua*)	Lainungan Village	Periodic	Flowing, Turbid
Pabberessang	Pabberessang Sub-village, Mattirotassi Village	Ephemeral	Flowing, Turbid
Lapade	Mattirotassi Village	Ephemeral	Flowing, Turbid
Datae	Lainungan and Lawawoi Village	Periodic	Flowing, Turbid
Bangkai	Lawawoi Village	Periodic	Flowing, Turbid
Notes: *) local name			

The northern area includes Datae and Bangkai Rivers. Datae River is likely to be affected by the project because it would be a receiving water body from run-off from project activity. The Bangkai River generally collects water from outside the study area and is relatively far from the turbine locations. It is not likely to be impacted.

There is a pond located in Lainungan Village approximately 500 m from one of the proposed turbine locations. This pond collects water from run off from the study area. There is a man-made dam and reservoir, which provides a water resource to the local community. It receives waters from the project area via the Datae River and is located in Lawawoi Village approximately 930 meter northwest of a proposed turbine location.

The southern area is traversed by the Pangepange River and Lempongpusae River, both of which flow to the Kamirie River. The Kamirie River, as well as the Lapade River, flow into the Jawijawi River at Pare-pare. The Pabberessang River is located within Pabberessang Sub-village flowing into the Karajae River. There is also a large pond located in Mattirotassi village around 570 m from a proposed turbine location. This pond is not likely to be affected by the project activity due to the distance from the project location and separation by topography. Watersheds in the southern area are likely to be subject to greater impacts due to their location downstream (hill) of the turbine construction area.

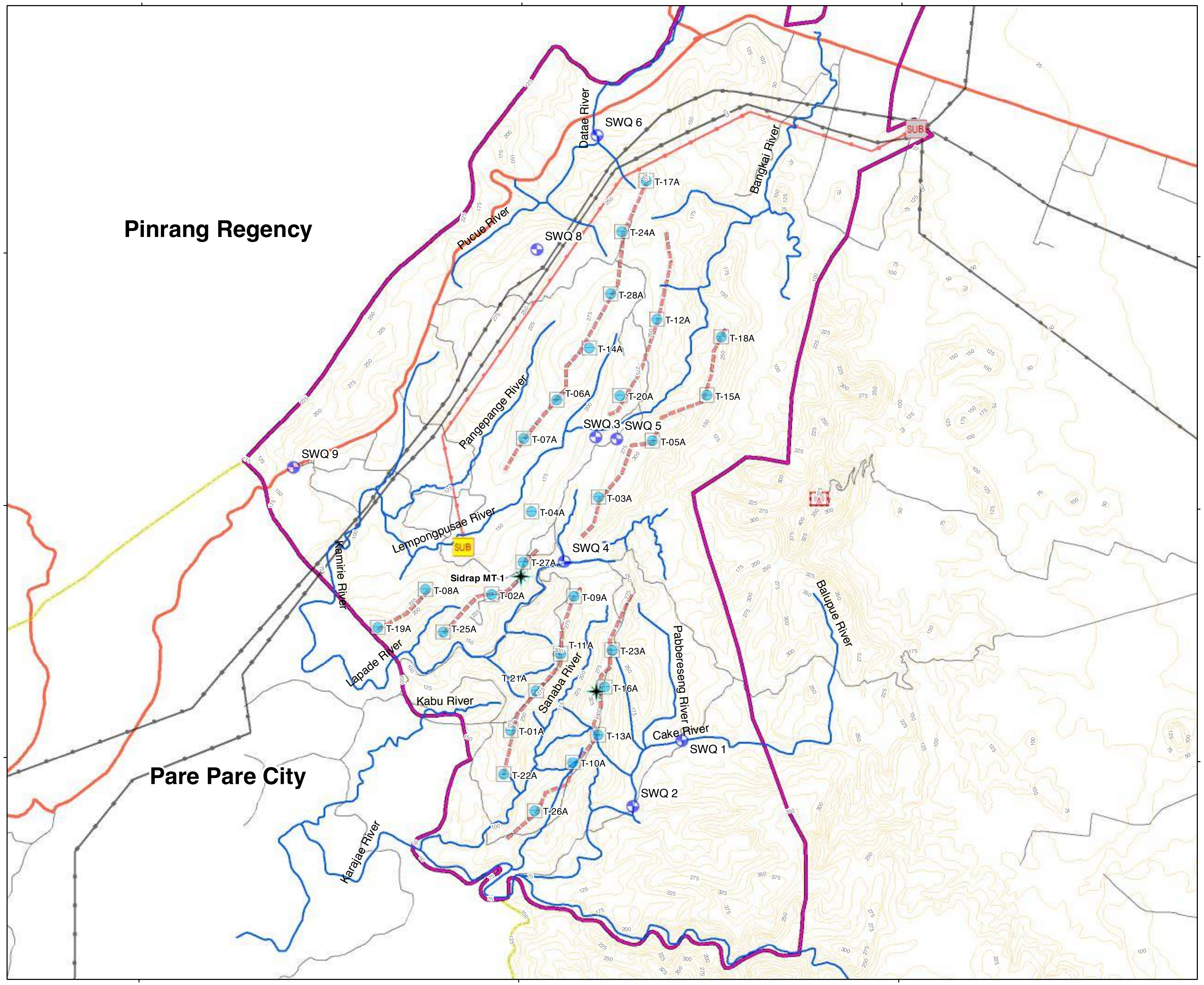

FIGURE 4-5	CLIENT: PT UPC Sidrap Bayu Energi

Map Title

RIVERS WITHIN THE STUDY AREA

Administration Detail

Regency	Sidenreng Rappang
Province	Sulawesi Selatan

Scale Map

Scale 1:80,000 on A4 paper

0.7 0.35 0 0.7 1.4 2.1 Kilometers

Map Location

Legend

- Aquatic Sampling
- Met Tower
- Proposed WTG
- PLN Substation
- Proposed UPC Substation
- River
- Contour
- Existing Transmission Line
- Proposed Transmission Line
- Proposed WTG Strings
- Comm Tower
- Study Boundary
- Regency Boundary
- Arterial Road
- Local Road

Data Source

1. PT UPC Sidrap Bayu Energi
2. ESRI Topographic Map
3. *Badan Informasi Geospasial* (Geospatial Information Agency)

Parameter

Datum	World Geodetic System 1984
Projection	Universal Transverse Mercator
Zone	50 South
Unit	Meter

Rev.	BY	DATE	DESCRIPTION	CHKD	APPD
0	IDR	7 Feb 2014	Draft of river map		

Revision: 0	Created: IDR	Date: 7 Feb 2014	Project ID: IDJKT14001
	Checked:	Date:	File Name: Fig4-5-River
	Approved:	Date:	Status: DRAFT

Note

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4.3.3 Surface Water Quality

Samples are collected from eight locations within the study area boundary. The sampling locations are presented in Table 4-5.

Table 4-5 Water Quality Sampling Location

Sample Name	Coordinate		Remarks
	Latitude	Longitude	
SWQ 1	03° 39' 50.5" S	119° 43' 16.2" E	Upstream Pabberessang River
SWQ 2	04° 00' 21.9" S	119° 42' 53.2" E	Downstream Pabberessang River
SWQ 3	03° 57' 26.5" S	119° 42' 35.0" E	Upstream Lapade River
SWQ 4	03° 58' 25.6" S	119° 42' 20.4" E	Downstream Lapade River
SWQ 5	03° 57' 27.5" S	119° 42' 45.0" E	Pond located at Lainungan Village
SWQ 6	03° 55' 03.2" S	119° 42' 35.3" E	Datae River Dam
SWQ 8	03° 55' 57.5" S	119° 42' 07.0" E	Water storage tank at Lawawoi village (Upstream of Datae River)
SWQ 9	03° 57' 41.4" S	119° 40' 11.9" E	Water storage tank at Kampung Baru sub-village (Upstream of Lempongpusae River)

The surface water sampling location can be seen in **Appendix B (Figure B-1).** The photographs of each river are presented in **Appendix C**.

Based on the field survey, there are several surface water sources within the study area, including Pabberessang River, Lapade River, a pond in Lainungan Village, Kulua River, Datae River and the Datae Reservoir in Lawawoi Village. Only the Lempongpusae and Datae Rivers are used by the local population. The utilization of surface water is described in Table 4-6.

Table 4-6 The Utilization of Surface Water Source Within Study Area

Surface Water	Utilization
Pabberasang River	Drink water source for cattle
Lapade River	Drink water source for cattle
Pond in Lainungan Village	Drink water source for cattle and fish farm activity
Datae Dam	Recreation
Datae River	Clean water source for Lawawoi Village
Lempongpusae River	Clean water source for Kampung Baru Village

Government Regulation No. 82/2001 concerning Water Quality and Water Pollution Control for Water Type I (raw water treated for the purpose of drinking water) is used as a water quality standard because it is more stringent than South Sulawesi Governor Regulation No 69 year 2010 concerning Quality Standard and Criteria of Environmental Damage. The results of lab testing of the water quality samples are shown in Table 4-7 below. All water quality parameters comply with the regulatory standard.

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Table 4-7 Analytical Results of Surface Water Quality

Parameter	Unit	Regulation		Results							
		PP 82/2001*	South Sulawesi Governor Regulation No 69/2010*	SWQ1	SWQ 2	SWQ 3	SWQ 4	SWQ 5	SWQ6	SWQ8	SWQ9
Physic											
Temperature	°C	±3	±3	28.7	28.4	26.7	26.5	26.6	27.06	26.37	26.5
TDS	mg/L	1000	1000	162	262	248	234	254	182	148	134
TSS	mg/L	50	50	20	21.6	20.4	18.8	23.6	18.8	8.4	12.4
Organic Chemical											
pH		6 – 9	6 – 8.5	7.8	7.8	8.07	7.8	8.05	8.09	8.1	8.04
BOD	mg/L	**2**	3	1.001	0.991	1.044	1.075	1.033	0.98	0.917	0.959
COD	mg/L	**10**	25	5.271	5.215	5.493	5.659	5.437	5.16	4.827	5.049
DO	mg/L	6	4	8.62	9.48	7.89	8.81	7.1	9.85	8.74	7.68
Phosphate Total as P	mg/L	0.2	0.2	0.028	0.023	0.004	0.032	0.016	0.037	0.033	0.04
NO3 as N	mg/L	10	10	0	0	0	0	0	0	0	0
NH3 -N	mg/L	**0.5**	-	0.181	0.053	0.064	0.052	0.063	0	0.01	0
Arsenic (As)	mg/L	**0.05**	1	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cobalt (Co)	mg/L	0.2	0.2	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Barium (Ba)	mg/L	**1**	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	mg/L	1	1	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Selenium (Se)	mg/L	**0.01**	0.05	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cadmium (Cd)	mg/L	0.01	0.01	<0.0230	<0.0230	<0.0230	<0.0230	<0.0230	<0.0230	<0.0230	<0.0230
Chromium Hexavalen (Cr6+)	mg/L	0.05	0.05	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chrom (Cr)	mg/L		-	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11
Copper (Cu)	mg/L	0.02	0.02	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Iron (Fe)	mg/L	**0.3**	-	0.158	0.149	0.088	0.272	0.253	0.131	0.051	0.017
Lead (Pb)	mg/L	0.03	0.03	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009
Physic											

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Parameter	Unit	Regulation		Results							
		PP 82/2001*	South Sulawesi Governor Regulation No 69/2010*	SWQ1	SWQ 2	SWQ 3	SWQ 4	SWQ 5	SWQ6	SWQ8	SWQ9
Mangannese (Mn)	mg/L	**0.1**	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Mercury (Hg)	mg/L	**0.001**	0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Zinc (Zn)	mg/L	0.05	0.05	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chlorida (Cl)	mg/L	**600**	-	6.007	4.729	6.859	6.092	6.22	3.025	3.451	4.303
Cianide (CN)	mg/L	0.02	0.02	0	0	0	0	0	0	0	0
Fluoride (F)	mg/L	**0.5**	1.5	0	0	0	0	0	0	0	0
Nitrite as N	mg/L	0.06	0.06	0	0	0	0	0	0	0	0
Sulphate	mg/L	**400**	-	3.768	3.971	3.006	3.607	3.04	4.234	0	3.903
Free Chlorine	mg/L	0.03	0.03	0	0	0	0	0	0	0	0
Sulphure as H2S	mg/L	0.002	0.002	0	0	0	0	0	0	0	0
Microbiology											
Total coliform	Number/100 mL	1000	5000	120	152	130	95	145	93	65	49
Organic Chemical											
Oil and Grease	ug/L	1000	800	0	0	0	0	0	0	0	0

Notes:
SWQ 1 Upstream Pabberessang River
SWQ 2 Downstream Pabberessang River
SWQ 3 Upstream Lapade River
SWQ 4 Downstream Lapade River
SWQ 5 Pond located at Mattirotassi Village
SWQ 6 Datae River Reservoir
SWQ 8 Water storage tank at Lawawoi village (Upstream Kulua River)
SWQ 9 Water storage tank at Kampung Baru sub-village (Upstream Datae River)

*) Government Regulation No. 82 year 2001 Water Quality and Water Pollution Control for Water Type I (raw water treated for the purpose of drinking water)
*) South Sulawesi Governor Regulation No 69 year 2010 concerning Quality Standard and Criteria of Environmental Damage
(-) No standard or guideline has been established for given parameter
µg/L micrograms per liter
mg/L milligrams per liter (parts per million)

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4.4 Groundwater

4.4.1 Groundwater Resource

The main water source for the community in or near the study area is water taken from springs or stream run-off. There were two springs identified during the survey, which, provide a water source for Lainungan Village and Pabberessang Sub-village. Due to the inaccessibility of the route to the spring location, the groundwater samples were taken from the nearest reservoir that holds the spring water. Generally, they use this water as a clean water source for household activity but sometimes use it for drinking water especially during the dry season. There also some dug out wells in residential areas, but the quantity is highly dependent on seasons. Table 4-8 identifies the sampling locations for groundwater quality within the study area.

Table 4-8 Groundwater Sampling Locations

Sample Names	Coordinate		Remarks
	Latitude	Longitude	
GWQ 1	03^0 59' 57.5" S	119^0 43' 11.5" E	Pabberessang Sub-village reservoir
GWQ 2	03^0 56' 10.9" S	119^0 41' 24.7" E	Lainungan Village reservoir

Details of groundwater sampling locations are presented in **Appendix B (figure B-1).**

4.4.2 Groundwater Quality

All water quality parameter results were compared to the regulatory standard (RL) defined by South Sulawesi Governor Regulation No 69 year 2010 regarding Quality Standard and Criteria of Environmental Damage, because in most cases it is more stringent than the clean water quality standard of the Minister of Health Regulation No. 416 year 1990 regarding Clean Water Quality Standards. The groundwater water quality results are presented in Table 4-9.

Table 4-9 Analytical Results of Groundwater Quality

Parameter	Regulation		Results	
	MoH No. 416/1990*	South Sulawesi Governor Regulation No 69/2010**	GWQ1	GWQ2
Physical				
Temperature	±3	±3	30.4	26.01
TDS	1500	1000	224	116
TSS	-	50	20.8	2.4
Chemical				
pH	6.5 - 9	6 – 8.5	7.8	7.51
BOD	-	2	1.128	0.949
COD	-	10	5.937	4.993
DO	-	6	**3.61**	6.34
Phosphate Total as P	-	0.2	0.015	0.018
NO_3 as N	10	10	0	0
NH_3-N	-	0.5	0.158	0
Arsenic (As)	0.05	0.05	<0.0001	<0.0001
Cobalt (Co)	-	0.2	<0.0001	<0.0001

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Parameter	Regulation		Results	
	MoH No. 416/1990*	South Sulawesi Governor Regulation No 69/2010**	GWQ1	GWQ2
Barium (Ba)	-	1	<0.0001	<0.0001
Boron (B)	-	1	<0.0001	<0.0001
Selenium (Se)	0.01	0.01	<0.0001	<0.0001
Cadmium (Cd)	**0.005**	0.01	<0.023	<0.023
Chromium Hexavalent (Cr6+)	0.05	0.05	<0.0001	<0.0001
Chromium (Cr)	-	-	<0.11	<0.11
Copper (Cu)	-	0.02	<0.0001	<0.0001
Iron (Fe)	**1**	3	0.174	0.027
Lead (Pb)	**0.05**	0.03	<0.009	<0.009
Manganese (Mn)	0.5	**0.1**	<0.0001	<0.0001
Mercury (Hg)	0.001	0.001	<0.0001	<0.0001
Zinc (Zn)	15	**0.05**	<0.0001	<0.0001
Chloride (Cl)	600	600	7.285	24.325
Cyanide (CN)	0.1	**0.02**	0	0
Fluoride (F)	1.5	**0.5**	0	0
Nitrite sebagai N	1	**0.06**	0	0
Sulfate	400	400	3.954	1.795
Free Chlorine	-	0.03	0	0
Sulphure as H2S	-	0.002	0	0
Oil and Grease	-	600	0	0
Microbiology				
Total Coliform	50	1000	145	35

Notes:
GWQ 1 Pabberessang Sub-village reservoir
GWQ 2 Lainungan Village reservoir

*) Government Regulation No. 82 year 2001 Water Quality and Water Pollution Control for Water Type I (raw water treated for the purpose of drinking water)
*) South Sulawesi Governor Regulation No 69 year 2010 concerning Quality Standard and Criteria of Environmental Damage
(-) No standard or guideline has been established for the given parameter
µg/L micrograms per liter
mg/L milligrams per liter (parts per million)

Based on the results shown in Table 4-9, the groundwater quality of GWQ1 and GWQ2 comply with the Regulatory standard, with the exception of Dissolved Oxygen (DO) concentration on GWQ1 which were lower than the regulatory standard. DO is an oxygen concentration in the water which can support the sustainability of aquatic organisms. It is normal that groundwater has low DO concentration due to anoxic environment which does not allow oxygen diffusion from the atmosphere.

4.5 Air Quality

Air quality monitoring was conducted at four sampling points. Seven air quality parameters (SO_2, NO_2, CO, Pb, O_3, H_2S and TSP) were analysed by the laboratory. The results of laboratory analysis are shown in Table 4-10. Compared to South Sulawesi Governor Regulation No 69/2010, all monitored parameters were below the threshold limit.

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Table 4-10 Laboratory Results of Air Quality Parameters

No	Parameter	Unit	Threshold Limit *	Results			
				AQ1	AQ2	AQ3	AQ4
1	Sulphur dioxide (SO_2)	µg/Nm^3	900	13.591	10.064	11.735	14.787
2	Nitrogen dioxide (NO_2)	µg/Nm^3	400	12.143	9.408	12.930	17.330
3	Carbon monoxide (CO)	µg/Nm^3	30,000	17.840	30.167	28.496	20.567
4	Lead (Pb)	µg/Nm^3	2	0.036	0.029	0.023	0.043
5	Ozone (O_3)	µg/Nm^3	235	21.240	14.898	26. 583	17.971
6	Hydrogen Sulphide (H_2S)	ppm	0.02	0.0058	0.0113	0.0095	0.0062
7	TSP	µg/Nm^3	230	11.295	22.232	32.021	28.044

Note:
*) South Sulawesi Governor Regulation No 69 year 2010 concerning Quality Standard and Criteria of Environmental Damage, annex III.A Ambient Air Quality Standards

AQ1 : S:04° 00' 00.4'' E: 119° 43' 02.9'' (Pabberesang Village)
AQ2 : S:03° 58' 21.8'' E: 119° 42' 0.00'' (PT. UPC Meteorological tower)
AQ3 : S:05° 05' 45.3'' E: 119° 28' 29.1'' (Village Government Office)
AQ4 : S:05° 05' 43.6'' E: 119° 28' 28.6'' (Lainungan Village)

Detailed air quality sampling locations is shown in **Appendix B (Figure B-1).**

The *Indeks Standar Pencemar Udara* (ISPU) or Air Pollutant Standard Index (APSI) is determined by Decree of Head of Bappedal No. 107 year 1997 regarding Technical Guidance of ISPU Calculation and Information. ISPU/APSI reflects the air quality condition of certain area and its impact on health and vegetation. The ISPU/APSI categories are shown in Table 4-11.

Table 4-11 ISPU/APSI Levels and Health Impacts

APSI	Air Pollution Level	Health Impact
0 - 50	Good	Does not have an impact on human or animal health.
51 - 100	Moderate	No effect on human or animal health but does affect sensitive plants.
101 - 199	Unhealthy	Harmful to human and animal groups which are sensitive and could cause damage to plants or aesthetic values.
200 - 299	Very Unhealthy	Air quality that can be detrimental to health in a number of segments of the population exposed.
300 - 500	Dangerous	Hazardous air quality in general can be detrimental to health in the population (e.g. eye irritation, cough, phlegm and sore throat).

Several air quality parameters were converted into APSI, including SO_2, NO_2, O_3 and CO as shown in Table 4-12. Based on ISPU/APSI calculation, the project location is categorized as good air ambient quality. There are no existing activities within the study area that result in significant air pollution issues.

Table 4-12 APSI Category within the Project Location

Parameter	Ia	Ib	Xa	Xb	Xx	I	APSI Category
SO_2	50	0	80	0	12.57	7.86	**Good**
NO_2	50	0	0	0	12.95	-	**Good**
O_3	50	0	120	0	20.17	8.41	**Good**
CO	50	0	34	17	24.27	21.38	**Good**
Conclusion							**Good**

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Note:
Ia : upper limit   Ib: lower limit
Xa: upper ambient limit   Xb: lower ambient limit   Xx: ambient level (calculation result)

4.6 Noise

The project has the potential to increase ambient noise levels during the construction phase and during operation of the WTGs. Those affected by noise from the project are those located near the impact area, referred to as sensitive receptors. The survey points were chosen based upon sensitive receptor locations e.g. the nearest residences. It is typical in rural agricultural areas for noise levels to be relatively low. Standards for noise impacts include Government of Indonesia standards as well as IFC. The GOI threshold is 55dB in residential areas and IFC's strictest standard is 45dB at the façade of residential buildings. The noise measurement results are presented in Table 4-13. Based on the results below, only AQ 2 and AQ4 ambient levels are within the government threshold limit, while noise levels at other areas exceed the threshold limit. As previously mentioned, noise sampling will be re-surveyed for 24-hour periods for greater accuracy.

Table 4-13 Noise Level Measurements

No	Location	Unit	Threshold Limit*	Results
1	AQ1	$\mu g/Nm^3$	55	58.3
2	AQ2	$\mu g/Nm^3$	55	35.9
3	AQ3	$\mu g/Nm^3$	55	56.6
4	AQ4	$\mu g/Nm^3$	55	52.6

Note:
*) Minister of Environment Regulation No.48 year 1996 regarding Noise Level Standard

AQ1 : S:04° 00' 00.4'' E: 119° 43' 02.9'' (Pabberesang Village)
AQ2 : S:03° 58' 21.8'' E: 119° 42' 0.00'' (Mattirotasi Village)
AQ3 : S:05° 05' 45.3'' E: 119° 28' 29.1'' (Village Government Office)
AQ4 : S:05° 05' 43.6'' E: 119° 28' 28.6'' (Lainungan Village)

Noise sampling locations is shown in **Appendix B (figure B-1)**.

4.7 Terrestrial Biota

Bibliographic terrestrial biota information for Sidrap is not available, as the area is not well studied or reported in journals. The following discussion provides terrestrial baseline information based on field observation, interviews with local residents, and incidental observations undertaken during the baseline survey. Survey locations are identified in the map in **Appendix A**.

4.7.1 Flora

Based on the field survey, the predominant land use within the study area is cultivated area, shrubs and grassland. The diversity of vegetation is quite low. Some areas are disrupted by land clearing activities for agriculture. Cultivated plants are commonly found in the project area, including corn (*Zea mays*), mango (*Mangivera indica*), jambu mete (*Anacardium occidentale*), kemiri (*Aleurites moluccana*), banana (*Musa paradisiaca*), etc. Neither endemic species nor protected species was found in the study area. Detailed records of the agricultural plants identified within the Project boundary are shown in the table below.

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Table 4-14 List of Vegetation within the Project Boundary

No.	Local Name	Scientific Name
1	Jambu Mete	*Anacardium occidentale*
2	Kayu daja	*Cassia pistula*
3	Angsana	*Pterocarpus indicus*
4	Jati	*Tectona grandis*
5	Jati Putih	*Gmelinaa arbórea*
6	Sukun	*Actocarpus altilis*
7	Kelapa	*Cocos nucifera*
8	Nangka	*Actocarpus integra*
9	Kedondong	*Spondias pinnata*
10	Gamal	*Gliricidia sepium*
11	Akasia	*Acacia auriculaiformis*
12	Kapuk	*Ceiba pentandra*
13	Kemiri	*Aleurites moluccana*
14	Jagung	*Zea mays*
15	Mangga	*Mangifera indica*
16	Pisang	*Musa paradisiaca*
17	Kayu jawa	*Lannea sp*
18	Lantoro	*Leucaena glauca*
19	Putri malu	*Mimosa pudica*
20	Beringin	*Ficus benyamina*
21	Waru	*Hibiscus tiliaceus*
22	Pulai	*Alstonia scholaris*
23	Orok-orok	*Crotalaria striata*
24	Jarak	*Jatropa curcas*
25	Temblekan	*Lantana camara*
26	Kirinyu	*Eupatorium odoratum*
27	Sidaguri	*Sida ronbifolia*
28	Malapao	*Mangufera sp.*
29	Coppeng	*Zysigium communi*
30	Kepuh/kalujang	*Sterculia foetida*
31	Lobi lobi	*Flacourtia inermis*
32	Bampu	*Morinda bracteata*
33	Kayu tangkurbuaja	Bombacaceae (Fam.)
34	Babadotan	*Ageratum sp.*
35	Tapak liman	*Elephantopus scaber*
36	Meniran	*Phylanthus urinaria*
37	Pecut kuda	*Starcytarpeta sp*
38	Patikan	*Euphorbia hirta*
39	Keladi	*Colocasia sp*
40	Jarak	*Jatripa curcas*
41	Bayam duri	*Amaranthus spinosus*
42	Terong cipoka	*Solanum torvum*
43	Jambu biji	*Psidium guajava*
44	Palem hitam	*Pinanga caesia*
45	Alang alang	*Imperata cylindrica*
46	Teki	*Cyperus sp*

4.7.2 Fauna

4.7.2.1 Mammals

Mammals in the study location are primarily domesticated livestock such as cows and buffalo. Wild mammals were sparse and likely live quite far from the local community and avoid open areas. Only a Celebes Macaque (*Macaca maura*) was identified in the border of protected forest nearby VP4. This primate is a Sulawesi endemic species.

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Table 4-15 List of Mammals within the Project Boundary

No.	Local Name	Common Name	Scientific Name	Conservation status		
				GR No.7/1999	IUCN	CITES
1	Sapi/Saping	Cow	*Bos indicus*			
2	Babi /Bawi	Wild pig	*Sus scrofa*		Insp	
3	Monyet/Ceba	Celebes Macaque	*Macaca maura**	P	LC	A2
4	Tikus/ Balao	Mause	*Mus musculus*		Insp	
5	Kelelawar /Panning	Bat	*Dobsonia exoleta*		LC	
6	Codot/Panning beccu	Small bat	*Pteropus edulis*		LC	
7	Kerbau/Tedong	Buffalo	*Bubalus bubalus*		-	

Notes:
*) endemic species
P = Protected species by Indonesia as per Government Regulation No. 7 Year 1999 concerning Flora and Fauna Conservation
IUCN: Insp= Invasive Species Alien; LC= Least Concern
CITES: A1 = Appendix I; A2 = Appendix II; A3 = Appendix III

4.7.2.2 Birds

Habitat

Generally, the project location is dominated by grassland and shrubs. Based on the forestry map, the land status in project area is production forest and community forest. The community forest is dominated by cashew trees and teak wood. This forest can be found in Matirotasi Village, Lainungan Village, Lawawoi Village, and Uluale Village. Corn was found in Lainungan Village which is located near the proposed area for WTG 6 – 7. While most of the area is cultivated, there are some existing ecosystems that support the existence of birds for nesting and foraging.

There are, however several water bodies which provide suitable habitat for wildlife within the study area. In addition, the project area is located between two large bodies of water (lakes and the sea), which may be a travel route for some bird species.

Bird Diversity and Their Conservation Status

A total of 30 bird species were identified in the study area. Seventeen of these bird species were observed at five vantage points and 13 species were recorded based on interviews with local residents and incidental observation at the villages within the study area.

The list of bird species observed in study area is presented in Table 4-16. There are five protected bird species as per Indonesian Government Regulation (GR) No. 7 Year 1999 concerning Flora and Fauna Conservation. Two endemic species, namely Serak Sulawesi (*Tyto rosenbergii*) and Caladi Sulawesi (*Dendrocopos temminckii*) reportedly exist within study area, as reported by community members. According to the Red List Data Book released by the IUCN (International Union for Conservation of Nature), all of the bird species recorded are categorized as Least Concern (LC), except for the Java Sparrow (*Padda oryzivora*) and Sulawesi Owl (*Tyto rosenbergii*) which are listed as Vulnerable (VU). The Java Sparrow (*Lonchura oryzivora*) also known as the Java Finch or Java Rice Bird is a resident breeding bird in Java, Bali and Bawean in Indonesia. It is a popular cage bird, and has been introduced in a large number of islands including Sulawesi. Their main habitats are agricultural area, paddy field, shrubs with dispersed trees and residential area. The Sulawesi Owl (*Tyto rosenbergii*) lives in agricultural areas with few trees, grass lands, coconut plantations and the forest edge. Owls are nocturnal and can be considered raptors; however, for the purposes of this study, they are not classified as raptors.

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There were four species on Appendix II of CITES (Convention on International Trade in Endangered Spesies of Wild Fauna and Flora) list. Appendix II lists species that are not necessarily now threatened with extinction but that may become so unless trade is closely controlled. It also includes so-called "look-alike species", i.e. species whose specimens in trade look like those of species listed for conservation reasons.

Table 4-16 List of Bird of Study Area

No.	Species	Common Name	Local Name	GR No.7/1999	IUCN	CITES	Remarks
1	*Ardeola speciosa*	Javan pond heron	Blekok sawah		LC		
2	*Bulbulcus ibis*	Cattle Egret	Kuntul kerbau /Campong		LC		
3	*Elanus caeruleus*	Black-winged Kite	Elang tikus/ janna	P	LC	A2	
4	*Ictinaetus malayensis*	Black Eagle	Elang hitam/ Sikko	P	LC	A2	
5	*Falco moluccensis*	Spotted Kestrel	Alap-alap sapi	P	LC	A2	
6	*Gallus gallus*	Red junglefowl	Ayam hutan/ manu ale		LC		
7	*Turnix suscitator*	Barred button-quail	Gemak loreng/ Puro		LC		
8	*Columba vitiensis*	Metallic Pigeon	Merpati hutan metalik/Bekku dare		LC		
9	*Streptopelia chinensis*	Spotted Dove	Tekukur/ Bekku lompo		LC		
10	*Geopelia striata*	Zebra Dove	Perkutut jawa/Bekku jawa		LC		
11	*Centropus bengalensis*	Lesser coucal	Bubut alang-alang/ Kalukku		LC		
12	*Tyto rosenbergii*	Sulawesi Owl	Serak sulawesi/ Serra		VU	A2	Endemic to Sulawesi
13	*Caprimulgus affinis*	Savana Nightjar	Cabak kota/Laga-laga tanah		LC		
14	*Collocalia vanikorensis*	Uniform Swiftlet	Walet		LC		
15	*Halcyon chloris*	Collared Kingfisher	Cekakak sungai/ Jikki	P	LC		
16	*Dendrocopos temminckii*	Sulawesi Woodpecker	Caladi sulawesi / Tampali toto		LC		Endemic to Sulawesi
17	*Hirundo tahitica*	Pacific Swallow	Layang-layang/ Kori-kori		LC		
18	*Dicrurus hottentottus*	Hair-crested Drongo	Srigunting jambul/Patikko		LC		
19	*Pycnonotus aurigaster*	Sooty-headed bulbul	Kutilang		LC		
20	*Oriolus chinensis*	Black –naped Oriole	Kepudang kuduk hitam/Cakuridi		LC		
21	*Corvus enca*	Slender-billed Crow	Gagak/Kao-kao		LC		
22	*Saxicola caprata*	Pied Bush-chat	Decu belang/Kanci-kanci dongi		LC		
23	*Zosterops montanus*	Mountains White-eye	Kacamata gunung/ cui-cui		LC		
24	*Artamus leucorhynchus*	White-breasted Wood-Swallow	Kekep babi		LC		
25	*Nectarinia jugularis*	Sunbird	Burung madu/ Cui-cui	P	LC		

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No.	Species	Common Name	Local Name	GR No.7/1999	IUCN	CITES	Remarks
26	*Passer montanus*	Tree Sparrow	Burung gereja		LC		
27	*Lonchura Malacca*	Chestnut Munia	Bondol rawa/ Dongi sepang		LC		
28	*Lonchura mollucca*	Black-faced Munia	Bondol taruk / Dongi pere		LC		
29	*Lonchura pallida*	Pale-headed Munia	Bondol kepala pucat/Dongi peca-ulu		LC		
30	*Padda oryzivora*	Java sparrow	Gelatik jawa/ Dongi jawa		VU		

Notes:
P = Protected species by Indonesia as per Government Regulation No. 7 Year 1999 concerning Flora and Fauna Conservation
IUCN: Vu= Vulnerable; LC= Least Concern
CITES: A1 = Appendix I; A2 = Appendix II; A3 = Appendix III

During the survey, target species (raptors and migratory birds) were observed. Aside from Sulawesi owl (VU), three other raptors including the black eagle (*Ictinaetus malayensis*), spotted kestrel (*Falco moluccensis)* and black-winged kite (*Elanus caeruleus*) were spotted. The black eagle was spotted on VP1, VP2, VP3 and VP5. The black eagle is a resident bird that lives in hills and mountain areas. The spotted kestrel is widely dispersed, living in grasslands, trees, agriculture areas and the edge of primary and secondary forest. This species was spotted on VP1, VP4 and VP5. The black-winged kite is a resident bird and common found in grassland and agriculture area. During observation, the black-winged kite was only spotted in VP5. These three raptors are categorized in the protected species list as per GR No 7 /1999. IUCN categorized these species into Least Concern (LC) species list. The results of the vantage point surveys are shown in Table 4-17 and Figure B-2 in **Appendix B**.

Fly Pattern

During observation, it was noted that most of the birds fly below 50 m height except the Pacific swallow (*Hirundo tahitica*) and raptors including the black eagle, spotted kestrel and black-winged kite which often fly higher than 50 m. There was no specific fly pattern of those birds. The risk of fatality to most birds from the WTGs due to collision is considered to be low, with the exception of raptors.

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Table 4-17 List of Birds and Observed Locations in Study Area

No.	Species	Common Name	Local Name	VP 1	VP 2	VP 3	VP 4	VP 5	Others
				WTG 9- 11	WTG 2- 27	WTG 17 -24	WTG 15 -18	WTG 6 - 7	
1	*Ardeola speciosa*	Javan pond heron	Blekok sawah/Campong					√	Paddy field near WTG7
2	*Bulbulcus ibis*	Cattle Egret	Kuntul kerbau /Campong						Reported by local resident
3	*Elanus caeruleus*	Black-winged Kite*	Elang tikus/ janna					√	
4	*Ictinaeutus malayensis*	Black Eagle*	Elang hitam/ Sikko	√	√	√		√	
5	*Falco moluccensis*	Spotted Kestrel*	Alap-alap sapi	√			√	√	
6	*Gallus gallus*	Red junglefowl	Ayam hutan/ manu ale						Reported by local resident
7	*Turnix suscitator*	Barred button-quail	Gemak loreng/ Puro	√					
8	*Columba vitiensis*	Metallic Pigeon	Merpati hutan metalik/Bekku dare						Reported by local resident
9	*Streptopelia chinensis*	Spotted Dove	Tekukur/ Bekku lompo		√	√	√	√	
10	*Geopelia striata*	Zebra Dove	Perkutut jawa/Bekku jawa						Reported by local resident
11	*Centropus bengalensis*	Lesser coucal	Bubut alang-alang/ Kalukku		√		√	√	
12	*Tyto rosenbergii*	Sulawesi Owl	Serak sulawesi/ Serra						Reported by local resident
13	*Caprimulgus affinis*	Savana Nightjar	Cabak kota/Laga-laga tanah						Reported by local resident
14	*Collocalia vanikorensis*	Uniform Swiftlet	Walet					√	
15	*Halcyon chloris*	Collared Kingfisher	Cekakak sungai/ Jikki	√	√	√	√	√	
16	*Dendrocopos temminckii*	Sulawesi Woodpecker	Caladi sulawesi / Tampali toto						Reported by local resident
17	*Hirundo tahitica*	Pacific Swallow	Layang-layang/ Kori-kori	√	√	√	√	√	
18	*Dicrurus hottentottus*	Hair-crested Drongo	Srigunting jambul/Patikko			√	√	√	
19	*Pycnonotus aurigaster*	Sooty-headed bulbul	Kutilang	√	√	√	√	√	
20	*Oriolus chinensis*	Black –naped Oriole	Kepudang kuduk hitam/Cakuridi						Reported by local resident
21	*Corvus enca*	Slender-billed Crow	Gagak/Kao-kao		√	√		√	
22	*Saxicola caprata*	Pied Bush-chat	Decu belang/Kanci- kanci dongi	√	√			√	

D R A F T

No.	Species	Common Name	Local Name	VP 1	VP 2	VP 3	VP 4	VP 5	Others
23	*Zosterops montanus*	Mountains White-eye	Kacamata gunung/ cui-cui	V	V	V	V	V	
24	*Artamus leucorhynchus*	White-breasted Wood-Swallow	Kekep babi	V	V			V	
25	*Nectarinia jugularis*	Sunbrid	Burung madu/ Cui-cui						Matirotasi Village
26	*Passer montanus*	Tree Sparrow	Burung gereja						Matirotasi Village and rice mills
27	*Lonchura Malacca*	Chestnut Munia	Bondol rawa/ Dongi sepang	V		V		V	
28	*Lonchura mollucca*	Black-faced Munia	Bondol taruk / Dongi pere		V				
29	*Lonchura pallida*	Pale-headed Munia	Bondol kepala pucat/Dongi peca-ulu						Reported by resident
30	*Padda oryzivora*	Java sparrow	Gelatik jawa/ Dongi jawa						Reported by resident
	Species Richness			**10**	**11**	**9**	**8**	**15**	
	Species Diversity			**1,96**	**1,57**	**1,97**	**1,75**	**1,51**	
	Evenness			**0,85**	**0,65**	**0,89**	**0,84**	**0,55**	

*Note: *) Target species*

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Populations of Concern

Birds are highly mobile and cover a wide range. According to Birdlife International the threshold for inclusion as an "important population" is taken to be a complex of fields or a discreet area of land which regularly supports birdlife (i.e. recorded several times a year during the period when the birds are present) (Birdlife, 2013). In this case population justification was given to the target species (raptors and migratory birds).

The three raptors observed during the survey have a wide range, and hence do not approach the thresholds for Vulnerable under the range size criterion (Extent of Occurrence <20,000 km^2 combined with a declining or fluctuating range size, habitat extent/quality, or population size and a small number of locations or severe fragmentation). The population trend appears to be increasing, and hence the species does not approach the thresholds for Vulnerable under the population trend criterion (>30% decline over ten years or three generations). The population size may be moderately small to large, but it is not believed to approach the thresholds for Vulnerable under the population size criterion (<10,000 mature individuals with a continuing decline estimated to be >10% in ten years or three generations, or with a specified population structure). For these reasons the species is evaluated as Least Concern.

The Black Eagles are approximately 10,000-100,000 birds spread from northeastern Pakistan and the base of the Himalayas through Bhutan, India, and Sri Lanka, and down into Indochina, Malaysia and Indonesia, from 34° to 9°S. Adults are partial migrants (MacKinnon, et al., 1992). The local population appears to be decreasing. The spotted kestrel population is estimated to number in the tens of thousands and the local population appears to be increasing. The black-winged kite population is stable but threatened by the use of pesticides within its range. The key facts regarding these raptors are summarized below.

Table 4-18 Key Facts on Raptors in the Study Area

	Black Eagle (*Ictinaetus malayensis*)	**Spotted Kestrel (*Falco moluccensis)***	**Black-winged Kite (*Elanus caeruleus*)**
Current IUCN Red List category	Least Concern	Least Concern	Least Concern
Family	Accipitridae	Falconidae	Accipitridae
Population trend	Decreasing	Increasing	Stable
Country endemic	No	No	No

Source: (Birdlife, 2013)

4.7.2.3 Reptiles and Amphibians

Reptile and amphibian populations are not well studied in this area. Data gathered during this survey was collected through incidental observations while travelling around the survey site. Based on local information, pythons (*Python molurus*) exist within the study area. Neither endemic nor protected amphibian species were found in the study location. The list of reptile and amphibian species identified is presented in Table 4-19.

D R A F T

Table 4-19 Reptiles and Amphibians within the Study Area

No.	Local Name	Common Name	Scientific Name	Conservation status		
				GR No.7/1999	IUCN	CITES
Reptilian						
1	Ular sawah	Black tailed python	*Python molurus**	P	LC	A2
2	Kadal /Bucili	Many striped skink	*Mabouya multifasciata*		LC	
3	Kadal ekor biru/Bucili	Pacific bluetail skink	*Emoia caeruleocauda*		LC	
4	Biawak /Pararang	Water monitor	*Varanus salvator*		LC	
Amphibian						
1	Katak Air	Crab-eating frog	*Rana cancrivora*		LC	

Notes:
*) Protected species based on Government Regulation No. 7 Year 1999 concerning Flora and Fauna Conservation

4.7.2.4 Insects

Insects have an important role as ecological indicators. There were seven insect species found in the study area which are presented in Table 4-20. Neither endemic nor protected reptile species were found in the study area.

Table 4-20 List of Insects in the Study Area

No.	Local Name	Common Name	Scientific Name
1	Belalang	Grasshopper	*Valanga* sp.
2	Kumbang	Beetle	*unknown*
3	Capung	Clubtail dragonfly	*Gromphus* sp.
4	Kupu-kupu sayap hitam	Swallowtail butterfly	*Graphium* sp.
5	Kupu-kupu hitam putih	Albatross butterfly	*Appias* sp.
6	Kupu kuning tepi hitam	Emigrant butterfly	*Catopsilia* sp.
7	Jangkrik	Cricket	*Gryllidae* sp.

4.8 Freshwater Aquatic Biota

The following sections describe the analysis results of plankton and benthos samples taken during the field survey and observation as well as interview results on fish species in the major rivers. The aquatic biota sampling locations are shown in **Appendix B (Figure B-3).**

4.8.1 Plankton

Phytoplankton and zooplankton have fast growth rates and can be used as indicators of ecological change in short timescales. These organisms are quite sensitive to low levels of pollutants such as pesticides, which are a major anthropogenic stress on natural communities.

Samples were taken at the same locations as the surface water quality samples. A total of 18 phytoplankton species and 9 zooplankton species were identified from all samples. The details are presented in Table 4-21.

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Table 4-21 Plankton Identification Results

Phytoplankton		Zooplankton	
Phylum	**Species Number**	**Phylum**	**Species Number**
Chrysophyta	**8**	**Protozoa**	**5**
Chlorophyta	**4**	**Arthropoda**	**2**
Cyanophyta	**3**	**Rotaria**	**2**
Pyrrophyta	**2**		
Euglenophyta	**1**		

Abundance

A total of 17,209 phytoplankton individuals were collected in the study area. The most abundant class was Chrysophyta (51%), followed by Chlorophyta (24%), Cyanophyta (16%), Pyrrophyta (6%) and Euglenophyta (3%). The relative abundance of the phytoplankton taxa observed during this baseline survey is presented in Table 4-22.

Table 4-22 Phytoplankton Abundance by Sampling Location

Sampling Location ID	Abundance (Individual/m3)	Abundance of Groups				
		Chrysophyta	**Chlorophyta**	**Cyanophyta**	**Pyrrophyta**	**Euglenophyta**
SWQ1	2,812	1,431	647	460	187	87
SWQ2	3,004	1,580	682	459	189	94
SWQ3	2,998	1,522	764	426	188	98
SWQ4	2,601	1,347	638	384	146	86
SWQ5	2,888	1,480	668	473	175	92
SWQ6	2,906	1,410	711	503	180	102
Total	**17,209**	**8,770**	**4,110**	**2,705**	**1,065**	**559**

Notes:
SWQ 1 Upstream Pabberessang River
SWQ 2 Downstream Pabberessang River
SWQ 3 Upstream Lapade River
SWQ 4 Downstream Lapade River
SWQ 5 Pond located at Mattirotassi Village
SWQ 6 Datae River Dam

Based on abundance, the composition of phytoplankton of each sampling locations is dominated by Chrysophyceae (Figure 4-6). Chrysophyceae mainly occurs in oligotrophic (low nutrient) waters low in calcium.

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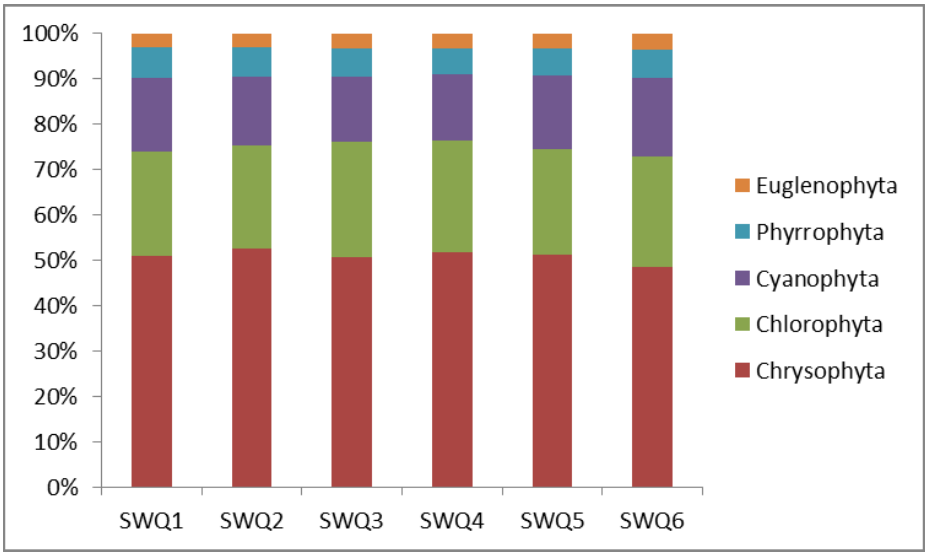

Figure 4-6 Percentage of Phytoplankton Abundance by Sampling Location

The zooplankton abundance recorded in the study area was 3,832 individuals/m^3 (Table 4-23), where Protozoa was the most dominant class (58%) on every station, followed by Arthropoda (28%) and Rotaria (14%) (Figure 4-7).

Table 4-23 Zooplankton Abundance by Sampling Location

Sampling Location ID	Abundance (Individual/m3)	Abundance of Groups		
		Protozoa	Arthropoda	Rotaria
SWQ1	546	342	148	56
SWQ2	548	340	146	62
SWQ3	680	377	190	113
SWQ4	696	394	179	123
SWQ5	650	361	196	93
SWQ6	712	406	202	104
Total	**3,832**	**2,220**	**1,061**	**551**

Notes:
SWQ 1 Upstream Pabberessang River
SWQ 2 Downstream Pabberessang River
SWQ 3 Upstream Lapade River
SWQ 4 Downstream Lapade River
SWQ 5 Pond located at Mattirotassi Village
SWQ 6 Datae River Dam

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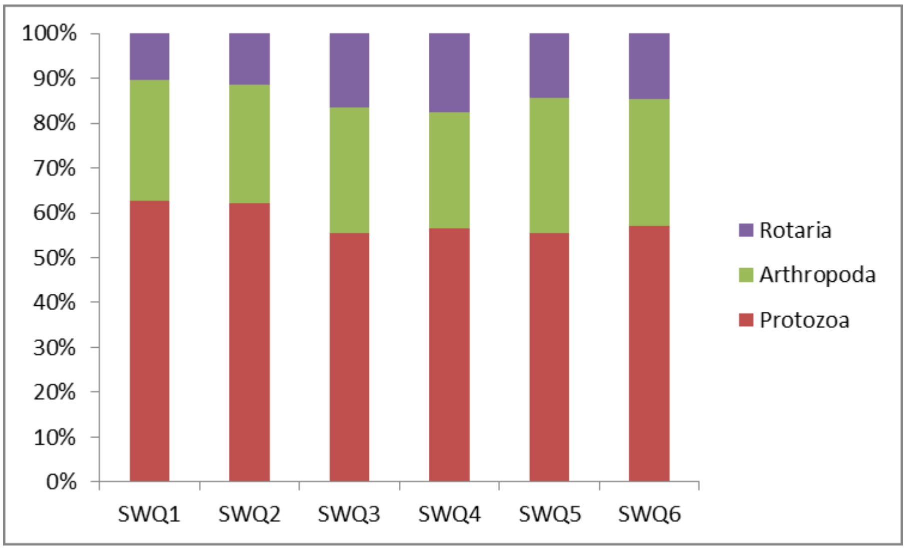

Figure 4-7 Percentage of Zooplankton Abundance by Sampling Location

Species Diversity, Richness, Evenness, and Dominance Index

The purpose of a diversity index (H') is to obtain a quantitative estimate of biological variability that can be used to compare biological entities, composed of discrete components, in space or in time. Two different aspects are generally accepted to contribute to the intuitive concept of diversity of a community: species richness and evenness. Species richness is the total number of species in the community (but note already that the actual number of species in the community is usually unmeasurable). Evenness expresses how evenly the individuals in the community are distributed over the different species. The dominance index shows the proportional abundance of the commonest species.

Odum divided the variables of the Shannon Wiener diversity index (SDI) into high (H'>4), moderate (2<H'<4) and low (H'<1) (Odum, 1971 (3rd Edition)). Based on the SDI, Sastrawijaya (1991) categorized the pollution levels are as follows:

Shannon Wiener diversity index	Pollution Level
H' > 2	Not polluted
1.6<H'<2	Low
1<H'<1.6	Moderate
H'<1	High

Evenness indices standardize abundance and range from near 0 when most individuals belong to a few species, to close to 1, when species are nearly equally abundant (Smith & Wilson, 1996).

The biology indices calculation results are presented in Table 4-24. Generally, the phytoplankton diversity index ranges between 2.80 – 2.83 and evenness index ranges between 0.97 – 0.98 (approximately 1), while the zooplankton diversity index ranges between 1.92 and 1.95 and evenness index ranges between 0.86 – 0.89 (approximately 1). The dominance Index, both of phytoplankton and zooplankton is low (approximately 0). In theory, the diversity index and evenness index are high when the dominance index is low and vice versa. Based on the results presented in the table, the diversity index and evenness index were high, while the dominance index was low in all sampling locations. It can be concluded that the surface water in the study location is of good quality with high biodiversity and no dominance between species (evenly distributed).

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Table 4-24 Biological Indices of Water Quality

Sampling Location ID	Number of Taxons	Diversity Index (Shannon Wiener Index)	Evenness Index	Dominance Index	Pollution Level
Phytoplankton					
SWQ1	18	2.80	0.97	0.06	Not polluted
SWQ2	18	2.80	0.97	0.07	Not polluted
SWQ3	18	2.83	0.98	0.06	Not polluted
SWQ4	18	2.83	0.98	0.06	Not polluted
SWQ5	18	2.80	0.97	0.07	Not polluted
SWQ6	18	2.82	0.97	0.06	Not polluted
Zooplankton					
SWQ1	9	1.89	0.86	0.11	Low pollution level
SWQ2	9	1.92	0.87	0.11	Low pollution level
SWQ3	9	1.95	0.89	0.11	Low pollution level
SWQ4	9	1.96	0.89	0.11	Low pollution level
SWQ5	9	1.92	0.87	0.11	Low pollution level
SWQ6	9	1.95	0.89	0.11	Low pollution level

Notes:
SWQ 1 Upstream Pabberessang River
SWQ 2 Downstream Pabberessang River
SWQ 3 Upstream Lapade River
SWQ 4 Downstream Lapade River
SWQ 5 Pond located at Mattirotassi Village
SWQ 6 Datae River Dam

4.8.2 Macro Benthic

A total of 9,451 macro benthic individuals were recorded during the survey (Table 4-25). The observation of these macro benthic fauna advised that the rivers in the study area are populated mainly by Gastropod (43%), followed by Bivalvia (24%), Polychaeta (19%), Crustacea (6%), Olygochaeta (5%), and Platyhelmintes (3%). The relative abundance of the macro benthic taxa observed during this baseline survey is presented in Table 4-25.

Table 4-25 Macro Benthic Community Structure by Percentage of Abundance

Sampling Location ID	Abundance (Individual/m3)	Abundance of Groups					
		Gastropoda	Bivalvia	Polychaeta	Olygochaeta	Crustacea	Platyhelmintes
SWQ1	1,590	564	465	307	139	81	34
SWQ2	1,696	672	365	391	102	127	39
SWQ3	1,463	646	385	274	67	52	39
SWQ4	1,623	781	351	276	74	92	49
SWQ5	1,364	634	365	250	29	47	39
SWQ6	1,715	747	369	327	69	142	61
Total	**9,451**	**4,044**	**2,300**	**1,825**	**480**	**541**	**261**

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Sampling Location ID	Abundance (Individual/m3)	Abundance of Groups					
		Gastropoda	Bivalvia	Polychaeta	Olygochaeta	Crustacea	Platyhelmintes

Notes:
SWQ 1 Upstream Pabberessang River
SWQ 2 Downstream Pabberessang River
SWQ 3 Upstream Lapade River
SWQ 4 Downstream Lapade River
SWQ 5 Pond located at Mattirotassi Village
SWQ 6 Datae River Dam

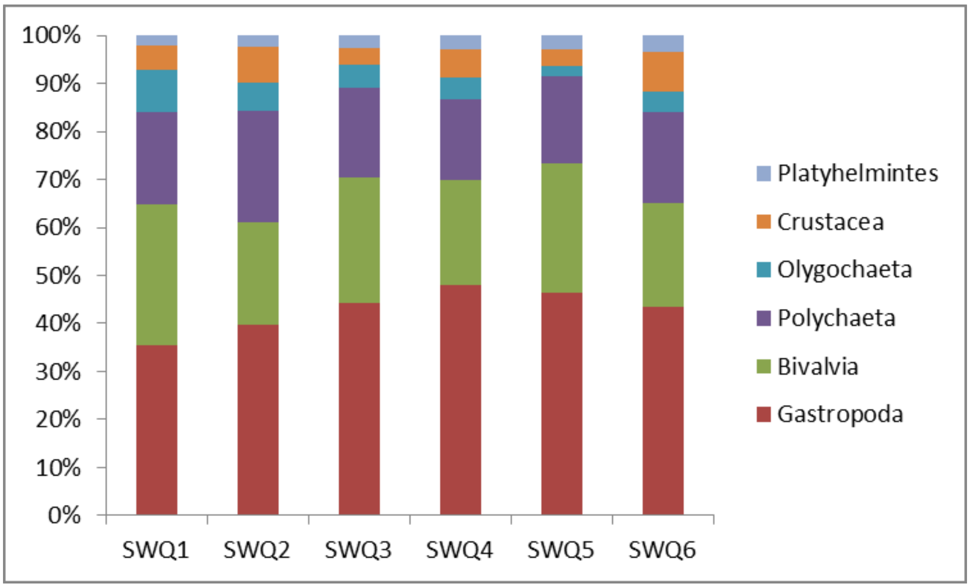

Figure 4-8 Percentage of Macro Benthic Abundance by Sampling Location

The biology indices calculation results are presented in Table 4-26. Generally, the macro benthic diversity index ranges between 2.57 – 2.88, with a high evenness index ranging from 0.84-0.91 (approximately 1) and low dominance index (approximately 0). It can be concluded that the surface water in the study location is of good quality with high biodiversity and no dominance between species (evenly distributed). The good water quality of the rivers in the study area are likely due to the absence of industrial activities along the rivers.

Table 4-26 Biological Indices of Water Quality

Sampling Location ID	Number of Taxons	Diversity Index (Shannon Wiener Index)	Evenness Index	Dominance Index	Pollution Level
Phytoplankton					
SWQ1	21	2.86	0.94	0.05	Not polluted
SWQ2	21	2.88	0.95	0.05	Not polluted
SWQ3	21	2.57	0.85	0.10	Not polluted
SWQ4	21	2.74	0.90	0.08	Not polluted
SWQ5	21	2.57	0.84	0.10	Not polluted
SWQ6	21	2.78	0.91	0.07	Not polluted

Notes:
SWQ 1 Upstream Pabberessang River
SWQ 2 Downstream Pabberessang River
SWQ 3 Upstream Lapade River

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Sampling Location ID	Number of Taxons	Diversity Index (Shannon Wiener Index)	Evenness Index	Dominance Index	Pollution Level

SWQ 4 Downstream Lapade River
SWQ 5 Pond located at Mattirotassi Village
SWQ 6 Datae River Dam

4.8.3 Nekton (Fish)

There is very limited information on fish diversity in the study area. The fish data was gathered by direct observation and interviews with the local community. None of them is categorized into protected species as per Government Regulation No.7/199. The list of fish species is presented in the table below.

Table 4-27 Fish Species within the Study Area

No.	Local Name	Common Name	Scientific Name	Conservation Status
				IUCN
1	Gabus/bale salo/bale bolong	Murrel	*Ophiocephlus striatus*	LC
2	Nila	Victoria perch	*Lates niloticus*	Insp
3	janggo	Spotted gourami	*Trichogaster pectoralis*	LC
4	Betok/ Osang	Climbing perch	*Anabas testudineus*	LC
5	Belut/Lendrong	Eel	*Fluta alba*	LC
6	Lele/ cepe/samelang	Catfish	*Clarias batracus*	Insp
7	Sidat	Freshwater Eel	*Anguila sp*	LC
8	Mujair	Common tilapia	*Tilapia mosambica*	Insp
9	Udang Sungai	Freshwater shrimp	*Macrobrachium rosenbergii*	LC

Notes:
IUCN: Insp= Invasive Species Alien; LC= Least Concern

4.9 Clean Water Supply and Waste Management

Sanitation is an important issue for the population of Wattang Pulu Sub-district, as most of the population is dependent on river water for their daily life including cooking/drinking, washing and bathing. Over 1,000 houses in Wattang Pulu have no toilet in their house and more than 400 houses have no access to a drinking water supply. There was no observed facilities for waste management such as a temporary disposal site (*Tempat Pembuangan Sementara* - TPS) or a final disposal site (*Tempat Pembuangan Akhir* - TPA). Dumping and burning nearby homes is the common practice for domestic waste management.

In response to the current condition, a national government program for rural empowerment, called PAMSIMAS (*Program Nasional Penyediaan Air Minum dan Sanitasi Berbasis Masyarakat*) or National Program for Clean Water and Sanitation Community Based Development has become involved in clean water and sanitation projects in several villages within the study area. However, domestic waste management is not part of this program. The clean water and sanitation projects provide water reservoir, pumps, pipeline and toilets in several villages including Mattirotasi Village (Figure 4-14).

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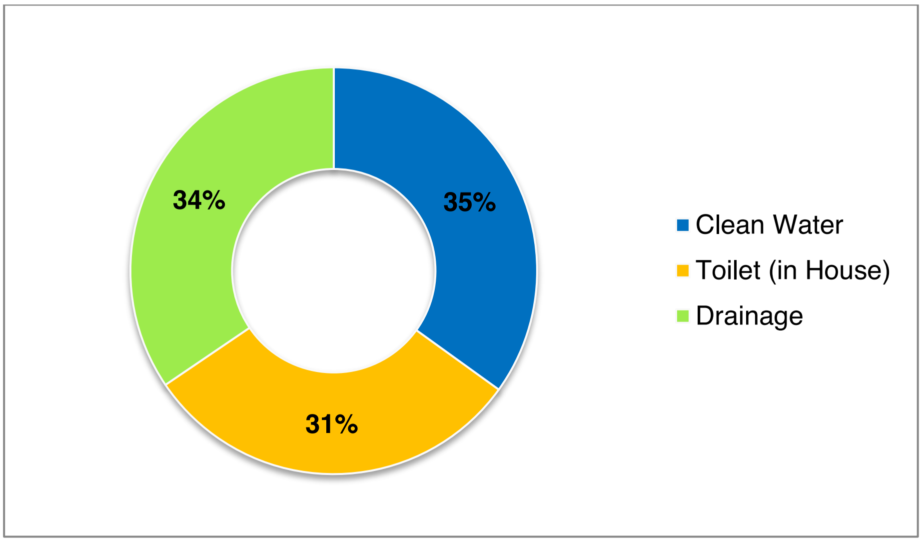

Figure 4-9 Sanitation Infrastructure Provided by Resident in Study Area

4.10 Traffic and Transport

Traffic volume was observed on the Pare-pare – Sidrap main road (Km 168) and the Mattirotasi main road. These roads will provide a route for mobilization during the construction phase and may be used for access to the turbines and the sub-station during operation. The Pare-pare – Sidrap main road is part of the trans Sulawesi highway that connects cities between Southern Sulawesi (including Makassar) and Northern Sulawesi (including Manado). The Mattirotasi main road is a local road that connects all villages in Wattang Pulu Sub-district within the project area.

The following table describes the movement direction and width of the two main roads that will be affected by the project.

Table 4-28 Main Road Description

No	Geometric Parameter	Movement Direction	Dimension (m)
Pare-pare - Sidrap Main Road			
1	Road Type		2/2 UD
2	Road	Left	2.5
		Right	2.5
3	Median		None
4	Right of Way (RoW)	Left	0.50 – 1.00
		Right	0.50 – 1.00
5	Road Condition	Good, paved road.	
Mattirotasi Main Road			
1	Road Type		2/2UD
2	Road	Left	1.5
		Right	1.5
3	Median		None
4	Right of Way	Left	0.40 – 1.00
		Right	0.50 – 1.00
5	Road Condition	Good paved road condition in some areas, but degraded in others.	

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4.10.1 Road Condition

The road condition of the access road to the project location is shown in photographs in Figure 4-10, Figure 4-11 and Figure 4-12.

Figure 4-10 Pare-pare – Sidrap Main Road (left) and Entrance to Project Site (right)

Figure 4-11 Village Road at Mattirotasi (Potential Access to Site)

Figure 4-12 Access Road Connecting Mattirotasi Village to Site

The Parepare – Sidrap main road passes residential areas, mixed plantation and temporary buildings used as small shops. The Matterotasi main road passes residential areas and mixed plantations.

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4.10.2 Road Service Level Index

The traffic volume survey at peak morning and afternoon time periods was conducted on 15 December 2013 (Sunday) and 16 December 2013 (Monday).

The following table provides an indication of the Road Service Level Index based on the traffic count and volume recorded.

Table 4-29 Road Service Level Index (RSLI)

Location ID	Volume				Capacity pcu/hour	DS = Q/C		RSLI	
	pcu		pcu/hour						
	15 Dec	16 Dec	15 Dec	16 Dec		15 Dec	16 Dec	15 Dec	16 Dec
Traffic 1 Pare-pare - SIDRAP Road									
South to North	4646	5445	404.00	473.48	1344.67	0.57	0.65	Good	Good
North to South	4148.5	4631.5	360.74	402.74					
Total	**8794.5**	**10077**	**764.74**	**876.22**					
Traffic 2 Mattirotasi Main Road									
South to North	313	444	27.82	38.61	692.80	0.08	0.11	Good	Good
North to South	329	454	29.24	39.48					
Total	**642**	**898**	**57.07**	**78.09**					

Note:

Pcu *Passenger car unit*

DS *Degree of Saturation*

Q *total volume (pcu/hour)*

C *Road Capacity (pcu/hour)*

Table 4-29 shows that the degree of saturation (DS) at both survey locations was below 0.75. This means the road service level index of both roads is considered to be good and the capacity of the roads is acceptable to accommodate the traffic volume.

4.11 Socio Culture, Socio Economy and Public Health

4.11.1 Demography

The total area of Wattang Pulu Sub-district is 15 Ha, which administratively is divided into 10 villages including four villages potentially affected by the project. These four villages are Mattirotasi, Lainungan, Lawawoi, and Uluale.

Based on desktop research, the largest population is Lawawoi Village with a total of 5,243 people including 2,617 males and 2,626 females. The population growth in the four villages in 2012 was 8.59% compared to 2011. The densest population was observed in Lawawoi Village (574 people/km^2), while the most sparsely populated village is Mattirotasi Village where the population density is 59 people/km^2 (Table 4-30).

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Table 4-30 Total Population in Study Area

No	Village	Description		Total	Household Total	Area (Km^2)	Population Densitiy ($People/Km^2$)
		Male	Female				
1	Mattirotasi	995	1,001	1,996	541	34.06	59
2	Lainungan	1,669	1,721	3,390	882	25.70	132
3	Lawawoi	1,980	2,025	4,005	1,085	10.02	392
4	Uluale	2,617	2,626	5,243	721	9.12	574

Source: Kecamatan Wattang Pulu Dalam Angka, 2013

The population growth rate (PGR) shows the increase in a country's/province's/regency's/sub-district's population during a set period of time, usually over one year, expressed as a percentage of the population at the start of that period. It reflects the number of births and deaths during the period and the number of people migrating to and from a country/province/regency/sub district.

The population growth rate in the four villages over the last 5 years (2008-2012) fluctuates. The highest growth was recorded in Lainungan Village at 18% and Lawawoi Village at 16% in 2012 (Figure 4-10).

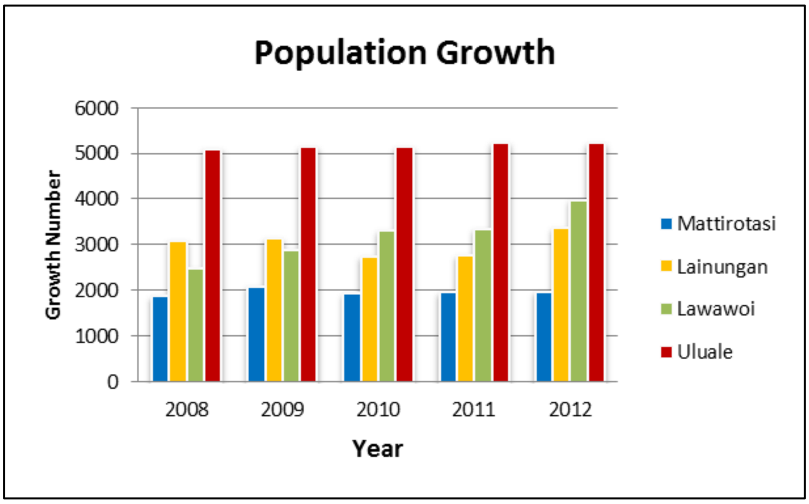

Figure 4-13 Population Growth in Study Area

4.11.2 Socio Culture

There are three main communities that live within the Wattang Pulu Sub-district including Bugis communities; Makassar communities; and transmigrant communities. The Bugis communities are mostly found in the Wattang Pulu Sub-district, and Makassar and transmigrant communities are relatively minor. There is no official data on the number of traditional or community leaders found in Wattang Pulu Sub-district. However, it is notable that the religion leaders have been incorporated into everyday life, indicating an important change. Currently, nearly all social activities including problem solving involve the opinion of the religious leader before being directed to the village chief.

There is annual ritual called *Mappadendang* in Wattang Pulu Sub-district. *Mappadendang* is a traditional ceremony, usually held after the harvest season. The main components for this occasion are six women, three men, *Baruga* booths, a mortar, pestle, and the traditional clothes (*Baju Bodo)*. This occasion is a form of traditional art performances.

4.11.3 Land Tenure

Based on the results of surveys and interviews with stakeholders, including village heads, community leaders, religious leaders and residents in Mattirotasi, Lainungan, Lawawoi Uluale Villages, land tenure consists of private ownership and state ownership in forestry areas. The type or model of private ownership of land consists of:

1. Letters of land ownership based Property Rights (SHM)
2. Land ownership based on the deed of land sell
3. Ownership of land based on letter (heirs)

4.11.4 Socio Economic

Economic growth in Sidrap Regency has grown by around 8% on average from 2008 to 2012, with an upward trend with the exception of 2010. The decreasing economic growth rate in 2009 may have been influenced by the regional economic situation in South Sulawesi when the regional economic growth rate declined in the same period. In general, during the last five years (2008-2012), the trend of economic growth of Sidrap Regency has continued to grow (Figure 4-14).

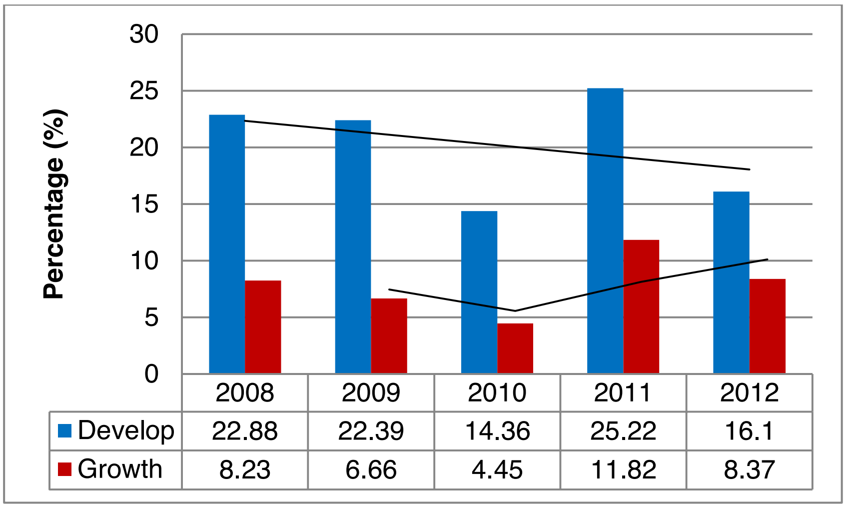

Figure 4-14 Economic Growth of Kabupaten Sidenreng Rappang Regency (2008-2012)

The Gross Regional Domestic Product (GRDP) includes the product value of several major economic sectors including agriculture, mining, industry, electric, gas, clean water supply, construction, trading, hotel and restaurant, communication, transportation, finance, rental and general services. The mining industry is the main economic development sector in Sidrap Regency (Figure 4-15).

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Figure 4-15 GRDP Growth Rate of Sidrap Regency (2008-2012)

Based on desktop research, the main commodity from agriculture in Wattang Pulu Sub-district is cashew nuts with a total production of almost 996 tons in 2012 with the second largest production coming from hazelnuts with a total of nearly 357 tons (Figure 4-16).

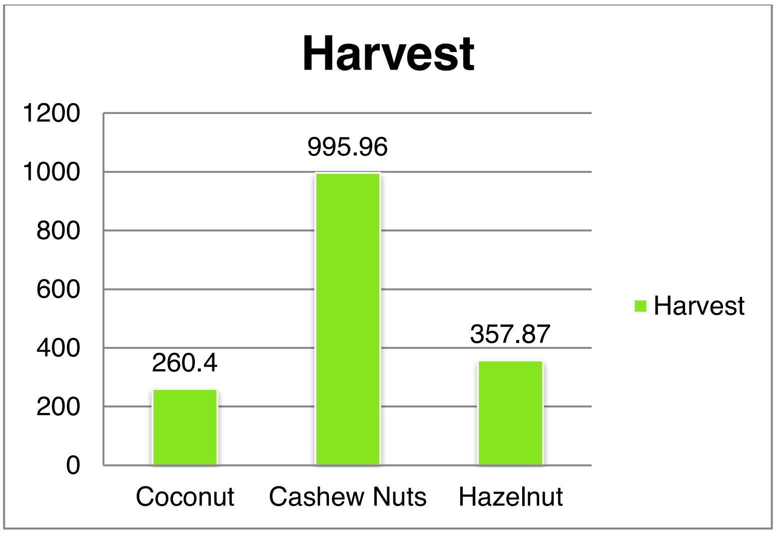

Figure 4-16 Harvest Commodities in Wattang Pulu Sub-district 2012

The most major livestock in Wattang Pulu Sub-district is chickens *(Kecamatan Wattang Pulu Dalam Angka, 2013)*. The "broiler chicken" is a special hi-breed meat producer because of its rapid growth. Within 6 weeks the chickens can weigh 1500 g/head and can produce meat (Figure 4-17). Lawawoi Village has the biggest population of this livestock (around 57,877 heads).

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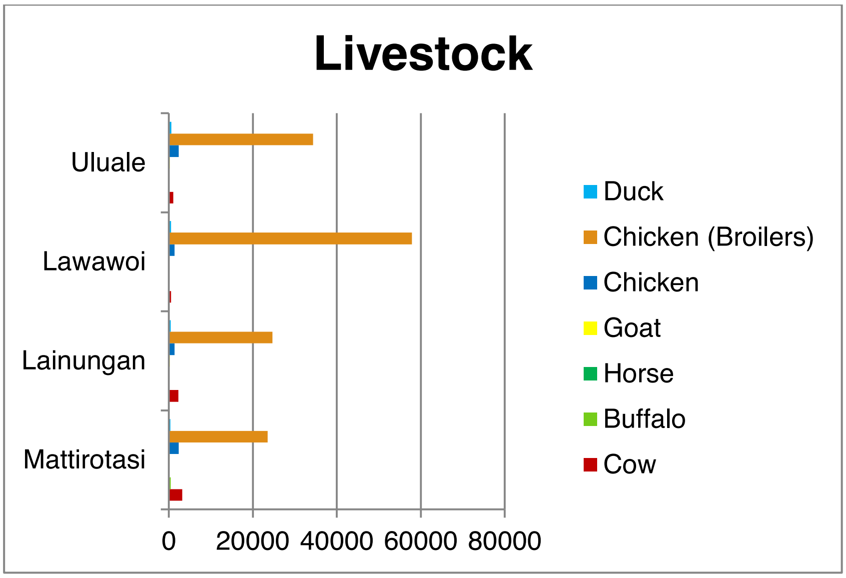
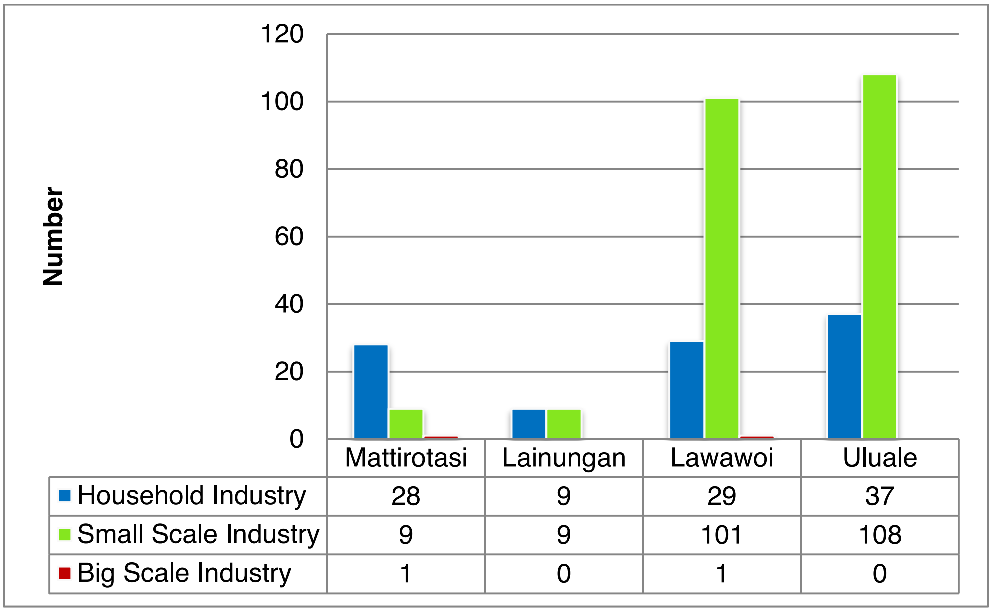


Figure 4-17 Livestock Commodity in Study Area

Small scale industries in Wattang Pulu Sub-district, especially in Lawawoi and Uluale Villages, have assisted in economic growth. Based on interviews and surveys, small scale industries include cashew nut trader, grocery shop, building material shop, etc. There are two large scale industries, one is a tile fabric manufacturer in Mattirotasi Village and the other is a stone quarry in Lawawoi Village (Figure 4-18).



	Mattirotasi	Lainungan	Lawawoi	Uluale
Household Industry	28	9	29	37
Small Scale Industry	9	9	101	108
Big Scale Industry	1	0	1	0

Figure 4-18 Industries in the Study Area

There are approximately 2,294 households in the affected study area, which can be divided into five levels of welfare. These are described as:

- Pre-Welfare stage: Families that do not meet one of the indicators for family basic needs, minimally described as the need for food, clothing, housing, health and education.
- Welfare stage I: The families are able to meet minimum basic needs, but have not been able to meet minimum family socio-psychological needs, as such needs of worship, eating animal

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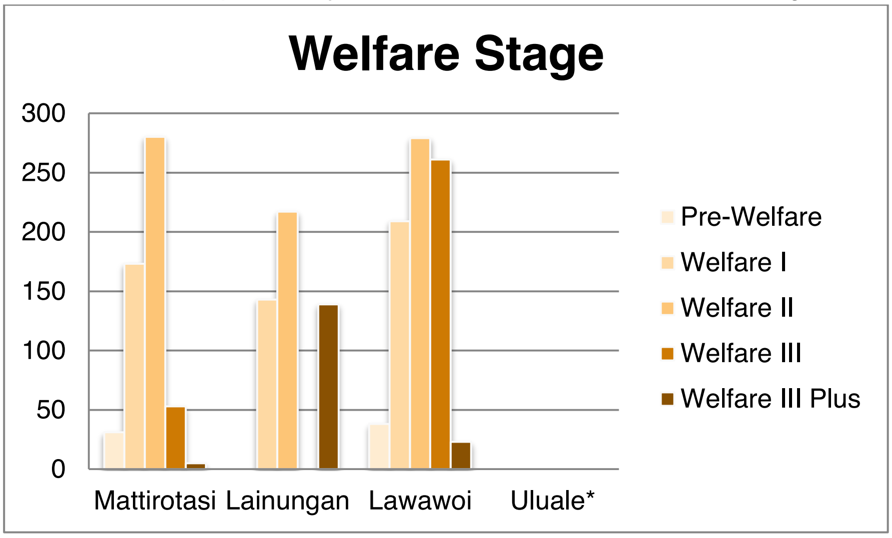
protein, clothes, space for family interaction, healthcare, have income, can read and write, and are capable of family planning.

- Welfare stage II: The families are able to meet minimum basic needs and the socio-psychological needs, but have not been able to meet family development needs, such as funds for further religious teachings, savings, participate in community activities and ability to obtain information.
- Welfare stage III: The families are able to meet the basic needs, the socio-psychological needs and the development needs, but have not been able to give contributions to the community, such as regularly give donations materially and financially to social interests and to participate actively in social, religious, arts, sports, or educational institutions or foundations.
- Welfare stage III Plus: Families which are have been able to meet all their needs for development, and financially secure enough to have contributed significantly to the community.

The levels of welfare in the four potentially affected communities are shown in Figure 4-16.



*No information was collected

Figure 4-19 Household Population by Welfare Stage in Study Area

4.11.5 Education

Education is one of the main development sectors which is given priority by the Indonesian Goverment. The ultimate goal of education development is to improve the quality of human resources in Indonesia. The main indicator to determine the education development is the ratio between the number of schools and students and teachers. Table 4-31 shows the education facilities in the study area and Table 4-32 shows the number of students.

Table 4-31 Number of Schools in Study Area

No	School	Village			
		Mattirotasi	Lainungan	Lawawoi	Uluale
1	Elementary School	2	2	3	3
2	Junior High School	N/A	N/A	N/A	2
3	Senior High School	N/A	N/A	N/A	1

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4	College/Academy	N/A	N/A	N/A	
Source: Village Monograph, 2010					

Table 4-32 Number of Students in Study Area

No	Village	Students				
		Kindergarten	Elementary School	Junior High School	Senior High School	College / Academy
1	Mattirotasi	28	191	210	64	-
2	Lainungan	41	406	-	-	-
3	Lawawoi	47	406	-	-	-
4	Uluale	58	520	775	-	-

4.11.6 Religion

The communities in the Wattang Pulu Sub-district embrace a diversity of beliefs / religions, and some also adhere to the local religion, the *Hindu Tolotang*. Tolotang relies on the five beliefs, including:

1. Belief in Seuwae God (One God)
2. Belief in Judgment Day, which marks as the end of life in the world
3. Belief there's a second world after Judgment Day
4. Belief in revelation from God
5. Belief in Lontara (Holy bible) through worship of rocks, wells and graves

This local religion is still embraced by some communities. However, migration and interaction have resulted in the diversification of religion. In Wattang Pulu Sub-district, the Tolotang community have adopted the Hindu faith while also adhering to the Tolotang cultural system. The mix between Hindu and Tolotang is called the Hindu Tolotang.

Based on statistical data, Islam is the most widely followed religion embraced by the residents of Wattang Pulu Sub-district, with as much as 88% of the population following Islam in Mattirotasi, Lainungan, Lawawoi and Ulale Villages. The mix of religion and religious facilities in these four villages is shown in and .

Table 4-33 Population by Religion

No	Religion	Village			
		Mattirotasi	Lainungan	Lawawoi	Uluale
1	Moslem	2009	1925	3848	4835
2	Hindu (Tolotang)	N/A	1465	129	408
3	Catholic	N/A	N/A	25	N/A

Source: Kecamatan Wattang Pulu Dalam Angka, 2013

D R A F T

Table 4-34 Number of Worship Houses

No	Worship	Village			
		Mattirotasi	Lainungan	Lawawoi	Uluale
1	Mosque	3	1	4	5
3	Church	N/A	N/A	N/A	N/A
4	Vihara	N/A	N/A	N/A	N/A
5	Temple	N/A	N/A	N/A	N/A

Source: Kecamatan Wattang Pulu Dalam Angka,2013

4.11.7 Man Power

The composition of man power in Sidrap Regency is divided between government employees and private employees. Government employees include government officers (*Pegawai Negri Sipil* or PNS), members of the National Military (*Tentara Nasional Indonesia* or TNI), and members of the National Police (POLRI).

The private includes entrepreneurs (*wiraswastawan*) and private company employees. The number of workers employed by private companies is very high. The role of the private sector in developing economic activities is greater than the government. This can be seen from the various activities created in the private sector, such as agriculture and stock farmers (Figure 4-20).

Most people in the area work in agriculture. From a total of 3,444 workers, approximately 1,468 people or 42.62% work as farmers. Following agriculture, 444 people or 12% work in the plantation sector, and 359 people or 10% work as livestock farmers.

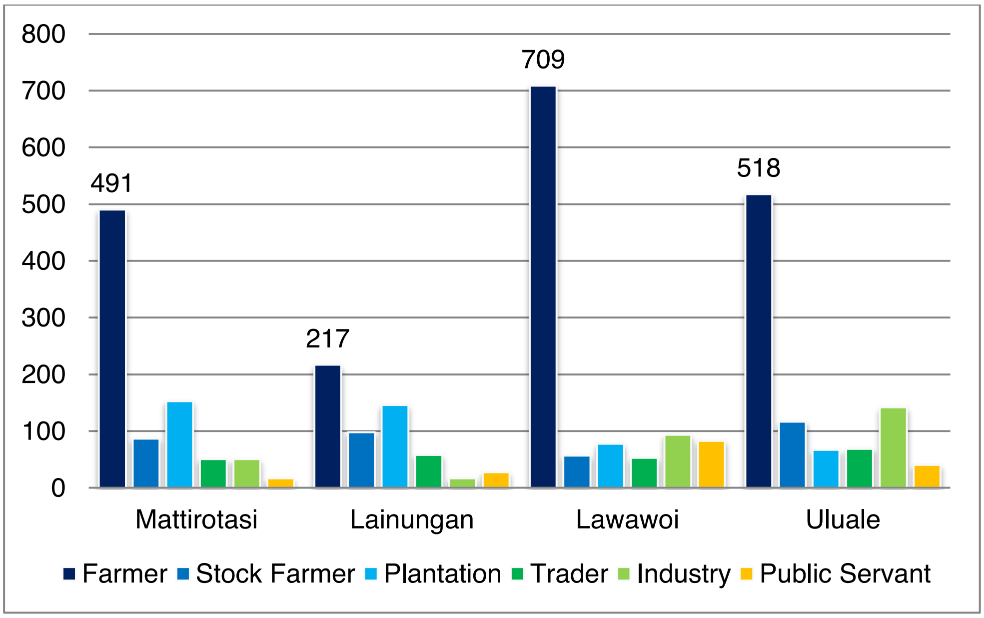

Figure 4-20 Composition of Man Power in Study Area

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4.11.8 Public Health

The most common disease recorded at the Puskesmas Lawawoi (sub district health center) is Upper Respiratory Tract Infection and cough. The range of reported diseases is illustrated in .

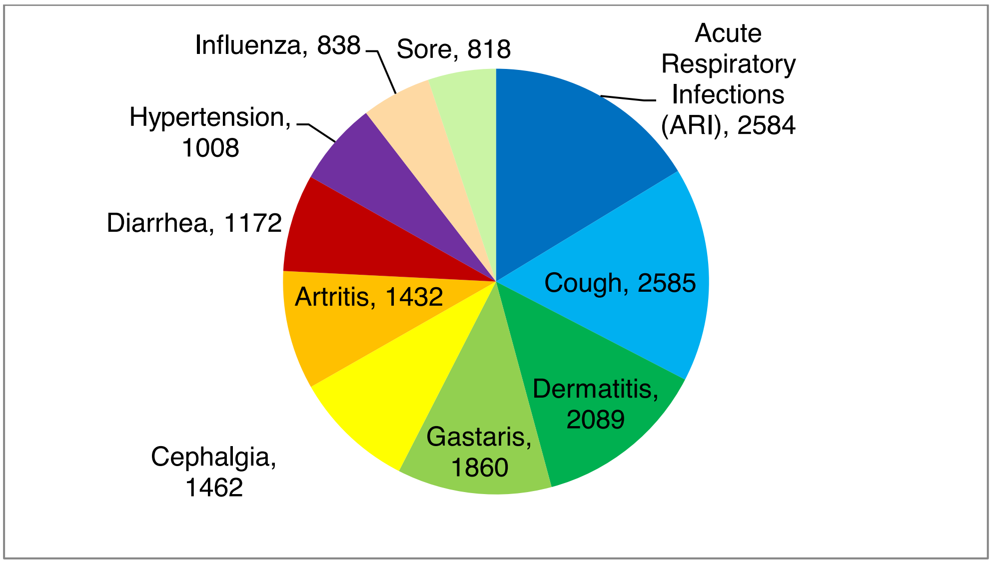

Figure 4-21 Common Diseases in Wattang Pulu Sub-district

The presence of healthcare facilities is an important aspect of community health. Table 4-35 identifies the existing healthcare facilities in the Wattang Pulu Sub-district area.

Table 4-35 Healthcare Facilities in Wattang Pulu Sub-district

No	Public Health	Government	Private
1	Pusekesmas	1	N/A
2	Puskesmas Pembantu	5	N/A
3	Puskesmas Keliling	1	N/A
4	Balai Pengobatan	N/A	1
5	Poskesdes	10	N/A
6	Posyandu	30	N/A
7	Apotek	1	N/A
8	Toko Obat	2	N/A

Source: Profil Kesehatan Puskesmas Lawawoi, 2012

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Appendix A

WTG ID	CLIENT
T-01A	UPC Renewables PT UPC Sidrap Bayu Energi

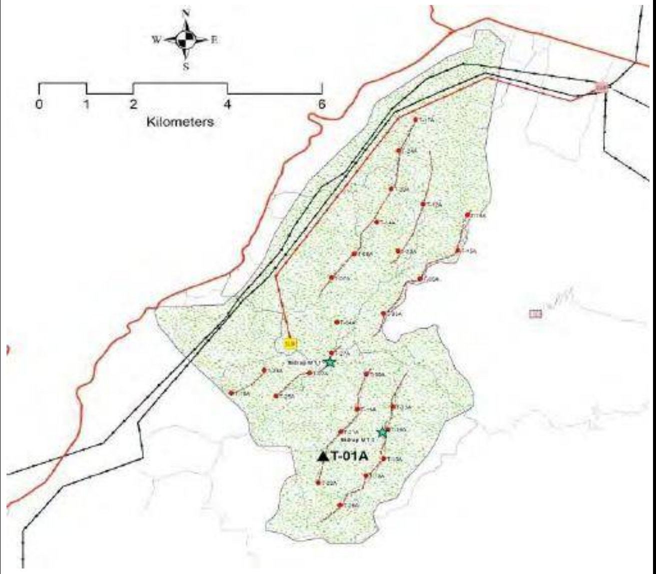
Administration Detail

Village	Mattirotasi
Sub District	Watang Pulu
Regency	Sidenreng Rappang
Province	South Sulawesi

Project

Number	JKTD14001
Name	Sidrap Wind Farm AMDAL

Photo Location



Coordinate Detail (GPS Handheld)

Longitude	119° 41' 55.158" E
Latitude	3° 59' 46.072" S
Easting	799678.00 m
Northing	9557808.16 m
Ellipsoid Height	290.80 m
Datum	WGS 1984
Map Projection	UTM 50 South

Description

1. Local guide;
   a. Name: Bpk. Tahir
   b. Contact: 085255920478
2. Forest class;
   Limited production forest
3. Land owner;
   a. Name: N/A
   b. Contact: N/A
4. Accessibility;
   By motobike from Pabbaresseng road
5. Land cover;
   - Bush
   - Rocks
   - Teak Wood
   - Wooden Trees
   - Cashew
6. Animal; Cow & Wild Pig

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Photo ID: PC171662	Direction: East

Photo ID: PC171663	Direction: South

Photo ID: PC171664	Direction: West

WTG ID	CLIENT
T-02A	UPC Renewables **PT UPC Sidrap Bayu Energi**

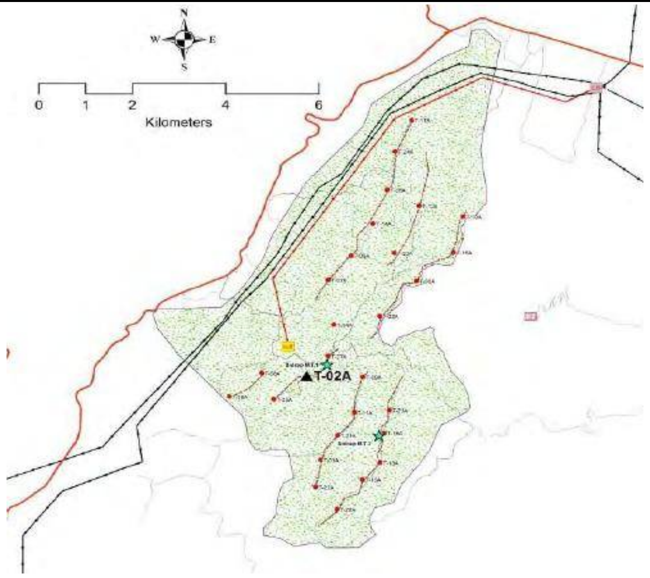
Administration Detail

Village	Mattirotasi
Sub District	Watang Pulu
Regency	Sidenreng Rappang
Province	South Sulawesi

Project

Number	JKTD14001
Name	Sidrap Wind Farm AMDAL

Photo Location



Coordinate Detail (GPS Handheld)

Longitude	119° 41' 45.928" E
Latitude	3° 58' 41.524" S
Easting	799399.57 m
Northing	9559793.19 m
Ellipsoid Height	210.86 m
Datum	WGS 1984
Map Projection	UTM 50 South

Description

1. Local guide;
   a. Name: Bpk. Samir
   b. Contact: 081241426271
2. Forest class;
   Limited production forest
3. Land owner;
   a. Name: Bpk. Lasundre Liah
   b. Contact: N/A
4. Accessibility;
   By motobike from Pabbaresseng road
5. Land cover;
   - Bush
   - Teak Wood
   - Cashew
   - Rocks
   - Wooden Trees
6. Animal; N/A

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Photo ID: PC151271	Direction: East

Photo ID: PC151272	Direction: South

Photo ID: PC151273	Direction: West

WTG ID	CLIENT
T-03A	PT UPC Sidrap Bayu Energi

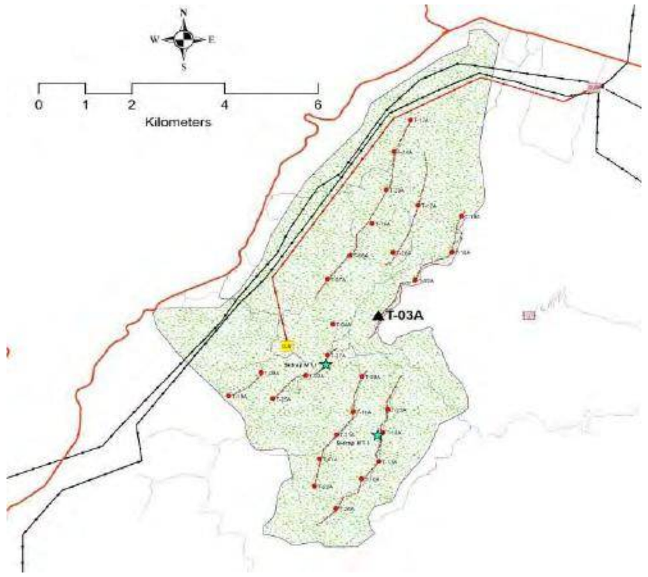
Administration Detail

Village	Lainungan
Sub District	Watang Pulu
Regency	Sidenreng Rappang
Province	South Sulawesi

Project

Number	JKTD14001
Name	Sidrap Wind Farm AMDAL

Photo Location



Coordinate Detail (GPS Handheld)

Longitude	119° 42' 39.132" E
Latitude	3° 57' 55.242" S
Easting	801046.65 m
Northing	9561210.44 m
Ellipsoid Height	275.00 m
Datum	WGS 1984
Map Projection	UTM 50 South

Description

1. Local guide;
   a. Name: Bpk. Darwis
   b. Contact: 085250791816
2. Forest class;
   Community forest
3. Land owner;
   a. Name: Bpk. Andi Ojeng
   b. Contact: 085299589760
4. Accessibility;
   By motobike from Pabbaresseng road
5. Land cover;

- Bush	- Rocks	- Candlenut
- Corn	- Coconut	- Orange
- Cashew	- Manggo	- Jackfruit

6. Animal; Dog

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Photo ID: PC130519	Direction: South

Photo ID: PC130520	Direction: West

WTG ID	CLIENT
T-04A	UPC Renewables PT UPC Sidrap Bayu Energi

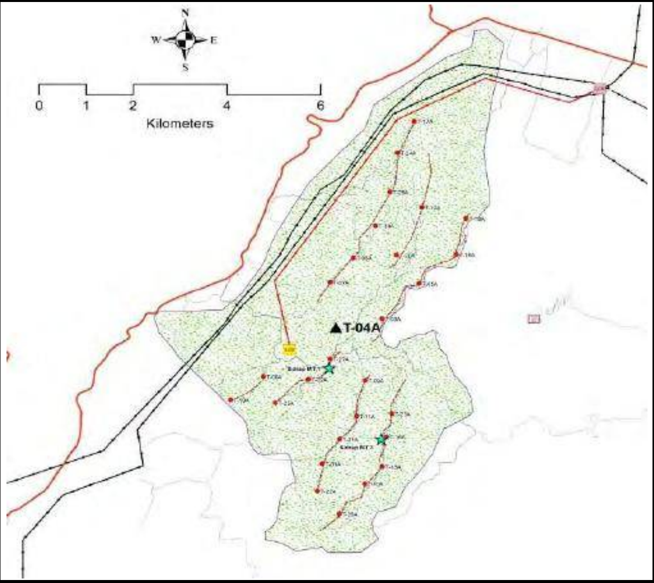
Administration Detail

Village	Lainungan
Sub District	Watang Pulu
Regency	Sidenreng Rappang
Province	South Sulawesi

Project

Number	JKTD14001
Name	Sidrap Wind Farm AMDAL

Photo Location



Coordinate Detail (GPS Handheld)

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Latitude	3° 58' 2.085" S
Easting	799983.86 m
Northing	9561003.55 m
Ellipsoid Height	187.13 m
Datum	WGS 1984
Map Projection	UTM 50 South

Description

1. Local guide;
   a. Name: Bpk. Darwis
   b. Contact: 085250791816
2. Forest class;
   Other uses (APL)
3. Land owner;
   a. Name: Bpk. Hasan
   b. Contact: 082337833277
4. Accessibility;
   By motobike from Pabbaresseng road
5. Land cover;
   - Rocks - Wooden Trees - Teak Wood
   - Corn - Jackfruit
   - Cashew - Manggo
6. Animal; Dog & Eagle

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Photo ID: PC161523	Direction: East

Photo ID: PC161524	Direction: South

Photo ID: PC161525	Direction: West

WTG ID	CLIENT
T-05A	PT UPC Sidrap Bayu Energi

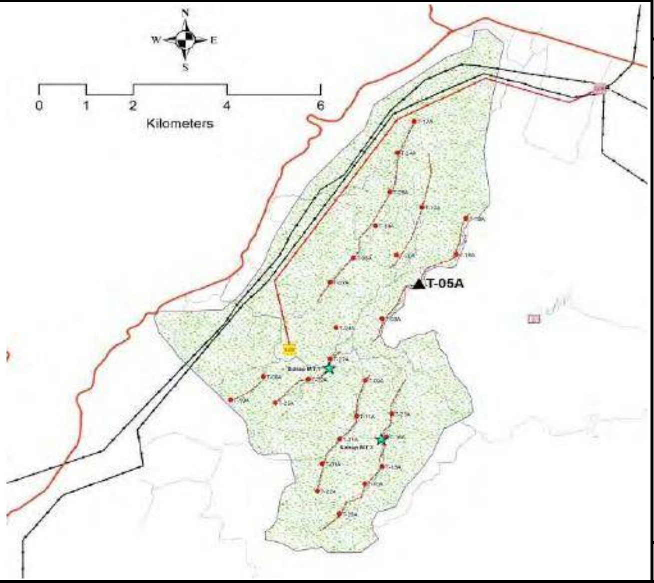
Administration Detail

Village	Lainungan
Sub District	Watang Pulu
Regency	Sidenreng Rappang
Province	South Sulawesi

Project

Number	JKTD14001
Name	Sidrap Wind Farm AMDAL

Photo Location



Coordinate Detail (GPS Handheld)

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Latitude	3° 57' 29.030" S
Easting	801638.20 m
Northing	9562014.22 m
Ellipsoid Height	319.60 m
Datum	WGS 1984
Map Projection	UTM 50 South

Description

1. Local guide;
   a. Name: Bpk. Darwis
   b. Contact: 085250791816
2. Forest class;
   Other uses (APL)
3. Land owner;
   a. Name: Bpk. Andi Haruna
   b. Contact: 085233180605
4. Accessibility;
   By motobike from Pabbaresseng road
5. Land cover;
   - Rocks - Candlenut
   - Corn - Wooden Trees
   - Bush
6. Animal; N/A

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Photo ID: PC130498	Direction: West

WTG ID	CLIENT
T-06A	UPC Renewables **PT UPC Sidrap Bayu Energi**

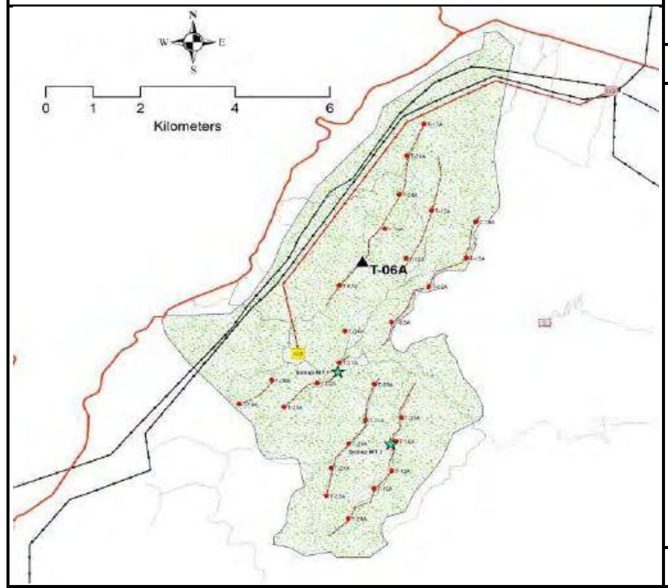
Administration Detail

Village	Lainungan
Sub District	Watang Pulu
Regency	Sidenreng Rappang
Province	South Sulawesi

Project

Number	JKTD14001
Name	Sidrap Wind Farm AMDAL

Photo Location



Coordinate Detail (GPS Handheld)

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Northing	9562638.43 m
Ellipsoid Height	229.94 m
Datum	WGS 1984
Map Projection	UTM 50 South

Description

1. Local guide;
   a. Name: Bpk. Darwis
   b. Contact: 085250791816
2. Forest class;
   Community forest
3. Land owner;
   a. Name: Ibu Itimah
   b. Contact: 085242210020 (Grandson: Nawi)
4. Accessibility;
   By motobike from Pabbaresseng road
5. Land cover;

- Rocks	- Wooden Trees	- Teak Wood
- Corn	- Jackfruit	- Candlenut
- Cashew	- Manggo	

6. Animal; Dog

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Photo ID: PC140760	Direction: South

Photo ID: PC140761	Direction: West

WTG ID	CLIENT
T-07A	PT UPC Sidrap Bayu Energi

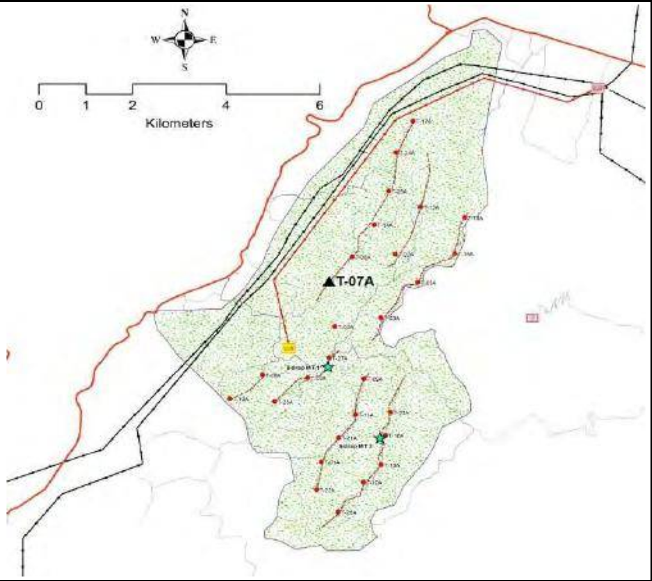
Administration Detail

Village	Lainungan
Sub District	Watang Pulu
Regency	Sidenreng Rappang
Province	South Sulawesi

Project

Number	JKTD14001
Name	Sidrap Wind Farm AMDAL

Photo Location



Coordinate Detail (GPS Handheld)

Longitude	119° 42' 0.626" E
Latitude	3° 57' 27.569" S
Easting	799860.74 m
Northing	9562064.95 m
Ellipsoid Height	201.58 m
Datum	WGS 1984
Map Projection	UTM 50 South

Description

1. Local guide;
   a. Name: Bpk. Darwis
   b. Contact: 085250791816
2. Forest class;
   Other uses (APL)
3. Land owner;
   a. Name: Ibu Itimah
   b. Contact: 085242210020 (Grandson: Nawi)
4. Accessibility;
   By motobike from Pabbaresseng road
5. Land cover;
   - Rocks - Wooden Trees
   - Jackfruit - Candlenut
   - Cashew - Manggo
6. Animal; N/A

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Photo ID: PC140790	Direction: North

Photo ID: PC140791	Direction: East

Photo ID: PC140792	Direction: South

Photo ID: PC140793	Direction: West

WTG ID	CLIENT
T-08A	UPC Renewables PT UPC Sidrap Bayu Energi

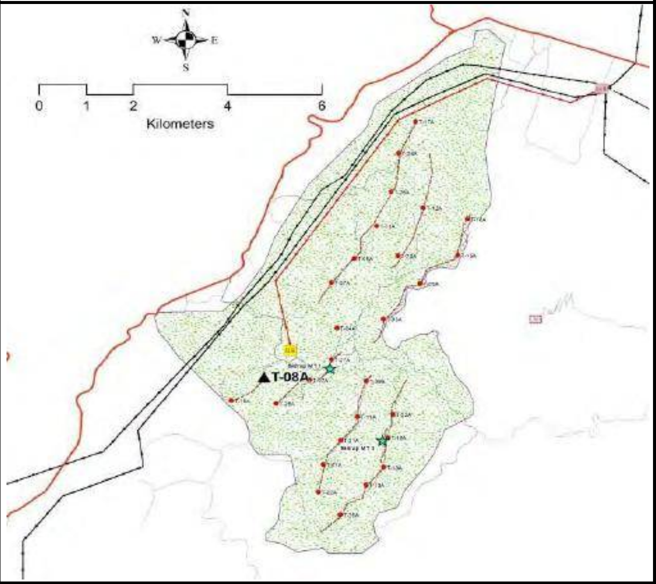
Administration Detail

Village	Mattirotasi
Sub District	Watang Pulu
Regency	Sidenreng Rappang
Province	South Sulawesi

Project

Number	JKTD14001
Name	Sidrap Wind Farm AMDAL

Photo Location



Coordinate Detail (GPS Handheld)

Longitude	119° 41' 14.550" E
Latitude	3° 58' 39.212" S
Easting	798431.19 m
Northing	9559867.39 m
Ellipsoid Height	238.84 m
Datum	WGS 1984
Map Projection	UTM 50 South

Description

1. Local guide;
   a. Name: Bpk. Laconding
   b. Contact: 082335531254
2. Forest class;
   Limited production forest
3. Land owner;
   a. Name: N/A
   b. Contact: N/A
4. Accessibility;
   By motobike from Pabbaresseng road
5. Land cover;
   - Rocks - Wooden Trees
   - Teak Wood
   - Bush
6. Animal; N/A

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Photo ID: PC161443	Direction: North

Photo ID: PC161444	Direction: East

Photo ID: PC161445	Direction: South

Photo ID: PC161446	Direction: West

WTG ID	CLIENT
T-09A	UPC Renewables **PT UPC Sidrap Bayu Energi**

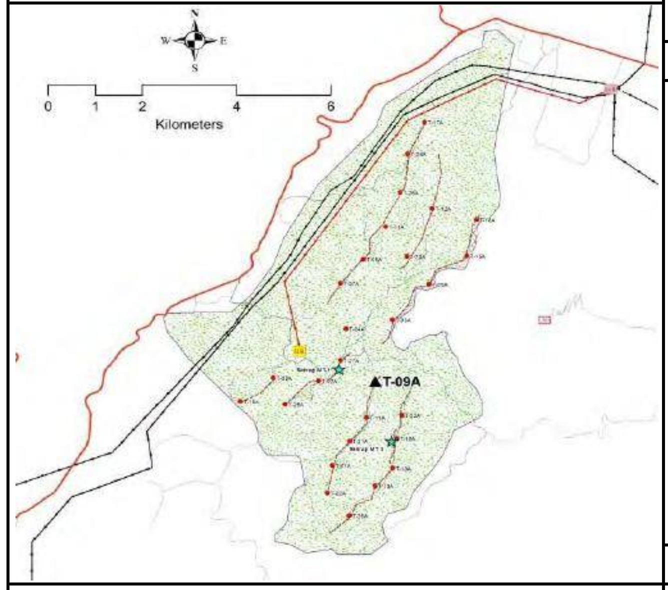
Administration Detail

Village	Mattirotasi
Sub District	Watang Pulu
Regency	Sidenreng Rappang
Province	South Sulawesi

Project

Number	JKTD14001
Name	Sidrap Wind Farm AMDAL

Photo Location



Coordinate Detail (GPS Handheld)

Longitude	119° 42' 24.966" E
Latitude	3° 58' 42.409" S
Easting	800604.60 m
Northing	9559762.02 m
Ellipsoid Height	286.60 m
Datum	WGS 1984
Map Projection	UTM 50 South

Description

1. Local guide;
   a. Name: Bpk. Tahir
   b. Contact: 085255920478
2. Forest class;
   Other uses (APL)
3. Land owner;
   a. Name: Bpk. H. Ara
   b. Contact: 082393997615 (Son: Usman)
4. Accessibility;
   By walking from Pabbaresseng road
5. Land cover;
   - Rocks - Wooden Trees
   - Grass
   - Bush
6. Animal; Cow

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Photo ID: PC171569	Direction: North

Photo ID: PC171570	Direction: East

Photo ID: PC171571	Direction: South

Photo ID: PC171572	Direction: West

WTG ID	CLIENT
T-10A	UPC Renewables **PT UPC Sidrap Bayu Energi**

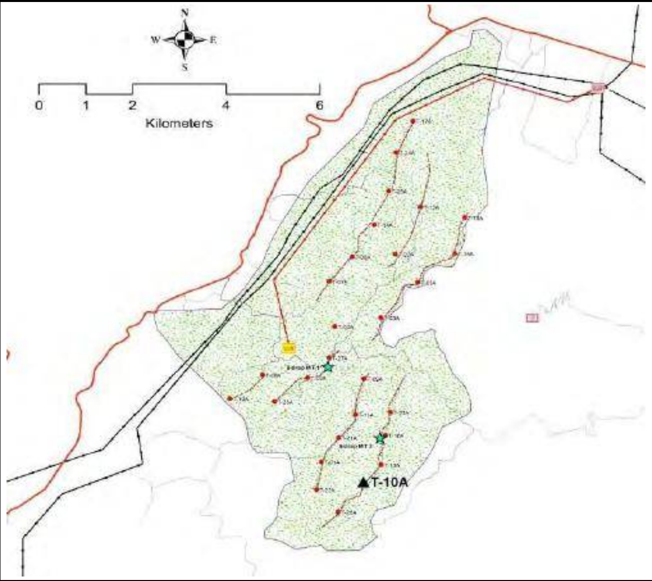
Administration Detail

Village	Mattirotasi
Sub District	Watang Pulu
Regency	Sidenreng Rappang
Province	South Sulawesi

Project

Number	JKTD14001
Name	Sidrap Wind Farm AMDAL

Photo Location



Coordinate Detail (GPS Handheld)

Longitude	119° 42' 24.667" E
Latitude	4° 0' 1.422" S
Easting	800587.38 m
Northing	9557333.32 m
Ellipsoid Height	258.91 m
Datum	WGS 1984
Map Projection	UTM 50 South

Description

1. Local guide;
   a. Name: Bpk. Samir
   b. Contact: 081241426271
2. Forest class;
   Limited production forest
3. Land owner;
   a. Name: Bpk. Baharuddin (Ambo Baha)
   b. Contact: 082190185561 (Daughter: Ibaba)
4. Accessibility;
   By motobike from Pabbaresseng road
5. Land cover;
   - Bush - Rocks - Coconut
   - Teak Wood - Wooden Trees
   - Cashew - Manggo
6. Animal; Cow

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Photo ID: PC151097	Direction: North

Photo ID: PC151098	Direction: East

Photo ID: PC151099	Direction: South

Photo ID: PC151100	Direction: West

WTG ID	CLIENT
T-11A	UPC Renewables **PT UPC Sidrap Bayu Energi**

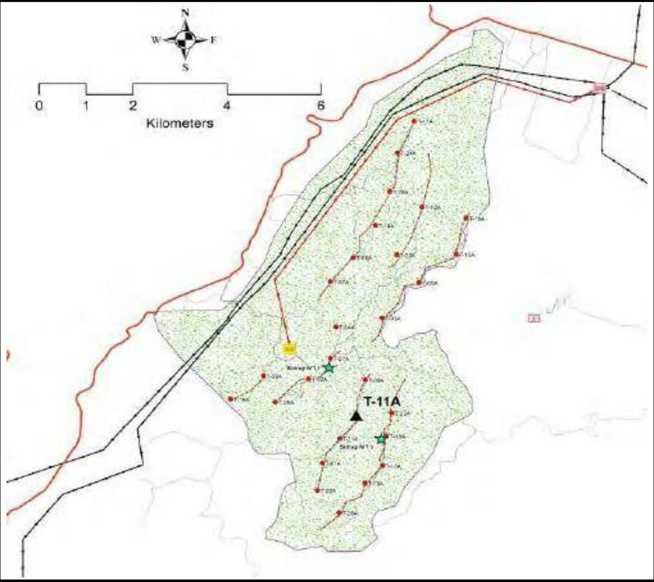
Administration Detail

Village	Mattirotasi
Sub District	Watang Pulu
Regency	Sidenreng Rappang
Province	South Sulawesi

Project

Number	JKTD14001
Name	Sidrap Wind Farm AMDAL

Photo Location



Coordinate Detail (GPS Handheld)

Longitude	119° 42' 18.792" E
Latitude	3° 59' 9.622" S
Easting	800411.26 m
Northing	9558926.18 m
Ellipsoid Height	308.36 m
Datum	WGS 1984
Map Projection	UTM 50 South

Description

1. Local guide;
   a. Name: Bpk. Tahir
   b. Contact: 085255920478
2. Forest class;
   Other uses (APL)
3. Land owner;
   a. Name: N/A
   b. Contact: N/A
4. Accessibility;
   By walking from Pabbaresseng road
5. Land cover;
   - Bush - Wooden Trees
   - Teak Wood
   - Rocks
6. Animal; Cow & Wild Pig

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Photo ID: PC171609	Direction: North

Photo ID: PC171610	Direction: East

Photo ID: PC171611	Direction: South

Photo ID: PC171612	Direction: West

WTG ID	CLIENT
T-12A	PT UPC Sidrap Bayu Energi

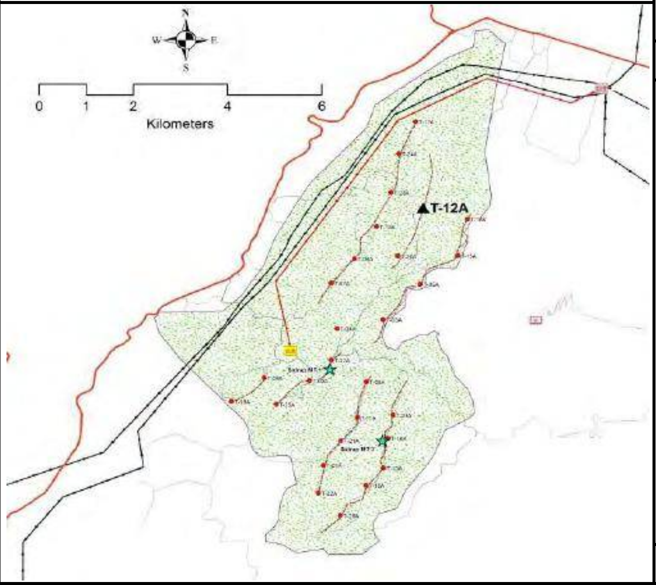
Administration Detail

Village	Lainungan
Sub District	Watang Pulu
Regency	Sidenreng Rappang
Province	South Sulawesi

Project

Number	JKTD14001
Name	Sidrap Wind Farm AMDAL

Photo Location



Coordinate Detail (GPS Handheld)

Longitude	119° 43' 3.684" E
Latitude	3° 56' 29.908" S
Easting	801813.18 m
Northing	9563831.03 m
Ellipsoid Height	255.81 m
Datum	WGS 1984
Map Projection	UTM 50 South

Description

1. Local guide;
   a. Name: Bpk. Darwis
   b. Contact: 085250791816
2. Forest class;
   Other uses (APL)
3. Land owner;
   a. Name: Bpk. Umar
   b. Contact: N/A
4. Accessibility;
   By motobike from Pabbaresseng road
5. Land cover;
   - Rocks
   - Corn
   - Cashew
   - Wooden Trees
   - Manggo
6. Animal;

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Photo ID: PC130578	Direction: North

Photo ID: PC130579	Direction: East

Photo ID: PC130580	Direction: South

Photo ID: PC130581	Direction: West

WTG ID	CLIENT
T-13A	PT UPC Sidrap Bayu Energi

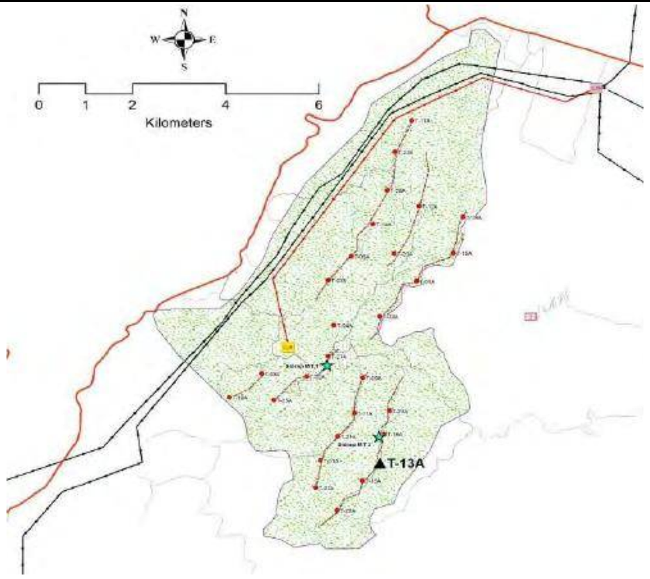
Administration Detail

Village	Mattirotasi
Sub District	Watang Pulu
Regency	Sidenreng Rappang
Province	South Sulawesi

Project

Number	JKTD14001
Name	Sidrap Wind Farm AMDAL

Photo Location



Coordinate Detail (GPS Handheld)

Longitude	119° 42' 36.641" E
Latitude	3° 59' 48.239" S
Easting	800958.33 m
Northing	9557737.33 m
Ellipsoid Height	298.42 m
Datum	WGS 1984
Map Projection	UTM 50 South

Description

1. Local guide;
   a. Name: Bpk. Samir
   b. Contact: 081241426271
2. Forest class;
   Limited production forest
3. Land owner;
   a. Name: Bpk. Idris
   b. Contact: N/A
4. Accessibility;
   By motobike from Pabbaresseng road
5. Land cover;
   - Bush
   - Teak Wood
   - Grass
   - Rocks
   - Wooden Trees
6. Animal; Cow

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Photo ID: PC151058	Direction: North

Photo ID: PC151059	Direction: East

Photo ID: PC1510_59_63	Direction: South

Photo ID: PC151063	Direction: West

WTG ID	CLIENT
T-14A	PT UPC Sidrap Bayu Energi

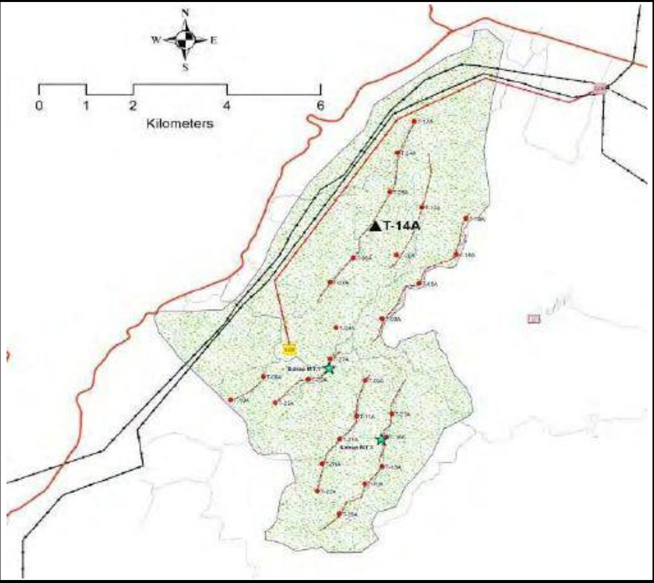
Administration Detail

Village	Lainungan
Sub District	Watang Pulu
Regency	Sidenreng Rappang
Province	South Sulawesi

Project

Number	JKTD14001
Name	Sidrap Wind Farm AMDAL

Photo Location



Coordinate Detail (GPS Handheld)

Longitude	119° 42' 32.011" E
Latitude	3° 56' 45.103" S
Easting	800833.87 m
Northing	9563367.13 m
Ellipsoid Height	282.44 m
Datum	WGS 1984
Map Projection	UTM 50 South

Description

1. Local guide;
   a. Name: Bpk. Darwis
   b. Contact: 085250791816
2. Forest class;
   Other uses (APL)
3. Land owner;
   a. Name: Bpk. Laddi Tana
   b. Contact: 081242335238 (Son: Latahang)
4. Accessibility;
   By motobike from Pabbaresseng road
5. Land cover;
   - Rocks - Wooden Trees - Teak Wood
   - Corn - Banana
   - Cashew - Candlenut
6. Animal; Dog & Eagle

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Photo ID: PC140846	Direction: North

Photo ID: PC140847	Direction: East

Photo ID: PC140848	Direction: South

Photo ID: PC140849	Direction: West

WTG ID	CLIENT
T-15A	PT UPC Sidrap Bayu Energi

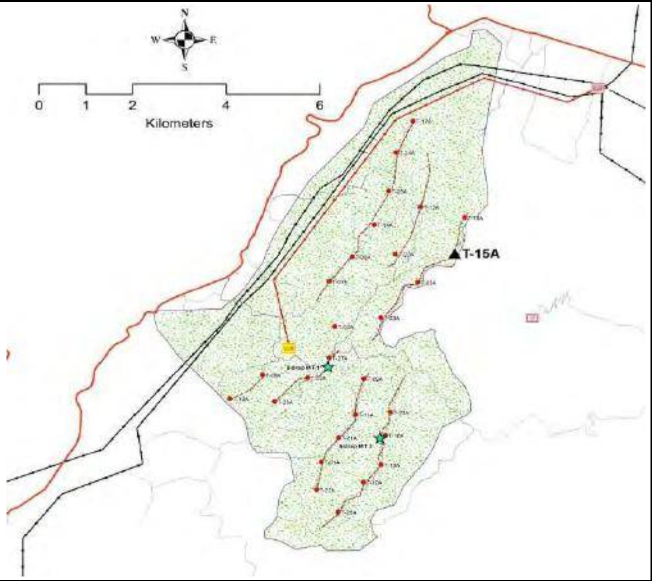
Administration Detail

Village	Ululale
Sub District	Watang Pulu
Regency	Sidenreng Rappang
Province	South Sulawesi

Project

Number	JKTD14001
Name	Sidrap Wind Farm AMDAL

Photo Location



Coordinate Detail (GPS Handheld)

Longitude	119° 43' 27.927" E
Latitude	3° 57' 6.530" S
Easting	802557.90 m
Northing	9562702.84 m
Ellipsoid Height	250.17 m
Datum	WGS 1984
Map Projection	UTM 50 South

Description

1. Local guide;
   a. Name: Bpk. Andi Ojeng
   b. Contact: 085299589760
2. Forest class;
   Other uses (APL)
3. Land owner;
   a. Name: N/A
   b. Contact: N/A
4. Accessibility;
   By walking from Pabbaresseng road
5. Land cover;
   - Bush
   - Wooden Trees
   - Rocks
6. Animal; Wild Pig

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Photo ID: PC181818	Direction: North

Photo ID: PC181819	Direction: East

Photo ID: PC181821	Direction: South

Photo ID: PC181822	Direction: West

WTG ID	CLIENT
T-16A	UPC Renewables PT UPC Sidrap Bayu Energi

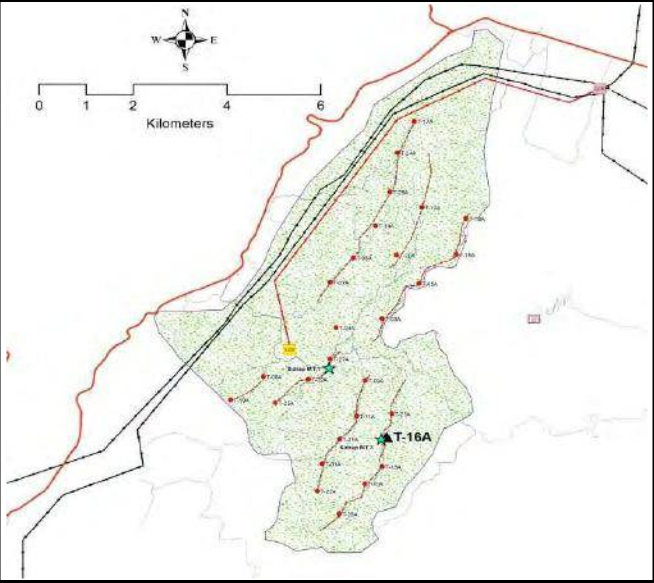
Administration Detail

Village	Mattirotasi
Sub District	Watang Pulu
Regency	Sidenreng Rappang
Province	South Sulawesi

Project

Number	JKTD14001
Name	Sidrap Wind Farm AMDAL

Photo Location



Coordinate Detail (GPS Handheld)

Longitude	119° 42' 39.636" E
Latitude	3° 59' 25.573" S
Easting	801053.09 m
Northing	9558433.74 m
Ellipsoid Height	329.44 m
Datum	WGS 1984
Map Projection	UTM 50 South

Description

1. Local guide;
   a. Name: Bpk. Samir
   b. Contact: 081241426271
2. Forest class;
   Other uses (APL)
3. Land owner;
   a. Name: Bpk. H. Ara
   b. Contact: 082393997615 (Son: Usman)
4. Accessibility;
   By motobike from Pabbaresseng road
5. Land cover;
   - Grass
   - Rocks
   - Teak Wood
   - Wooden Trees
   - Cashew
6. Animal; Cow

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Photo ID: PC151018	Direction: North

Photo ID: PC151019	Direction: East

Photo ID: PC151020	Direction: South

Photo ID: PC151021	Direction: West

WTG ID	CLIENT
T-17A	UPC Renewables PT UPC Sidrap Bayu Energi

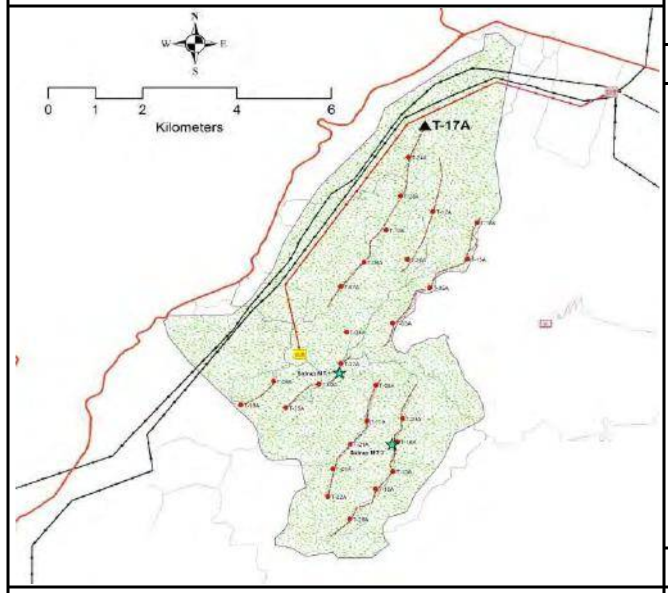
Administration Detail

Village	Lawawoi
Sub District	Watang Pulu
Regency	Sidenreng Rappang
Province	South Sulawesi

Project

Number	JKTD14001
Name	Sidrap Wind Farm AMDAL

Photo Location



Coordinate Detail (GPS Handheld)

Longitude	119° 42' 58.694" E
Latitude	3° 55' 24.604" S
Easting	801665.67 m
Northing	9565838.89 m
Ellipsoid Height	241.96 m
Datum	WGS 1984
Map Projection	UTM 50 South

Description

1. Local guide;
   a. Name: Bpk. Tahir
   b. Contact: 085255920478
2. Forest class;
   Other uses (APL)
3. Land owner;
   a. Name: N/A
   b. Contact: N/A
4. Accessibility;
   By motobike from Pabbaresseng road
5. Land cover;
   - Bush
   - Rocks
   - Wooden Trees
6. Animal; Birds

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Photo ID: PC181740 | Direction: North

Photo ID: PC181741 | Direction: East

Photo ID: PC181742 | Direction: South

Photo ID: PC181743 | Direction: West

WTG ID	CLIENT
T-18A	PT UPC Sidrap Bayu Energi

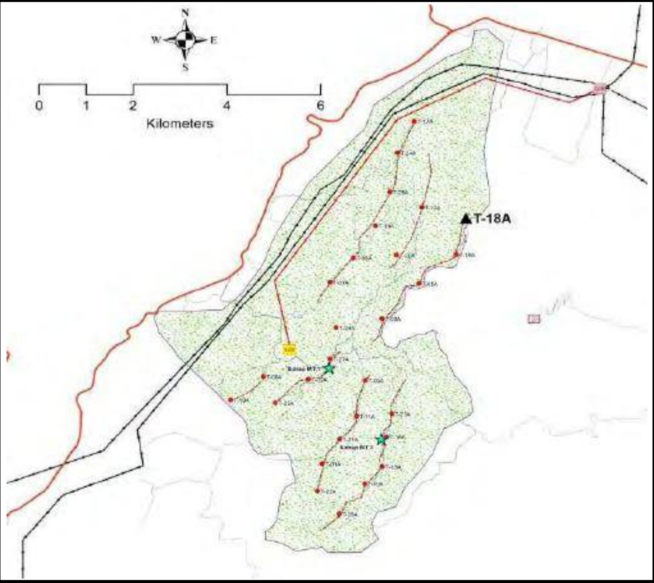
Administration Detail

Village	Ululale
Sub District	Watang Pulu
Regency	Sidenreng Rappang
Province	South Sulawesi

Project

Number	JKTD14001
Name	Sidrap Wind Farm AMDAL

Photo Location



Coordinate Detail (GPS Handheld)

Longitude	119° 43' 35.447" E
Latitude	3° 56' 39.088" S
Easting	802792.83 m
Northing	9563545.63 m
Ellipsoid Height	245.46 m
Datum	WGS 1984
Map Projection	UTM 50 South

Description

1. Local guide;
   a. Name: Bpk. Andi Ojeng
   b. Contact: 085299589760
2. Forest class;
   Other uses (APL)
3. Land owner;
   a. Name: N/A
   b. Contact: N/A
4. Accessibility;
   By walking from Pabbaresseng road
5. Land cover;
   - Bush
   - Wooden Trees
   - Rocks
6. Animal; Wild Pig

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Photo ID: PC181829	Direction: North

Photo ID: PC181830	Direction: East

Photo ID: PC181831	Direction: South

Photo ID: PC181832	Direction: West

WTG ID	CLIENT
T-19A	PT UPC Sidrap Bayu Energi

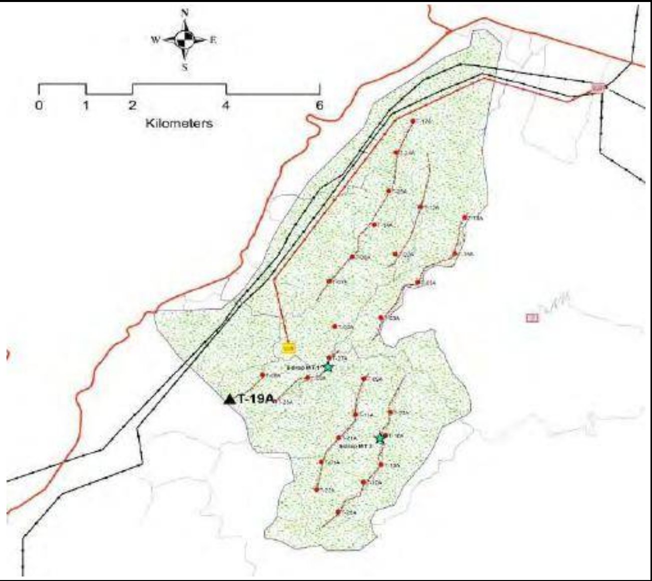
Administration Detail

Village	Mattirotasi
Sub District	Watang Pulu
Regency	Sidenreng Rappang
Province	South Sulawesi

Project

Number	JKTD14001
Name	Sidrap Wind Farm AMDAL

Photo Location



Coordinate Detail (GPS Handheld)

Longitude	119° 40' 52.190" E
Latitude	3° 58' 57.356" S
Easting	797739.14 m
Northing	9559311.93 m
Ellipsoid Height	243.47 m
Datum	WGS 1984
Map Projection	UTM 50 South

Description

1. Local guide;
   a. Name: Bpk. Laconding
   b. Contact: 082335531254
2. Forest class;
   Limited production forest
3. Land owner;
   a. Name: N/A
   b. Contact: N/A
4. Accessibility;
   By motobike from Pabbaresseng road
5. Land cover;
   - Rocks
   - Wooden Trees
   - Teak Wood
   - Bush
6. Animal; N/A

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Photo ID: PC161388 | Direction: North

Photo ID: PC161389 | Direction: East

Photo ID: PC161390 | Direction: South

Photo ID: PC161391 | Direction: West

WTG ID	CLIENT
T-20A	PT UPC Sidrap Bayu Energi

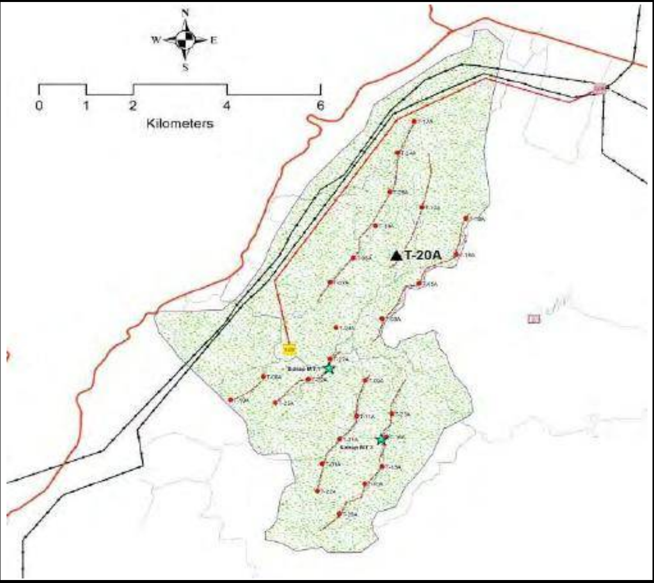
Administration Detail

Village	Lainungan
Sub District	Watang Pulu
Regency	Sidenreng Rappang
Province	South Sulawesi

Project

Number	JKTD14001
Name	Sidrap Wind Farm AMDAL

Photo Location



Coordinate Detail (GPS Handheld)

Longitude	119° 42' 49.442" E
Latitude	3° 57' 6.912" S
Easting	801369.81 m
Northing	9562695.00 m
Ellipsoid Height	292.41 m
Datum	WGS 1984
Map Projection	UTM 50 South

Description

1. Local guide;
   a. Name: Bpk. Darwis
   b. Contact: 085250791816
2. Forest class;
   Other uses (APL)
3. Land owner;
   a. Name: Bpk. Lagading
   b. Contact: N/A
4. Accessibility;
   By motobike from Pabbaresseng road
5. Land cover;
   - Rocks - Wooden Trees
   - Corn - Bush
   - Cashew
6. Animal; N/A

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Photo ID: PC130637	Direction: North

Photo ID: PC130638	Direction: East

Photo ID: PC130639	Direction: South

Photo ID: PC130640	Direction: West

WTG ID	CLIENT
T-21A	UPC Renewables PT UPC Sidrap Bayu Energi

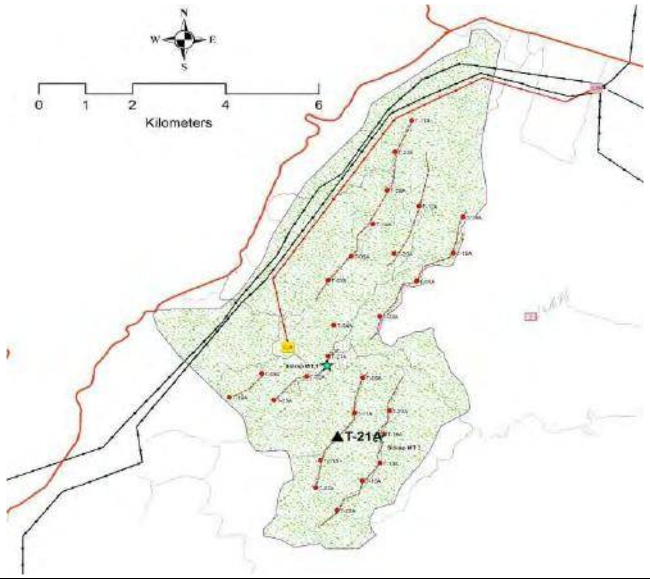
Administration Detail

Village	Mattirotasi
Sub District	Watang Pulu
Regency	Sidenreng Rappang
Province	South Sulawesi

Project

Number	JKTD14001
Name	Sidrap Wind Farm AMDAL

Photo Location



Coordinate Detail (GPS Handheld)

Longitude	119° 42' 7.092" E
Latitude	3° 59' 27.251" S
Easting	800048.30 m
Northing	9558385.48 m
Ellipsoid Height	290.87 m
Datum	WGS 1984
Map Projection	UTM 50 South

Description

1. Local guide;
   a. Name: Bpk. Tahir
   b. Contact: 085255920478
2. Forest class;
   Limited production forest
3. Land owner;
   a. Name: N/A
   b. Contact: N/A
4. Accessibility;
   By walking from Pabbaresseng road
5. Land cover;
   - Bush
   - Rocks
   - Teak Wood
6. Animal; Wild Pig & Cow

Provided by

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Photo ID: PC171640	Direction: North

Photo ID: PC171641	Direction: East

Photo ID: PC171642	Direction: South

Photo ID: PC171643	Direction: West

WTG ID	CLIENT
T-22A	UPC Renewables **PT UPC Sidrap Bayu Energi**

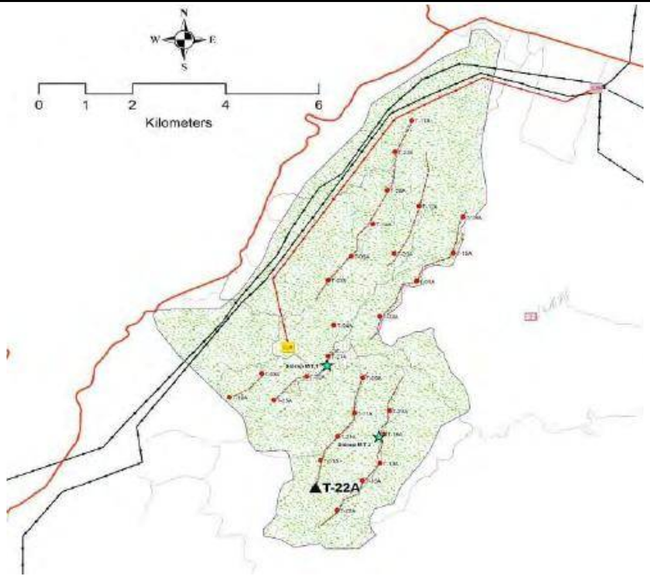
Administration Detail

Village	Mattirotasi
Sub District	Watang Pulu
Regency	Sidenreng Rappang
Province	South Sulawesi

Project

Number	JKTD14001
Name	Sidrap Wind Farm AMDAL

Photo Location



Coordinate Detail (GPS Handheld)

Longitude	119° 41' 52.087" E
Latitude	4° 0' 6.995" S
Easting	799581.10 m
Northing	9557165.33 m
Ellipsoid Height	210.18 m
Datum	WGS 1984
Map Projection	UTM 50 South

Description

1. Local guide;
   a. Name: Bpk. Tahir
   b. Contact: 085255920478
2. Forest class;
   Limited production forest
3. Land owner;
   a. Name: N/A
   b. Contact: N/A
4. Accessibility;
   By walking from Pabbaresseng road
5. Land cover;
   - Bush - Wooden Trees
   - Rocks
   - Teak Wood
6. Animal; Wild Pig & Cow

Provided by

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Photo ID: PC171688	Direction: North

Photo ID: PC171689	Direction: East

Photo ID: PC171690	Direction: South

Photo ID: PC171691	Direction: West

WTG ID	CLIENT
T-23A	UPC Renewables PT UPC Sidrap Bayu Energi

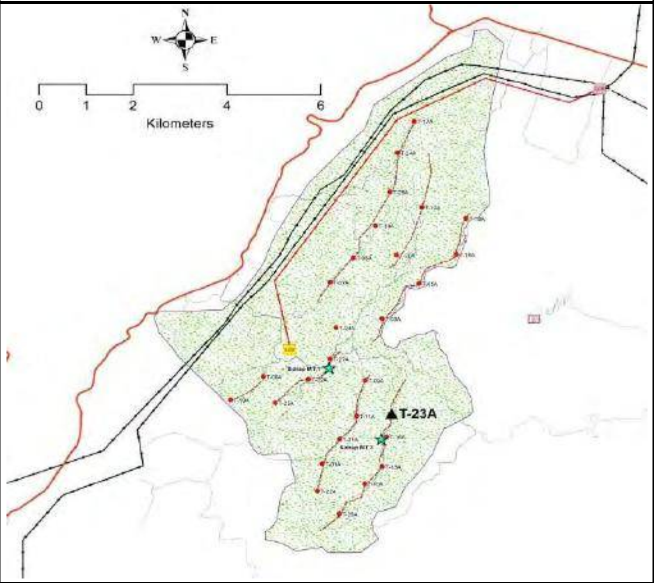
Administration Detail

Village	Mattirotasi
Sub District	Watang Pulu
Regency	Sidenreng Rappang
Province	South Sulawesi

Project

Number	JKTD14001
Name	Sidrap Wind Farm AMDAL

Photo Location



Coordinate Detail (GPS Handheld)

Longitude	119° 42' 43.175" E
Latitude	3° 59' 7.793" S
Easting	801164.14 m
Northing	9558979.92 m
Ellipsoid Height	280.84 m
Datum	WGS 1984
Map Projection	UTM 50 South

Description

1. Local guide;
   a. Name: Bpk. Samir
   b. Contact: 081241426271
2. Forest class;
   Limited production forest
3. Land owner;
   a. Name: Bpk. H. Ara
   b. Contact: 082393997615 (Son: Usman)
4. Accessibility;
   By motobike from Pabbaresseng road
5. Land cover;
   - Grass
   - Wooden Trees
   - Rocks
6. Animal; Cow

Provided by

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Photo ID: PC150992	Direction: North

Photo ID: PC150993	Direction: East

Photo ID: PC150994	Direction: South

Photo ID: PC150995	Direction: West

WTG ID	CLIENT
T-24A	UPC Renewables PT UPC Sidrap Bayu Energi

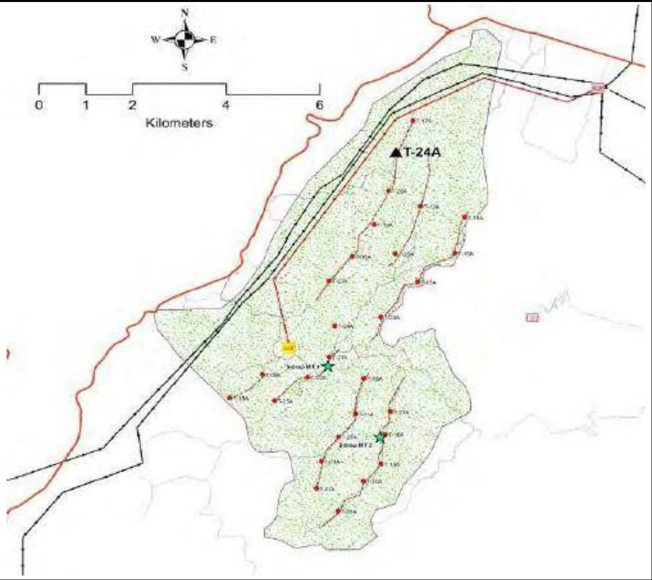
Administration Detail

Village	Lawawoi
Sub District	Watang Pulu
Regency	Sidenreng Rappang
Province	South Sulawesi

Project

Number	JKTD14001
Name	Sidrap Wind Farm AMDAL

Photo Location



Coordinate Detail (GPS Handheld)

Longitude	119° 42' 46.904" E
Latitude	3° 55' 48.900" S
Easting	801299.26 m
Northing	9565093.23 m
Ellipsoid Height	239.74 m
Datum	WGS 1984
Map Projection	UTM 50 South

Description

1. Local guide;
   a. Name: Bpk. Tahir
   b. Contact: 085255920478
2. Forest class;
   Other uses (APL)
3. Land owner;
   a. Name: Iresseng Larau
   b. Contact: N/A
4. Accessibility;
   By motobike from Pabbaresseng road
5. Land cover;
   - Corn
   - Rocks
   - Cashew
   - Wooden Trees
   - Candlenut
6. Animal; N/A

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Photo ID: PC181711	Direction: North

Photo ID: PC181712	Direction: East

Photo ID: PC181713	Direction: South

Photo ID: PC181714	Direction: West

WTG ID	CLIENT
T-25A	UPC Renewables **PT UPC Sidrap Bayu Energi**

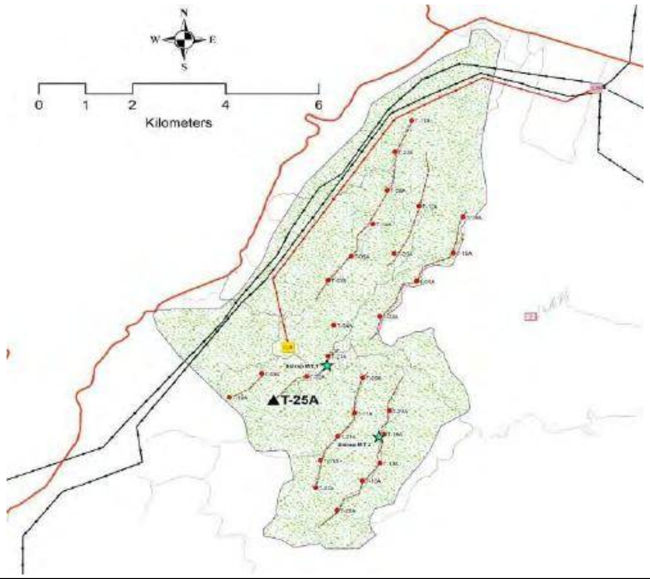
Administration Detail

Village	Mattirotasi
Sub District	Watang Pulu
Regency	Sidenreng Rappang
Province	South Sulawesi

Project

Number	JKTD14001
Name	Sidrap Wind Farm AMDAL

Photo Location



Coordinate Detail (GPS Handheld)

Longitude	119° 41' 25.080" E
Latitude	3° 58' 57.648" S
Easting	798754.39 m
Northing	9559299.66 m
Ellipsoid Height	203.69 m
Datum	WGS 1984
Map Projection	UTM 50 South

Description

1. Local guide;
   a. Name: Bpk. Laconding
   b. Contact: 082335531254
2. Forest class;
   Limited production forest
3. Land owner;
   a. Name: N/A
   b. Contact: N/A
4. Accessibility;
   By motobike from Pabbaresseng road
5. Land cover;
   - Rocks - Wooden Trees
   - Teak Wood
   - Bush
6. Animal; N/A

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Photo ID: PC161283	Direction: North

Photo ID: PC161284	Direction: East

Photo ID: PC161285	Direction: South

Photo ID: PC161286	Direction: West

WTG ID	CLIENT
T-26A	UPC Renewables **PT UPC Sidrap Bayu Energi**

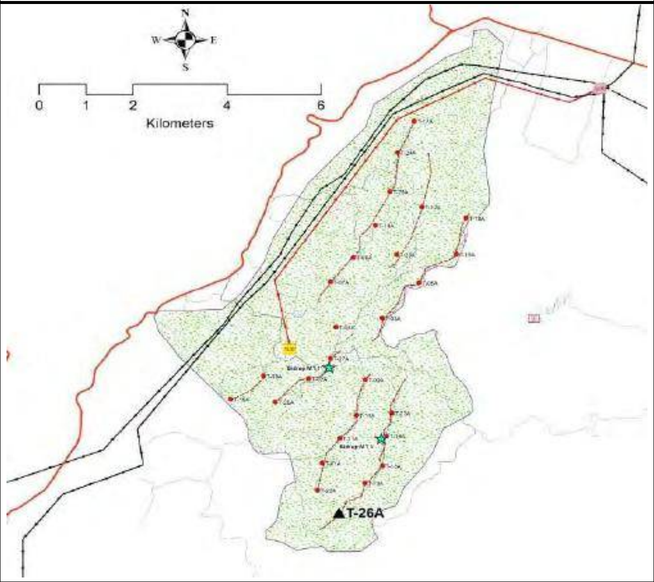
Administration Detail

Village	Mattirotasi
Sub District	Watang Pulu
Regency	Sidenreng Rappang
Province	South Sulawesi

Project

Number	JKTD14001
Name	Sidrap Wind Farm AMDAL

Photo Location



Coordinate Detail (GPS Handheld)

Longitude	119° 42' 6.807" E
Latitude	4° 0' 24.228" S
Easting	800033.76 m
Northing	9556634.12 m
Ellipsoid Height	225.77 m
Datum	WGS 1984
Map Projection	UTM 50 South

Description

1. Local guide;
   a. Name: Bpk. Samir
   b. Contact: 081241426271
2. Forest class;
   Limited production forest
3. Land owner;
   a. Name: Bpk. Baharuddin (Ambo Baha)
   b. Contact: 082190185561 (Daughter: Ibaba)
4. Accessibility;
   By motobike from Pabbaresseng road
5. Land cover;
   - Bush - Wooden Trees
   - Rocks
   - Cashew
6. Animal; N/A

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Photo ID: PC151168	Direction: North

Photo ID: PC151169	Direction: East

Photo ID: PC151170	Direction: South

Photo ID: PC151171	Direction: West

WTG ID	CLIENT
T-27A	UPC Renewables **PT UPC Sidrap Bayu Energi**

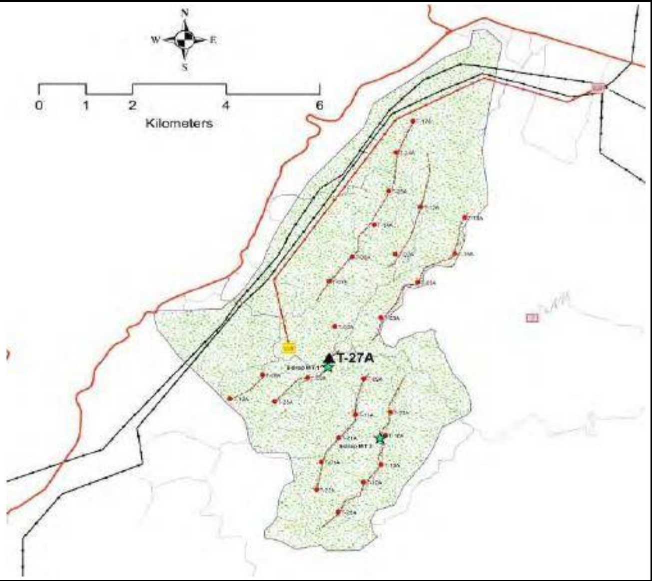
Administration Detail

Village	Mattirotasi
Sub District	Watang Pulu
Regency	Sidenreng Rappang
Province	South Sulawesi

Project

Number	JKTD14001
Name	Sidrap Wind Farm AMDAL

Photo Location



Coordinate Detail (GPS Handheld)

Longitude	119° 42' 0.828" E
Latitude	3° 58' 26.184" S
Easting	799861.09 m
Northing	9560263.20 m
Ellipsoid Height	212.62 m
Datum	WGS 1984
Map Projection	UTM 50 South

Description

1. Local guide;
   a. Name: Bpk. Samir
   b. Contact: 081241426271
2. Forest class;
   Limited production forest
3. Land owner;
   a. Name: Bpk. Rustan
   b. Contact: N/A
4. Accessibility;
   By motobike from Pabbaresseng road
5. Land cover;
   - Bush - Wooden Trees
   - Rocks
   - Cashew
6. Animal; N/A

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Photo ID: PC151260	Direction: North

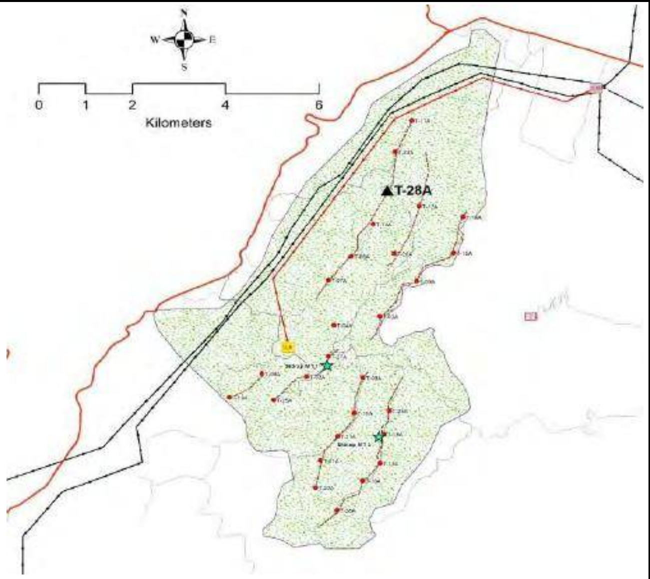
Photo ID: PC151261	Direction: East

Photo ID: PC151262	Direction: South

Photo ID: PC151263	Direction: West

WTG ID T-28A	CLIENT UPC Renewables PT UPC Sidrap Bayu Energi
Administration Detail	
Village	Lainungan
Sub District	Watang Pulu
Regency	Sidenreng Rappang
Province	South Sulawesi
Project	
Number	JKTD14001
Name	Sidrap Wind Farm AMDAL

Photo Location



Coordinate Detail (GPS Handheld)	
Longitude	119° 42' 42.062" E
Latitude	3° 56' 18.370" S
Easting	801146.83 m
Northing	9564187.86 m
Ellipsoid Height	284.41 m
Datum	WGS 1984
Map Projection	UTM 50 South

Description

1. Local guide;
   a. Name: Bpk. Darwis
   b. Contact: 085250791816
2. Forest class;
   Other uses (APL)
3. Land owner;
   a. Name: Bpk. Armin
   b. Contact: 081355892947 (Family in law: Sari)
4. Accessibility;
   By motobike from Pabbaresseng road
5. Land cover;

- Rocks	- Wooden Trees	- Teak Wood
- Corn	- Coconut	- Bamboo
- Cashew	- Candlenut	- Bush

6. Animal; Wild Pig

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Photo ID: PC140901	Direction: North

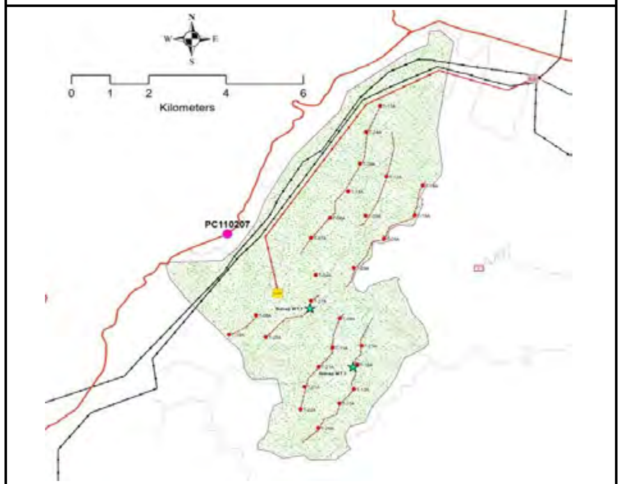
Photo ID: PC140902	Direction: East

Photo ID: PC140903	Direction: South

Photo ID: PC140904	Direction: West

PHOTO ID PC110207	CLIENT UPC Renewables PT UPC Sidrap Bayu Energi
Administration Detail	
Village	Mattirotasi
Sub District	Watang Pulu
Regency	Sidenreng Rappang
Province	South Sulawesi
Project	
Number	JKTD14001
Name	Sidrap Wind Farm AMDAL

Photo Location



Coordinate Detail (GPS Handheld)	
Longitude	119° 40' 50.70" E
Latitude	3° 57' 23.74" S
Easting	797702.34 m
Northing	9562189.64 m
Ellipsoid Height	131.40 m
Datum	WGS 1984
Map Projection	UTM 50 South

Provided by

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Description

Entrance Pabberesseng road to project area.

PHOTO ID MATTIROTASI VILLAGE OFFICE	CLIENT PT UPC Sidrap Bayu Energi

Administration Detail

Village	Mattirotasi
Sub District	Watang Pulu
Regency	Sidenreng Rappang
Province	South Sulawesi

Project

Number	JKTD14001
Name	Sidrap Wind Farm AMDAL

Photo Location

Coordinate Detail (GPS Handheld)

Longitude	119° 40' 45.49" E
Latitude	3° 57' 40.44" S
Easting	797539.87 m
Northing	9561676.70 m
Ellipsoid Height	75.40 m
Datum	WGS 1984
Map Projection	UTM 50 South

Provided by

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Description

Mattirotasi Village Office.

PHOTO ID PC110217	CLIENT PT UPC Sidrap Bayu Energi
Administration Detail	
Village	Mattirotasi
Sub District	Watang Pulu
Regency	Sidenreng Rappang
Province	South Sulawesi
Project	
Number	JKTD14001
Name	Sidrap Wind Farm AMDAL

Photo Location

Coordinate Detail (GPS Handheld)	
Longitude	119° 40' 58.32" E
Latitude	3° 57' 42.63" S
Easting	797935.75 m
Northing	9561608.26 m
Ellipsoid Height	113.30 m
Datum	WGS 1984
Map Projection	UTM 50 South

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Description

Bridge and transmission line crossing the access road.

PHOTO ID PC110221	CLIENT UPC Renewables PT UPC Sidrap Bayu Energi

Administration Detail

Village	Mattirotasi
Sub District	Watang Pulu
Regency	Sidenreng Rappang
Province	South Sulawesi

Project

Number	JKTD14001
Name	Sidrap Wind Farm AMDAL

Photo Location

Coordinate Detail (GPS Handheld)

Longitude	119° 41' 2.725" E
Latitude	3° 57' 44.844" S
Easting	798071.59 m
Northing	9561539.76 m
Ellipsoid Height	116.72 m
Datum	WGS 1984
Map Projection	UTM 50 South

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Description

Teak wood trees alongside the access road (±150 m length).

PHOTO ID PC110234	CLIENT UPC Renewables PT UPC Sidrap Bayu Energi
Administration Detail	
Village	Mattirotasi
Sub District	Watang Pulu
Regency	Sidenreng Rappang
Province	South Sulawesi
Project	
Number	JKTD14001
Name	Sidrap Wind Farm AMDAL
Photo Location	

Coordinate Detail (GPS Handheld)	
Longitude	119° 41' 24.017" E
Latitude	3° 57' 54.732" S
Easting	798727.86 m
Northing	9561233.67 m
Ellipsoid Height	123.91 m
Datum	WGS 1984
Map Projection	UTM 50 South
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Description

Dried paddy plant area.

PHOTO ID PC110242	CLIENT UPC Renewables PT UPC Sidrap Bayu Energi
Administration Detail	
Village	Mattirotasi
Sub District	Watang Pulu
Regency	Sidenreng Rappang
Province	South Sulawesi
Project	
Number	JKTD14001
Name	Sidrap Wind Farm AMDAL
Photo Location	

Coordinate Detail (GPS Handheld)	
Longitude	119° 41' 21.964" E
Latitude	3° 58' 18.473" S
Easting	798662.12 m
Northing	9560504.15 m
Ellipsoid Height	131.44 m
Datum	WGS 1984
Map Projection	UTM 50 South
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Description

Bridge across the access road.

PHOTO ID PC110257	CLIENT UPC Renewables PT UPC Sidrap Bayu Energi

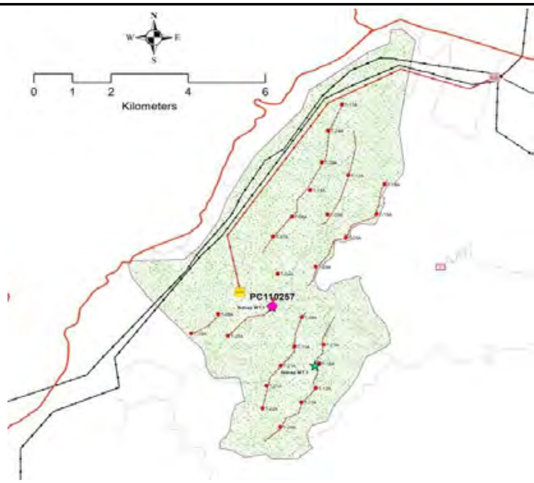
Administration Detail

Village	Mattirotasi
Sub District	Watang Pulu
Regency	Sidenreng Rappang
Province	South Sulawesi

Project

Number	JKTD14001
Name	Sidrap Wind Farm AMDAL

Photo Location



Coordinate Detail (GPS Handheld)

Longitude	119° 42' 0.108" E
Latitude	3° 58' 32.249" S
Easting	799838.25 m
Northing	9560076.86 m
Ellipsoid Height	220.45 m
Datum	WGS 1984
Map Projection	UTM 50 South

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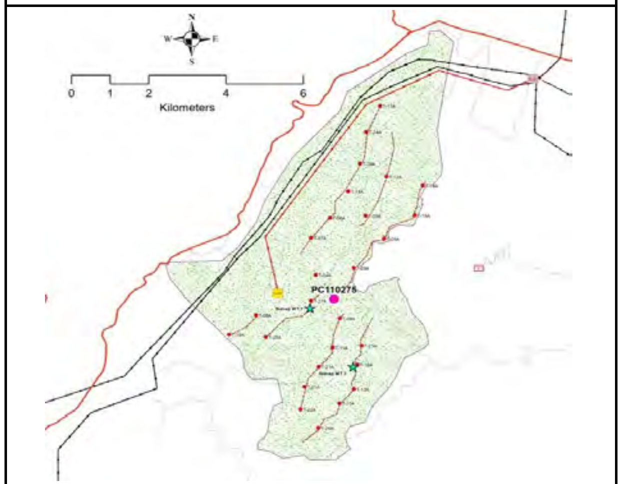
Description

Sidrap wind farm met tower-1.

Landcover: Cashew

PHOTO ID PC110275	CLIENT UPC Renewables PT UPC Sidrap Bayu Energi
Administration Detail	
Village	Mattirotasi
Sub District	Watang Pulu
Regency	Sidenreng Rappang
Province	South Sulawesi
Project	
Number	JKTD14001
Name	Sidrap Wind Farm AMDAL
Photo Location	



Coordinate Detail (GPS Handheld)	
Longitude	119° 42' 19.969" E
Latitude	3° 58' 24.439" S
Easting	800452.16 m
Northing	9560314.92 m
Ellipsoid Height	177.74 m
Datum	WGS 1984
Map Projection	UTM 50 South
Provided by	
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Description

Bridge across the access road.

PHOTO ID	CLIENT
PC110280	PT UPC Sidrap Bayu Energi

Administration Detail

Village	Mattirotasi
Sub District	Watang Pulu
Regency	Sidenreng Rappang
Province	South Sulawesi

Project

Number	JKTD14001
Name	Sidrap Wind Farm AMDAL

Photo Location

Coordinate Detail (GPS Handheld)

Longitude	119° 42' 30.755" E
Latitude	3° 58' 25.071" S
Easting	800785.05 m
Northing	9560294.39 m
Ellipsoid Height	188.22 m
Datum	WGS 1984
Map Projection	UTM 50 South

Provided by

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Description

Inundation.

PHOTO ID	CLIENT
PC110344	UPC Renewables™ PT UPC Sidrap Bayu Energi

Administration Detail

Village	Lainungan
Sub District	Watang Pulu
Regency	Sidenreng Rappang
Province	South Sulawesi

Project

Number	JKTD14001
Name	Sidrap Wind Farm AMDAL

Photo Location

Coordinate Detail (GPS Handheld)

Longitude	119° 43' 3.110" E
Latitude	4° 0' 1.159" S
Easting	801774.10 m
Northing	9557337.47 m
Ellipsoid Height	150.58 m
Datum	WGS 1984
Map Projection	UTM 50 South

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Description

Weather station.

PHOTO ID PC110353	CLIENT UPC Renewables PT UPC Sidrap Bayu Energi

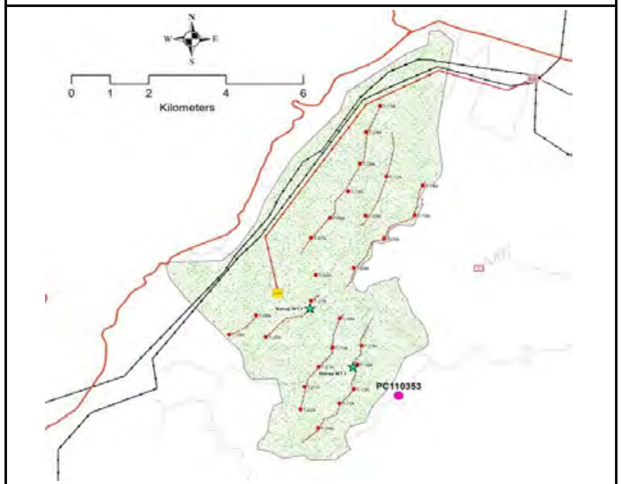
Administration Detail

Village	Lainungan
Sub District	Watang Pulu
Regency	Sidenreng Rappang
Province	South Sulawesi

Project

Number	JKTD14001
Name	Sidrap Wind Farm AMDAL

Photo Location



Coordinate Detail (GPS Handheld)

Longitude	119° 43' 3.110" E
Latitude	4° 0' 1.159" S
Easting	801774.10 m
Northing	9557337.47 m
Ellipsoid Height	150.58 m
Datum	WGS 1984
Map Projection	UTM 50 South

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www.aecom.com

Description

Elementary School (SDN No. 4 Lainungan).

PHOTO ID PC120389	CLIENT UPC Renewables PT UPC Sidrap Bayu Energi
Administration Detail	
Village	Uluale
Sub District	Watang Pulu
Regency	Sidenreng Rappang
Province	South Sulawesi
Project	
Number	JKTD14001
Name	Sidrap Wind Farm AMDAL

Photo Location

Coordinate Detail (GPS Handheld)	
Longitude	119° 44' 18.395" E
Latitude	3° 54' 28.653" S
Easting	804131.85 m
Northing	9567550.75 m
Ellipsoid Height	347.89 m
Datum	WGS 1984
Map Projection	UTM 50 South

Provided by

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www.aecom.com

Description

Mosque.

PHOTO ID PC120391	CLIENT UPC Renewables PT UPC Sidrap Bayu Energi
Administration Detail	
Village	Uluale
Sub District	Watang Pulu
Regency	Sidenreng Rappang
Province	South Sulawesi
Project	
Number	JKTD14001
Name	Sidrap Wind Farm AMDAL

Photo Location

Coordinate Detail (GPS Handheld)

Longitude	119° 44' 19.743" E
Latitude	3° 54' 31.390" S
Easting	804173.19 m
Northing	9567466.48 m
Ellipsoid Height	371.22 m
Datum	WGS 1984
Map Projection	UTM 50 South

Provided by

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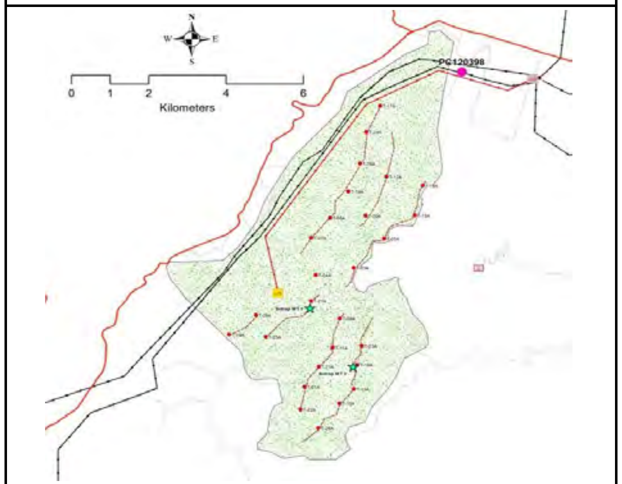
Description

Cemetery.

PHOTO ID PC120398	CLIENT UPC Renewables PT UPC Sidrap Bayu Energi
Administration Detail	
Village	Uluale
Sub District	Watang Pulu
Regency	Sidenreng Rappang
Province	South Sulawesi
Project	
Number	JKTD14001
Name	Sidrap Wind Farm AMDAL
Photo Location	



Coordinate Detail (GPS Handheld)	
Longitude	119° 44' 7.058" E
Latitude	3° 54' 52.932" S
Easting	803779.42 m
Northing	9566805.56 m
Ellipsoid Height	449.53 m
Datum	WGS 1984
Map Projection	UTM 50 South
Provided by	

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Description

Settlement under the transmission line.

PHOTO ID PC120411	CLIENT UPC Renewables PT UPC Sidrap Bayu Energi
Administration Detail	
Village	Uluale
Sub District	Watang Pulu
Regency	Sidenreng Rappang
Province	South Sulawesi
Project	
Number	JKTD14001
Name	Sidrap Wind Farm AMDAL
Photo Location	

Coordinate Detail (GPS Handheld)	
Longitude	119° 44' 0.351" E
Latitude	3° 55' 2.001" S
Easting	803571.42 m
Northing	9566527.48 m
Ellipsoid Height	440.06 m
Datum	WGS 1984
Map Projection	UTM 50 South
Provided by	

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Description

Quarry.

PHOTO ID PC120434	CLIENT UPC Renewables PT UPC Sidrap Bayu Energi
Administration Detail	
Village	Ulualé
Sub District	Watang Pulu
Regency	Sidenreng Rappang
Province	South Sulawesi
Project	
Number	JKTD14001
Name	Sidrap Wind Farm AMDAL
Photo Location	

Coordinate Detail (GPS Handheld)	
Longitude	119° 43' 44.864" E
Latitude	3° 55' 36.324" S
Easting	803089.86 m
Northing	9565473.97 m
Ellipsoid Height	518.75 m
Datum	WGS 1984
Map Projection	UTM 50 South
Provided by	

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Description

Spring water, flowing throughout the season and used for daily necessity.

PHOTO ID PC120572	CLIENT PT UPC Sidrap Bayu Energi
Administration Detail	
Village	Lainungan
Sub District	Watang Pulu
Regency	Sidenreng Rappang
Province	South Sulawesi
Project	
Number	JKTD14001
Name	Sidrap Wind Farm AMDAL

Photo Location

Coordinate Detail (GPS Handheld)

Longitude	119° 42' 58.370" E
Latitude	3° 56' 46.838" S
Easting	801647.41 m
Northing	9563311.14 m
Ellipsoid Height	266.9 m
Datum	WGS 1984
Map Projection	UTM 50 South

Provided by

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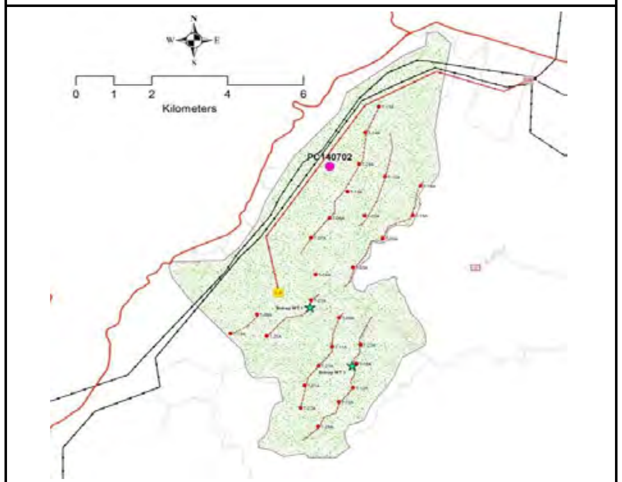
Description

Teak wood.

PHOTO ID PC140702	CLIENT UPC Renewables PT UPC Sidrap Bayu Energi
Administration Detail	
Village	Lainungan
Sub District	Watang Pulu
Regency	Sidenreng Rappang
Province	South Sulawesi
Project	
Number	JKTD14001
Name	Sidrap Wind Farm AMDAL

Photo Location



Coordinate Detail (GPS Handheld)	
Longitude	119° 42' 16.903" E
Latitude	3° 56' 20.849" S
Easting	800369.87 m
Northing	9564114.18 m
Ellipsoid Height	222.20 m
Datum	WGS 1984
Map Projection	UTM 50 South

Provided by

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www.aecom.com

Description

Corn Field.

PHOTO ID PC140823	CLIENT PT UPC Sidrap Bayu Energi
Administration Detail	
Village	Lainungan
Sub District	Watang Pulu
Regency	Sidenreng Rappang
Province	South Sulawesi
Project	
Number	JKTD14001
Name	Sidrap Wind Farm AMDAL

Photo Location

Coordinate Detail (GPS Handheld)	
Longitude	119° 42' 24.639" E
Latitude	3° 56' 59.220" S
Easting	800604.87 m
Northing	9562933.92 m
Ellipsoid Height	257.87 m
Datum	WGS 1984
Map Projection	UTM 50 South

Provided by

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Description

Corn Field.

PHOTO ID PC161340	CLIENT UPC Renewables PT UPC Sidrap Bayu Energi
Administration Detail	
Village	Mattirotasi
Sub District	Watang Pulu
Regency	Sidenreng Rappang
Province	South Sulawesi
Project	
Number	JKTD14001
Name	Sidrap Wind Farm AMDAL

Photo Location

Coordinate Detail (GPS Handheld)	
Longitude	119° 41' 39.601" E
Latitude	3° 58' 56.130" S
Easting	799202.79 m
Northing	9559344.84 m
Ellipsoid Height	227.83 m
Datum	WGS 1984
Map Projection	UTM 50 South

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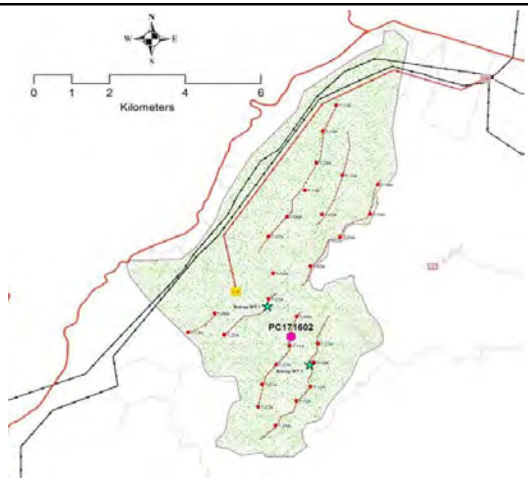
Description

Cow sheperding areas.

PHOTO ID PC171602	CLIENT PT UPC Sidrap Bayu Energi
Administration Detail	
Village	Mattirotasi
Sub District	Watang Pulu
Regency	Sidenreng Rappang
Province	South Sulawesi
Project	
Number	JKTD14001
Name	Sidrap Wind Farm AMDAL

Photo Location



Coordinate Detail (GPS Handheld)	
Longitude	119° 42' 20.221" E
Latitude	3° 59' 1.381" S
Easting	800456.19 m
Northing	9559179.33 m
Ellipsoid Height	301.61 m
Datum	WGS 1984
Map Projection	UTM 50 South

Provided by

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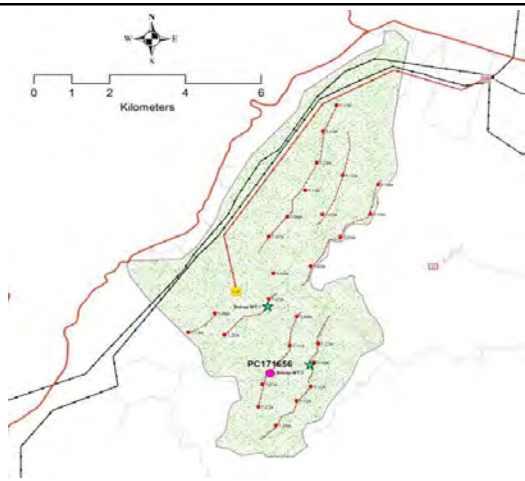
www.aecom.com

Description

Grassland.

PHOTO ID PC171656	CLIENT PT UPC Sidrap Bayu Energi
Administration Detail	
Village	Mattirotasi
Sub District	Watang Pulu
Regency	Sidenreng Rappang
Province	South Sulawesi
Project	
Number	JKTD14001
Name	Sidrap Wind Farm AMDAL
Photo Location	



Coordinate Detail (GPS Handheld)	
Longitude	119° 42' 1.920" E
Latitude	3° 59' 35.605" S
Easting	799887.79 m
Northing	9558129.21m
Ellipsoid Height	278.35 m
Datum	WGS 1984
Map Projection	UTM 50 South
Provided by	

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Description

Inundation.

PHOTO ID PC151034	CLIENT PT UPC Sidrap Bayu Energi
Administration Detail	
Village	Mattirotasi
Sub District	Watang Pulu
Regency	Sidenreng Rappang
Province	South Sulawesi
Project	
Number	JKTD14001
Name	Sidrap Wind Farm AMDAL

Photo Location

Coordinate Detail (GPS Handheld)	
Longitude	119° 42' 38.157" E
Latitude	3° 59' 28.676" S
Easting	801007.13 m
Northing	9558338.5 m
Ellipsoid Height	332.8 m
Datum	WGS 1984
Map Projection	UTM 50 South

Provided by

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Description

Sidrap wind farm met tower-2.

Landcover: Pasture.

PHOTO ID PC151088	CLIENT UPC Renewables PT UPC Sidrap Bayu Energi
Administration Detail	
Village	Mattirotasi
Sub District	Watang Pulu
Regency	Sidenreng Rappang
Province	South Sulawesi
Project	
Number	JKTD14001
Name	Sidrap Wind Farm AMDAL
Photo Location	

Coordinate Detail (GPS Handheld)	
Longitude	119° 42' 27.431" E
Latitude	4° 0' 3.281" S
Easting	800672.5 m
Northing	9557275.9 m
Ellipsoid Height	260.58 m
Datum	WGS 1984
Map Projection	UTM 50 South
Provided by	

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Description

Cashew tree near proposed wind turbine T-10A (± 100 m SE).

PHOTO ID	CLIENT
PC151130	PT UPC Sidrap Bayu Energi

Administration Detail

Village	Mattirotasi
Sub District	Watang Pulu
Regency	Sidenreng Rappang
Province	South Sulawesi

Project

Number	JKTD14001
Name	Sidrap Wind Farm AMDAL

Photo Location

Coordinate Detail (GPS Handheld)

Longitude	119° 42' 17.515" E
Latitude	4° 0' 11.627" S
Easting	800365.56 m
Northing	9557020.37 m
Ellipsoid Height	237.29 m
Datum	WGS 1984
Map Projection	UTM 50 South

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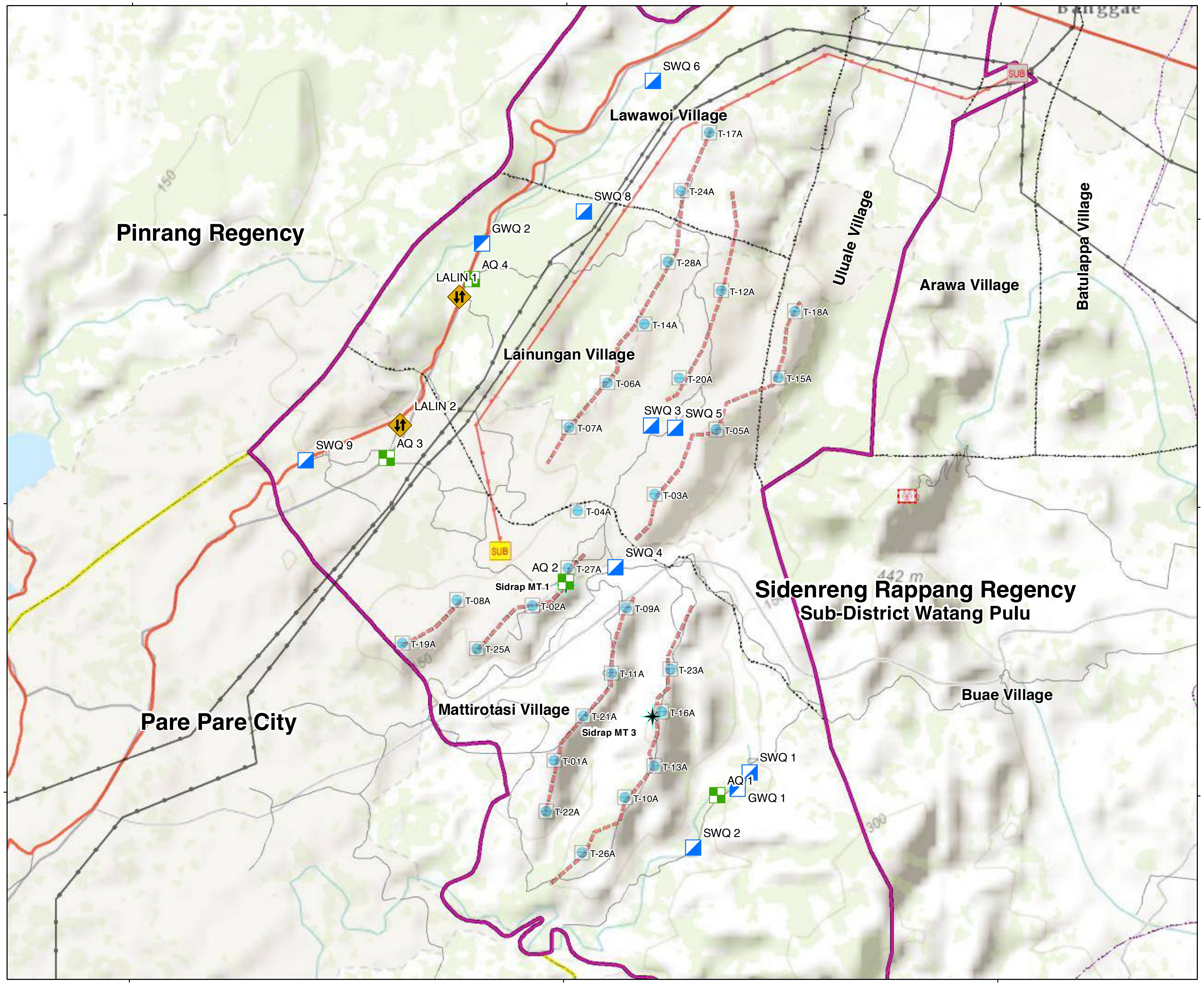
Description

Settlement between proposed wind turbine T-10A and T-26A

Appendix B



APPENDIX B-1

CLIENT

PT UPC Sidrap Bayu Energi

Map Title

SAMPLING LOCATION MAP
PHYSICAL & CHEMICAL

Administration Detail

Regency	Sidenreng Rappang
Province	Sulawesi Selatan

Scale Map

Scale 1:70,000 on A4 paper

0.6 0.3 0 0.6 1.2 1.8
Kilometers

Map Location

Legend

Met Tower
Proposed WTG
PLN Substation
Proposed UPC Substation
Existing Transmission Line
Proposed Transmission Line
Proposed WTG Strings
Comm Tower
Study Boundary
Regency Boundary
Sub-District Boundary
Village Boundary
Arterial Road
Local Road

Sampling
Air Quality
Ground Water Quality
Surface Water Quality
Traffic

Data Source

1. PT UPC Sidrap Bayu Energi
2. ESRI Topographic Map

Parameter

Datum	World Geodetic System 1984
Projection	Universal Transverse Mercator
Zone	50 South
Unit	Meter

Disclaimer:
This map represents a compilation of many spatial data from a variety of sources that aims to provide general information with details tailored to the scale that is written on this map. This map is intended to show the results of GIS analysis which can give the appearance of communicative spatial analysis. This map is not used as a judicial references associated with a boundary area depicted in the map view. This map is also not used as construction purposes. AECOM is not responsible for misuse of the information in the map view for any reason without prior confirmation.

This map is confidential and shall only be used for the purposes of this project

Rev.	BY	DATE	DESCRIPTION	CHKD	APPD
0	IDR	22 Jan 2014	Draft of physical & chemical sampling location		

Revision: 0	Created: IDR	Date: 22 Jan 2014	Project ID: IDJKT14001
	Checked:	Date:	File Name: AppB-1-Sampling Phys & Chem
	Approved:	Date:	Status: DRAFT

Note

Provided by

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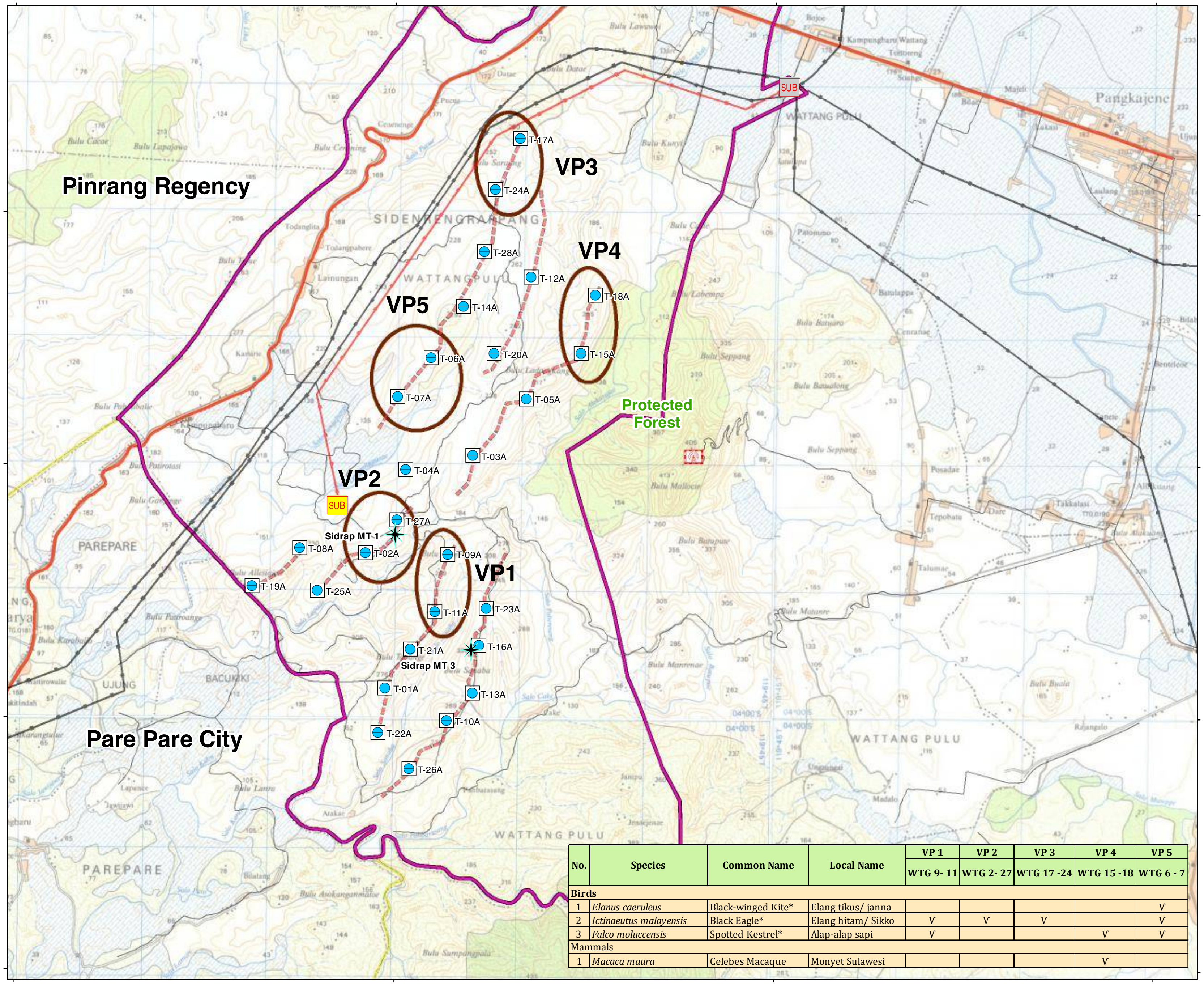
APPENDIX
B-2

CLIENT

PT UPC Sidrap Bayu Energi

Map Title

LOCATION OF VANTAGE POINT AND EXISTING TARGET SPECIES



No.	Species	Common Name	Local Name	VP 1	VP 2	VP 3	VP 4	VP 5
				WTG 9- 11	WTG 2- 27	WTG 17 -24	WTG 15 -18	WTG 6 - 7
Birds								
1	*Elanus caeruleus*	Black-winged Kite*	Elang tikus/ janna					V
2	*Ictinaeutus malayensis*	Black Eagle*	Elang hitam/ Sikko	V	V	V		V
3	*Falco moluccensis*	Spotted Kestrel*	Alap-alap sapi	V			V	V
Mammals								
1	*Macaca maura*	Celebes Macaque	Monyet Sulawesi				V	

Administration Detail

Regency	Sidenreng Rappang
Province	Sulawesi Selatan

Scale Map

Scale 1:80,000 on A4 paper

0.7 0.35 0 0.7 1.4 2.1

Kilometers

Map Location

Legend

- Met Tower
- Proposed WTG
- PLN Substation
- Proposed UPC Substation
- Existing Transmission Line
- Proposed Transmission Line
- Proposed WTG Strings
- Vantage Point
- Comm Tower
- Study Boundary
- Regency Boundary
- Arterial Road
- Local Road

Data Source

1. PT UPC Sidrap Bayu Energi
2. Field Survey January 2014
3. *Badan Informasi Geospasial* (Geospatial Information Agency)

Parameter

Datum	World Geodetic System 1984
Projection	Universal Transverse Mercator
Zone	50 South
Unit	Meter

Disclaimer:

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Rev.	BY	DATE	DESCRIPTION	CHKD	APPD
0	IDR	7 Feb 2014	Draft of vantage point map		

Revision: 0

Created: IDR	Date: 7 Feb 2014	Project ID: IDJKT14001
Checked:	Date:	File Name: AppB-2-VP&ETSO
Approved:	Date:	Status: DRAFT

Note

Provided by

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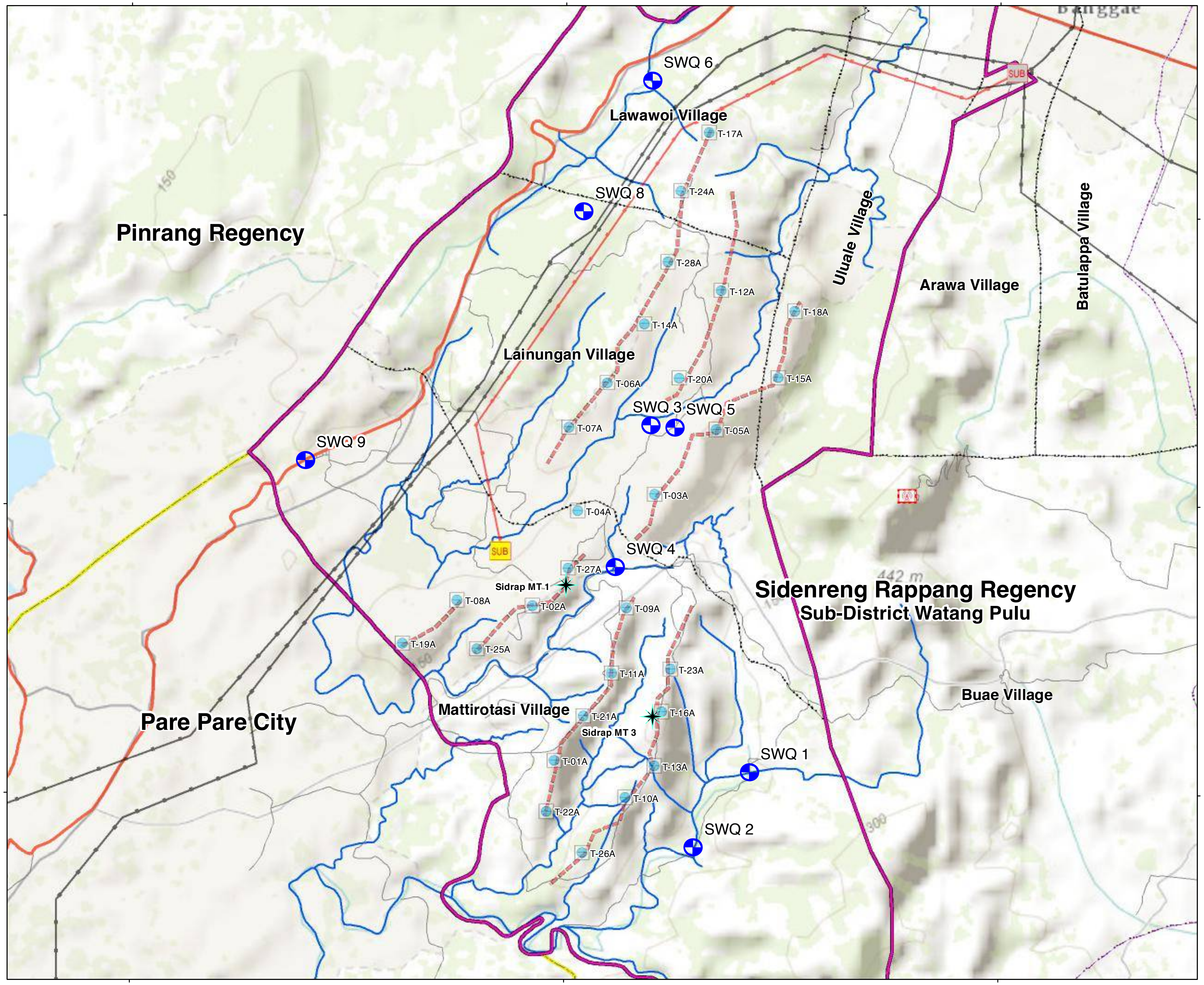

APPENDIX
B-3

CLIENT

UPC Renewables

PT UPC Sidrap Bayu Energi

Map Title

SAMPLING LOCATION MAP
AQUATIC BIOTA

Administration Detail

Regency	Sidenreng Rappang
Province	Sulawesi Selatan

Scale Map

Scale 1:70,000 on A4 paper

0.6 0.3 0 0.6 1.2 1.8
Kilometers

N W E S

Map Location

Legend

- Aquatic Sampling
- Met Tower
- Proposed WTG
- SUB PLN Substation
- SUB Proposed UPC Substation
- Comm Tower
- Existing Transmission Line
- Proposed Transmission Line
- Proposed WTG Strings
- Study Boundary
- Regency Boundary
- Sub-District Boundary
- Village Boundary
- Arterial Road
- Local Road
- River

Data Source

1. PT UPC Sidrap Bayu Energi
2. ESRI Topographic Map

Parameter

Datum	World Geodetic System 1984
Projection	Universal Transverse Mercator
Zone	50 South
Unit	Meter

Disclaimer:
This map represents a compilation of many spatial data from a variety of sources that aims to provide general information with details tailored to the scale that is written on this map. This map is intended to show the results of GIS analysis which can give the appearance of communicative spatial analysis. This map is not used as a judicial references associated with a boundary area depicted in the map view. This map is also not used as construction purposes. AECOM is not responsible for misuse of the information in the map view for any reason without prior confirmation.

This map is confidential and shall only be used for the purposes of this project

Rev.	BY	DATE	DESCRIPTION	CHKD	APPD
0	IDR	22 Jan 2014	Draft of aquatic sampling location		

Revision: 0	*Created:* IDR	*Date:* 22 Jan 2014	*Project ID:* IDJKT14001
	Checked:	*Date:*	*File Name:* AppB-3-Aquatic
	Approved:	*Date:*	*Status:* DRAFT

Note

Provided by

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F: +62 21 739 2001
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Appendix C

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Jakarta 12160, Indonesia
www.aecom.com

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+62 21 7392001 fax

PHOTOLOG

Surface Water

<table>
<tr><td colspan="2">Client Name:
UPC Sidrap</td><td>Site Location:
Desa Lainungan</td><td>Project No:
JKTD14001</td></tr>
<tr><td>Photo No:
01</td><td>Date:
13/12/2013</td><td colspan="2" rowspan="3"></td></tr>
<tr><td colspan="2">Direction Photo Taken:
Northeast</td></tr>
<tr><td colspan="2">Description:
Kamirie River, based on interviews, this river is ephemeral. Water condition is turbid with gravel and rock as riverbed. Does not appear to be very clean.</td></tr>
</table>

<table>
<tr><td colspan="2">Client Name:
UPC Sidrap</td><td>Site Location:
Desa Lainungan</td><td>Project No:
JKTD14001</td></tr>
<tr><td>Photo No:
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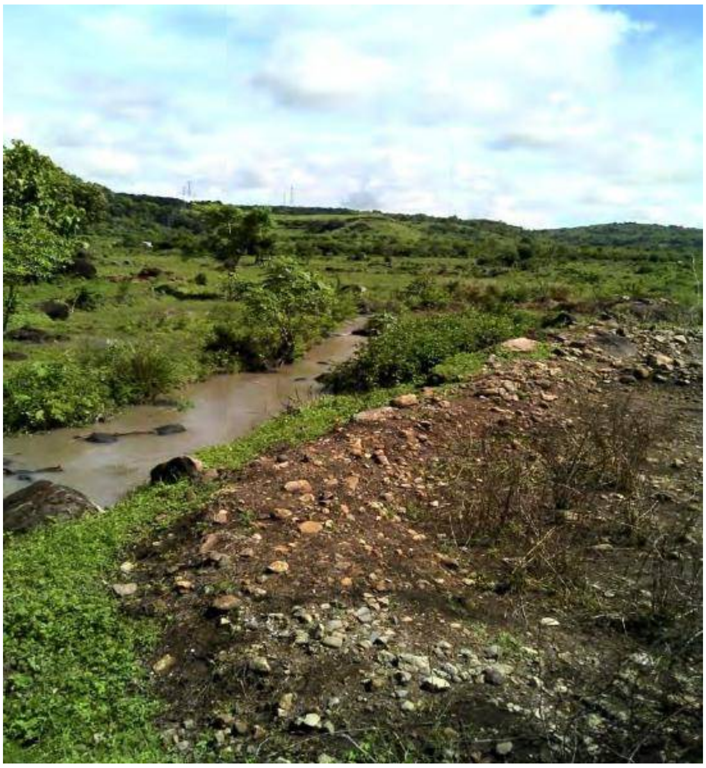
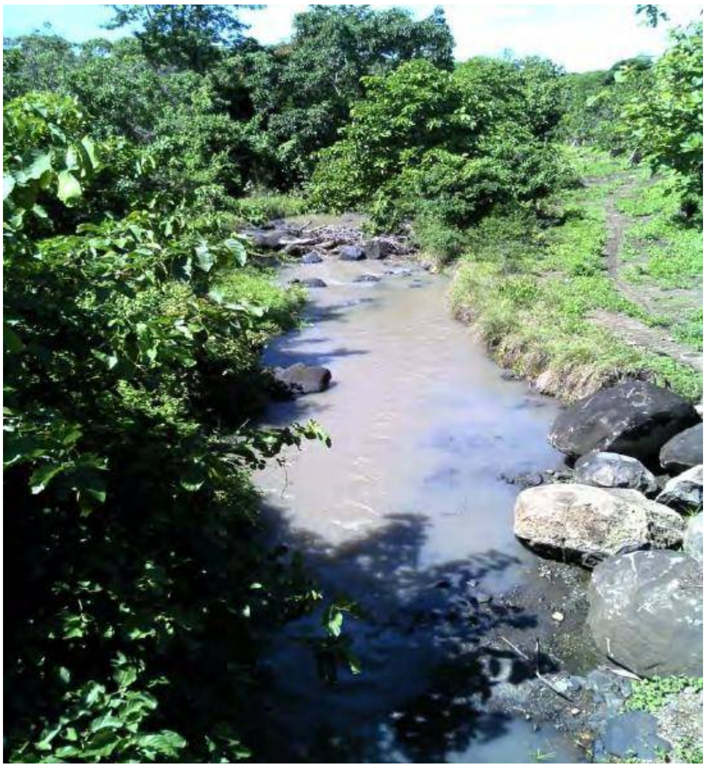
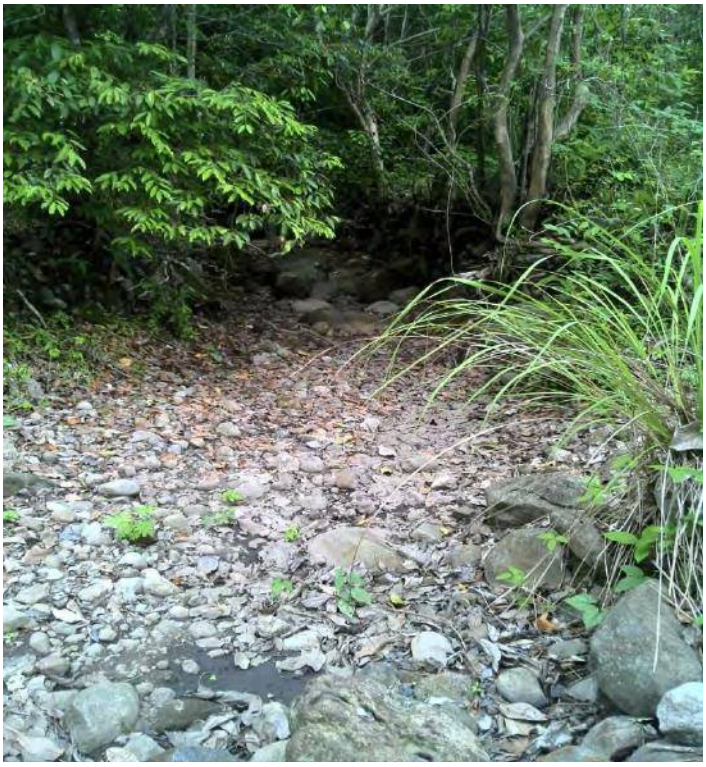
13/12/2013</td><td colspan="2" rowspan="3"></td></tr>
<tr><td colspan="2">Direction Photo Taken:
Northeast</td></tr>
<tr><td colspan="2">Description:
Abbeka River, based on interviews, this river is ephemeral.</td></tr>
</table>

<table>
<tr><td colspan="2">Client Name:
UPC Sidrap</td><td>Site Location:
Desa Lainungan</td><td>Project No:
JKTD14001</td></tr>
<tr><td>Photo No:
03</td><td>Date:
13/12/2013</td><td colspan="2" rowspan="3"></td></tr>
<tr><td colspan="2">Direction Photo Taken:
West</td></tr>
<tr><td colspan="2">Description:
Kulua River, based on interviews, this river is periodic. Water source for people in Dusun Kampung Baru (Desa Mattirotassi) located at the upstream of this river.</td></tr>
</table>

<table>
<tr><td colspan="2">Client Name:
UPC Sidrap</td><td>Site Location:
Desa Mattirotassi</td><td>Project No:
JKTD14001</td></tr>
<tr><td>Photo No:
04</td><td>Date:
13/12/2013</td><td colspan="2" rowspan="3"></td></tr>
<tr><td colspan="2">Direction Photo Taken:
West</td></tr>
<tr><td colspan="2">Description:
Lapade River (SWQ 3) located at Mattirotassi Village. Based on interviews, this river is ephemeral. No water biota observed.</td></tr>
</table>

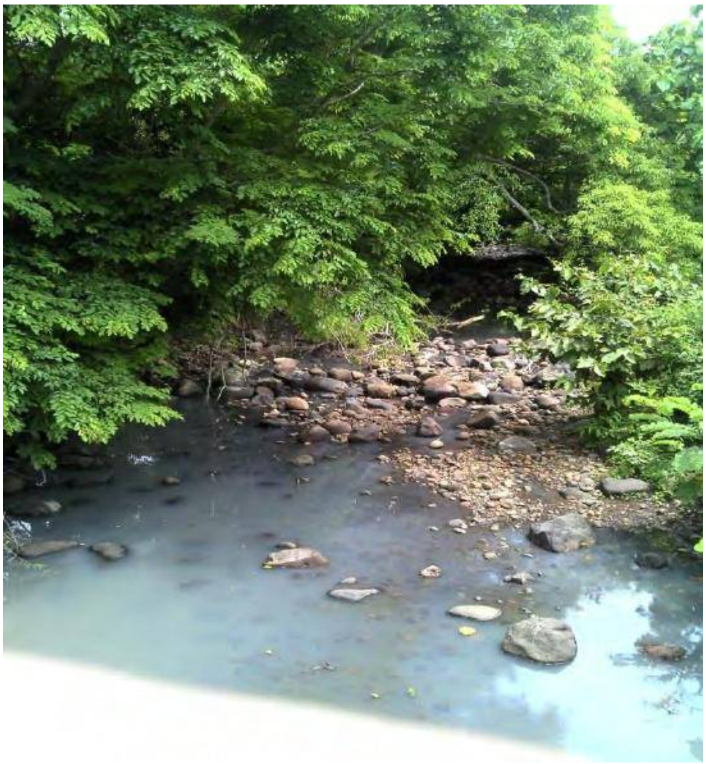
AECOM

Client Name: UPC Sidrap		Site Location: Desa Mattirotassi	Project No: JKTD14001
Photo No: 05	Date: 13/12/2013		
Direction Photo Taken: Northeast			
Description: Ephemeral creek comes from the study area. Water condition is dry and has rocky riverbed.			

Client Name: UPC Sidrap		Site Location: Desa Mattirotassi	Project No: JKTD14001
Photo No: 06	Date: 13/12/2013		
Direction Photo Taken: North			
Description: Downstream of Lapade river on photo 04 (SWQ 4). The water condition is less turbid with slow water flow.			

<table>
<tr><td colspan="2">Client Name:
UPC Sidrap</td><td>Site Location:
Lainungan Village</td><td>Project No:
JKTD14001</td></tr>
<tr><td>Photo No:
07</td><td>Date:
14/12/2013</td><td colspan="2" rowspan="3"></td></tr>
<tr><td colspan="2">Direction Photo Taken:
Northwest</td></tr>
<tr><td colspan="2">Description:
A small pond with size of ± 200m^2 located near in desa Mattirotassi (SWQ 5). The pool primarily used for drinking place for cows, but also for fish farm. Located appx. 500m from nearest wind turbine (T-05A)</td></tr>
</table>

<table>
<tr><td colspan="2">Client Name:
UPC Sidrap</td><td>Site Location:
Mattirotassi Village</td><td>Project No:
JKTD14001</td></tr>
<tr><td>Photo No:
08</td><td>Date:
14/12/2013</td><td colspan="2" rowspan="3"></td></tr>
<tr><td colspan="2">Direction Photo Taken:
North</td></tr>
<tr><td colspan="2">Description:
Lake with size ± 5000 m^2 located at Mattirotassi Village, used as drinking place for cows and buffalo. Located at ± 570 m from nearest wind turbine point (T-09A) to the northeast with slight slope.</td></tr>
</table>

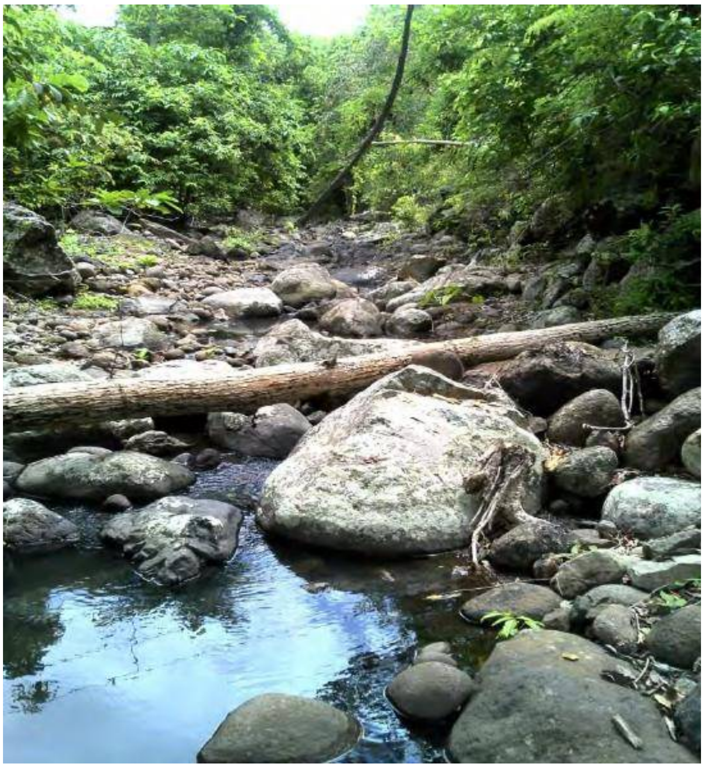
<table>
<tr><td colspan="2">Client Name:
UPC Sidrap</td><td>Site Location:
Pabberessang Sub-Village</td><td>Project No:
JKTD14001</td></tr>
<tr><td>Photo No:
09</td><td>Date:
14/12/2013</td><td colspan="2" rowspan="3"></td></tr>
<tr><td colspan="2">Direction Photo Taken:
East</td></tr>
<tr><td colspan="2">Description:
Pabberessang River (SWQ 1) flows trough Pabberessang Sub-village that potentially receives run-off from study area.</td></tr>
</table>

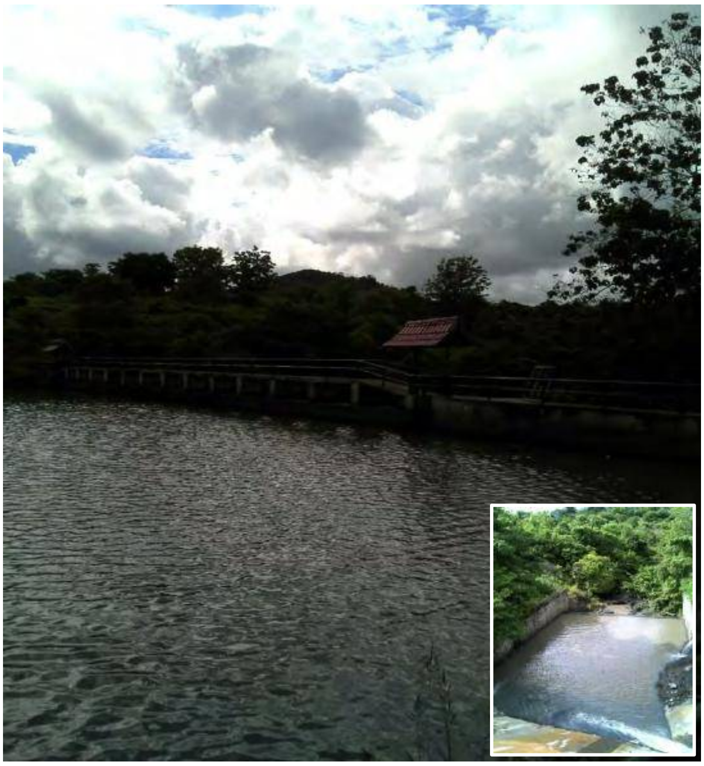
<table>
<tr><td colspan="2">Client Name:
UPC Sidrap</td><td>Site Location:
Pabberessang Sub-village</td><td>Project No:
JKTD14001</td></tr>
<tr><td>Photo No:
10</td><td>Date:
14/12/2013</td><td colspan="2" rowspan="3"></td></tr>
<tr><td colspan="2">Direction Photo Taken:
East</td></tr>
<tr><td colspan="2">Description:
Part of Pabberessang River crossing with ephemeral river from study area. Water condition is stagnant, used by buffalos to wade and drink.</td></tr>
</table>

Client Name: UPC Sidrap		Site Location: Pabberessang Sub-village	Project No: JKTD14001
Photo No: 11	Date: 14/12/2013		
Direction Photo Taken: West			
Description: Periodic creek comes from study area, with 4 meter width, and only have water flow when it rains.			

Client Name: UPC Sidrap		Site Location: Pabberessang Sub-village	Project No: JKTD14001
Photo No: 12	Date: 14/12/2013		
Direction Photo Taken: Northwest			
Description: Periodic creek comes from study area, 1.5 meter width, and only has water flow when it rains.			

Client Name: UPC Sidrap		Site Location: Pabberessang Sub-village	Project No: JKTD14001
Photo No: 13	Date: 14/12/2013		
Direction Photo Taken: South			
Description: Part of Pabberessang River downstream (SWQ 2), water condition is slow flowing with brownish colour (less turbid).			

Client Name: UPC Sidrap		Site Location: Pabberessang River	Project No: JKTD14001
Photo No: 14	Date: 14/12/2013		
Direction Photo Taken: South			
Description: Creek comes from outside study area that flows into Pabberessang River. Water was flowing slowly and had clear colour. Snakehead fish observed.			

Client Name: UPC Sidrap		Site Location: Lawawoi Village	Project No: JKTD14001
Photo No: 15	Date: 14/12/2013		
Direction Photo Taken: West			
Description: Water reservoir located in Lawawoi Village (SWQ 6), width of 60.25 m. The upstream of this river comes from the study area and the downstream will enter the Datae River. Mostly of the water was in the reservoir, but some flowed to a comercial pool using pipes and some flowed to the downstream (insert). Located ± 930 meter from T-17A to the northwest			

Client Name: UPC Sidrap		Site Location: Lawawoi Village	Project No: JKTD14001
Photo No: 15	Date: 16/12/2013		
Direction Photo Taken: Northwest			
Description: Bangkai River located at the northern part of the study area. The upstream of this river is coming from outside of the study area and some creeks from the study area that are relatively far from the turbine locations. Water condition is slow-flowing, turbid and has some debris.			

AECOM

Groundwater

Client Name: UPC Sidrap		Site Location: Pabberessang Sub-village	Project No: JKTD14001
Photo No: 16	Date: 15/12/2013		
Direction Photo Taken: South			
Description: Water storage tank located at Pabberessang Sub-village. This tank receives water from the spring and distributed trough a pipe to residents by gravity (insert). Located ± 970 meter from T-13A to southeast.			

Client Name: UPC Sidrap		Site Location: Lainungan Village	Project No: JKTD14001
Photo No: 17	Date: 16/12/2013		
Direction Photo Taken: East			
Description: Surface water from spring in Lainungan Village, the villagers stream them through pipe to their house. The water condition is clear to whitish. Located ± 1,950 meter from T-06A to the northwest.			

AECOM

Client Name: UPC Sidrap		Site Location: Lainungan Village	Project No: JKTD14001
Photo No: 18	Date: 16/12/2013		
Direction Photo Taken: Southeast			
Description: One of the springs that is directed to the village. This spring goes to the mosque. The villagers cover the spring to avoid debris into the channel. Located ± 1,950 meter from T-06A to the northwest.			

Client Name: UPC Sidrap		Site Location: Lainungan Village	Project No: JKTD14001
Photo No: 19	Date: 16/12/2013		
Direction Photo Taken: South			
Description: A storage tank that collected water from the spring near photo 17. The water condition is turbid and odorless. The residents use them for domestic use, but not for drinking. Located ± 2,110 meter from T-06A to the northwest.			

<table>
<tr><td colspan="2">Client Name:
UPC Sidrap</td><td>Site Location:
Lainungan Village</td><td>Project No:
JKTD14001</td></tr>
<tr><td>Photo No:
20</td><td>Date:
16/12/2013</td><td colspan="2" rowspan="3"></td></tr>
<tr><td colspan="2">Direction Photo Taken:
Northwest</td></tr>
<tr><td colspan="2">Description:
A rainwater collector at one of the houses in Lainungan Village. They use a funnel to capture rainwater from their roof attached into hose and a drum as a tank. They use the water for drinking. Located ± 2,110 meter from T-06A to the northwest.</td></tr>
</table>

<table>
<tr><td colspan="2">Client Name:
UPC Sidrap</td><td>Site Location:
Lainungan Village</td><td>Project No:
JKTD14001</td></tr>
<tr><td>Photo No:
21</td><td>Date:
16/12/2013</td><td colspan="2" rowspan="3"></td></tr>
<tr><td colspan="2">Direction Photo Taken:
Southeast</td></tr>
<tr><td colspan="2">Description:
A storage Tank built with PNPM funding. It stores water that comes from a spring located in study area (± 2.6 km from the village). It is in Photo 28. Located ± 2,150 meter from T-06A to the northwest.</td></tr>
</table>

Client Name: UPC Sidrap		Site Location: Lainungan Village	Project No: JKTD14001
Photo No: 22	Date: 16/12/2013		
Direction Photo Taken: Southeast			
Description: A storage tank built in Lainungan Village to store water that come from a spring located in study area (± 2.6 km from the village). Located ± 2,300 meter from T-07A to the northwest.			

Client Name: UPC Sidrap		Site Location: Lainungan Village	Project No: JKTD14001
Photo No: 23	Date: 16/12/2013		
Direction Photo Taken: West			
Description: A storage tank built in Lainungan Village to store water that comes from a spring located in study area (± 2.6 km from the village). Located ± 2,010 meter from T-07A to the northwest.			

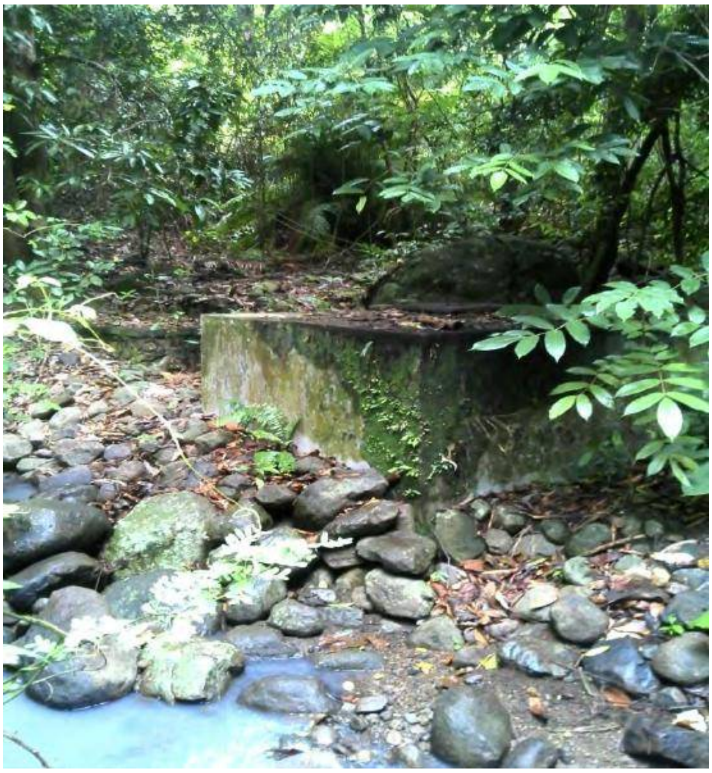
AECOM

Client Name: UPC Sidrap		Site Location: Lainungan Village	Project No: JKTD14001
Photo No: 24	Date: 16/12/2013		
Direction Photo Taken: South			
Description: A storage tank built in Lainungan Village to store water that come from a spring located in study area (± 2.6 km from the village). Located ± 1,950 meter from T-06A to the northwest.			

Client Name: UPC Sidrap		Site Location: Lainungan Village	Project No: JKTD14001
Photo No: 25	Date: 16/12/2013		
Direction Photo Taken: North			
Description: A well-developed dug well in Lainungan Village. Based on interviews, the water in this well is present all year. The water is clear and odorless (insert). Located ± 2km from T-07A to the northwest. Due to its distance from the site, this well was not utilized for groundwater sampling.			

Client Name: UPC Sidrap		Site Location: Lainungan Village	Project No: JKTD14001
Photo No: 26	Date: 16/12/2013		
Direction Photo Taken: Northwest			
Description: Water storage tank (GWQ 2) that stores water from spring in photo 28. After stored in this tank, the water will be distributed to storage tanks in Lainungan Village (photo 21, 22, 23 and 24). Water condition in this tank is clear and odorless. Located ± 2,250 meter from T-14A to the northwest.			

Client Name: UPC Sidrap		Site Location: Lawawoi Village	Project No: JKTD14001
Photo No: 27	Date: 16/12/2013		
Direction Photo Taken: Northwest			
Description: Water storage tank located in Lawawoi Village (SWQ 8). The water is taken from surface water on photo 29 and then streamed to residents in Lawawoi. Water condition in this tank is turbid (insert). Located ± 1,420 meter from T-14A to the northwest.			

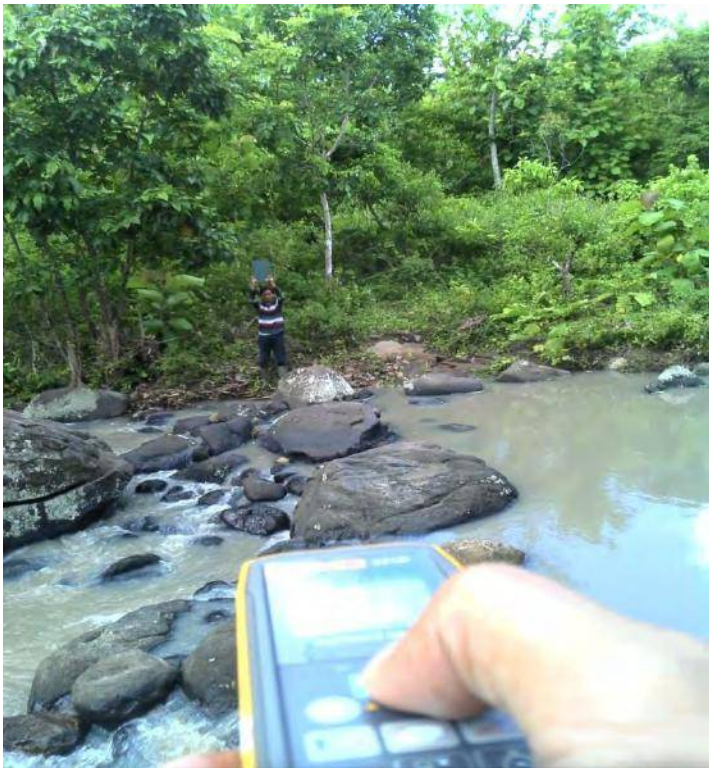
Client Name: UPC Sidrap		Site Location: Lawawoi Village	Project No: JKTD14001
Photo No: 28	Date: 16/12/2013		
Direction Photo Taken: East			
Description: Water source for Lainungan Village. Water condition is clear with no odor. The spring is protected by concrete, built by the resident,so it's likely protected from any disturbance on surface water. Located ± 470 meter from T-24A to the northwest.			

Client Name: UPC Sidrap		Site Location: Lawawoi Village	Project No: JKTD14001
Photo No: 29	Date: 16/12/2013		
Direction Photo Taken: West			
Description: Water source for Lawawoi Village. The water is taken from surface water that the upstream comes from the spring and run-off from uphill. Water condition is whitish. Located ± 500 meter from T-24A to the northwest			

Client Name: UPC Sidrap		Site Location: Lainungan Village	Project No: JKTD14001
Photo No: 32	Date: 18/12/2013		
Direction Photo Taken: Southeast			
Description: Water source for Kampung Baru Sub-village, Mattirotassi Village. Water is taken from surface water from study area. Water condition is turbid with no odor. Located ± 450 meter from T-06A to the south.			

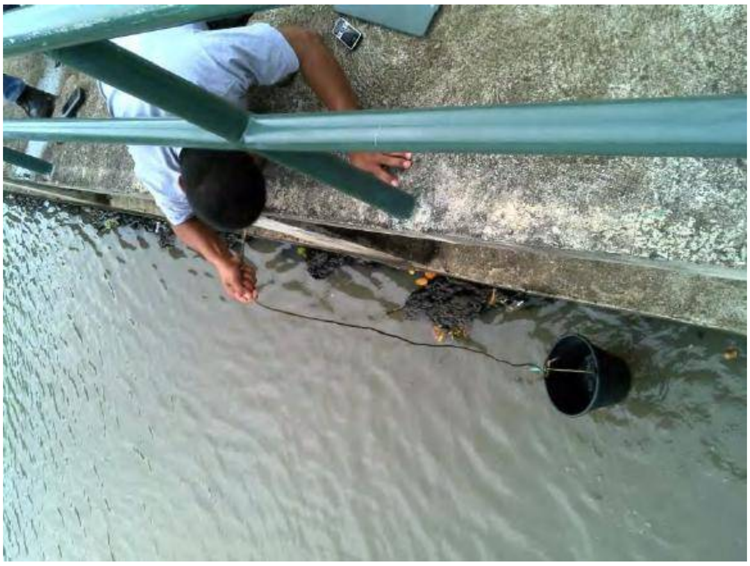
Client Name: UPC Sidrap		Site Location: Mattirotassi Village	Project No: JKTD14001
Photo No: 33	Date: 18/12/2013		
Direction Photo Taken:			
Description: Water storage tank in Kampung Baru Sub-village, Mattirotassi Village (SWQ 9). The water taken from Lainungan Village (photo 32). Water condition whitish and odorless (insert).			

Client Name: UPC Sidrap		Site Location: Pabberessang River	Project No: JKTD14001
Photo No: 34	Date: 17/12/2013		
Direction Photo Taken: North			
Description: Surface water sampling on SWQ 2			

Client Name: UPC Sidrap		Site Location: Pabberessang River	Project No: JKTD14001
Photo No: 35	Date: 17/12/2013		
Direction Photo Taken: Northwest			
Description: River width measurement using Flux-meter at Pabberessang River.			

Client Name: UPC Sidrap	Site Location: Pabberessang Sub-village	Project No: JKTD14001
Photo No: 36	Date: 17/12/2013	
Direction Photo Taken: Northeast		
Description: Ground water sampling on GWQ 1 (water storage tank at Pabberessang Sub-village). Water condition is clear and slightly turbid.		

Client Name: UPC Sidrap	Site Location: Pabberessang River	Project No: JKTD14001
Photo No: 37	Date: 17/12/2013	
Direction Photo Taken: Northwest		
Description: Surface Water Sampling on SWQ 1.		

Client Name: UPC Sidrap		Site Location: Lainungan village	Project No: JKTD14001
Photo No: 38	Date: 18/12/2013		
Direction Photo Taken: Southwest			
Description: Surface water sampling on SWQ 6.			

Client Name: UPC Sidrap		Site Location:	Project No: JKTD14001
Photo No: 39	Date: 18/12/2013		
Direction Photo Taken: East			
Description: Ground water sampling on GWQ 2. Located at Lainungan Village.			

Client Name: UPC Sidrap		Site Location: Pabberessang Sub-village	Project No: JKTD14001
Photo No: 40	Date: 15/12/2013		
Direction Photo Taken: East			
Description: Snake-head fish (Ikan Gabus – INA) - *Channa striata* caught in Pabberessang River.			

Client Name: UPC Sidrap		Site Location: VP5 (WTG 6-7)	Project No: JKTD14001
Photo No: 41	Date: 7/1/2014		
Direction Photo Taken: North			
Description: Black-winged Kite (*Elanus caeruleus*) is monitoring the prey in the top tree canopy within VP 5 (WTG 6-7)			

Client Name: UPC Sidrap		Site Location: Mattirotassi Village	Project No: JKTD14001
Photo No: 42	Date: 7/1/2014		
Direction Photo Taken: East			
Description: Spotted Kestrel (*Falco moluccensis*) is flying over to the nesting within the VP 4 (WTG 15-18).			

Client Name: UPC Sidrap		Site Location: Mattirotassi Village	Project No: JKTD14001
Photo No: 43	Date: 16/12/2013		
Direction Photo Taken: West			
Description: Black Eagle *(Ictinaeutus malayensis*) is flying over the nesting within the VP 4 (WTG 15-18).			

Appendix E

Noise Modelling

75MW SIDRAP WIND POWER PLANT PROJECT

NOISE ASSESSMENT

PT UPC SIDRAP BAYU ENERGI – PROJECT COMPANY

PT UPC RENEWABLES INDONESIA – DEVELOPMENT MANAGEMENT COMPANY

STRICTLY PRIVATE AND CONFIDENTIAL

Table of Contents

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1. Introduction

PT UPC Renewables Indonesia is proposing to construct a wind farm project in Sidrap. The project will be referred to as the 75MW Sidrap Wind Power Plant (the “Project”) and will be located on Sidrap, South Sulawesi, Indonesia.

2. Project Layout

Approval is being sought for thirty (30) wind turbine locations, with each turbine rated at 2.5 Megawatts maximum generation capacity.

The location of the Project Study Area was defined early in the planning process for the proposed wind energy facility, based on the availability of wind resources, approximate area required for the proposed project, and availability of existing infrastructure for connection to the electrical grid.

A figure showing the project location, wind turbine layout, noise sensitive areas (NSA) is provided in Appendix A.

3. Noise Assessment Guideline

This report has been prepared in accordance with ISO 9613-2 “Acoustics – Attenuation of sound during propagation outdoors”, which is a widely used standard for evaluation of noise impact in environmental assessments.

Due to the complexity of the equations contained within the ISO guidelines, it is standard practice to undertake these calculations using commercially available computer modelling software. The software WindPRO Decibel module, which implements ISO9613-2, is used to predict the noise levels at the Points of Reception. The height contours for the area were taken from the NASA Shuttle Radar Topographic Mission (SRTM). For modelling purposes, the vegetation and other obstacles that block some of the Noise-Sensitive Areas (NSA) from the sources have not been incorporated.

4. Noise Sources

The wind turbine technology proposed for this Project is the Gamesa G114-2.5MW Wind Turbine. The turbines have a 114m rotor diameter with a swept area of 10,208 m^2; each blade is connected to the main shaft via the hub. The noise level datasheets provided have been prepared and attached in the Appendix B.

For the purposes of modelling, a wind turbine is considered to have a single emission point, the hub of the turbine. Within DECIBEL, the turbines are modelled as an industrial point source at the hub height of the proposed turbines and single spot receivers are used to calculate the combined turbine noise levels at the closest NSAs.

The DECIBEL model does not take into account the shielding effects of barriers or buildings or miscellaneous effects such as the influence of sound propagation through foliage.

Manufacturer's warranted noise emission data (expressed as sound power levels) has been used in the prediction process and are summarized below.

Octave-band data are the noise level at a specified set of frequencies ranging from 62.5 to 8000 Hz.

5. Noise Sensitive Areas

The Noise Impact Summary Table, provided in Appendix C, lists all of the NSA within 4000m of the project turbines and the associated coordinates.

For this study, the elevation above ground used for the NSA is 4m. Also, noise compliance was verified within 30 m from the NSA center at 4m above the ground level.

6. Detailed Noise Impact Assessment

The noise impact analysis for the Project was completed using EMD WindPRO modelling software.

The noise modelling was conducted in accordance with the international standard ISO 9613-2. The noise predictions were calculated using downwind propagation from each source to each point of reception. This method produces a theoretical worst case prediction at each point of reception. The noise impact calculations were completed using octave band spectral values in the range of 62.5 to 8000Hz from 4 to 10m/s.

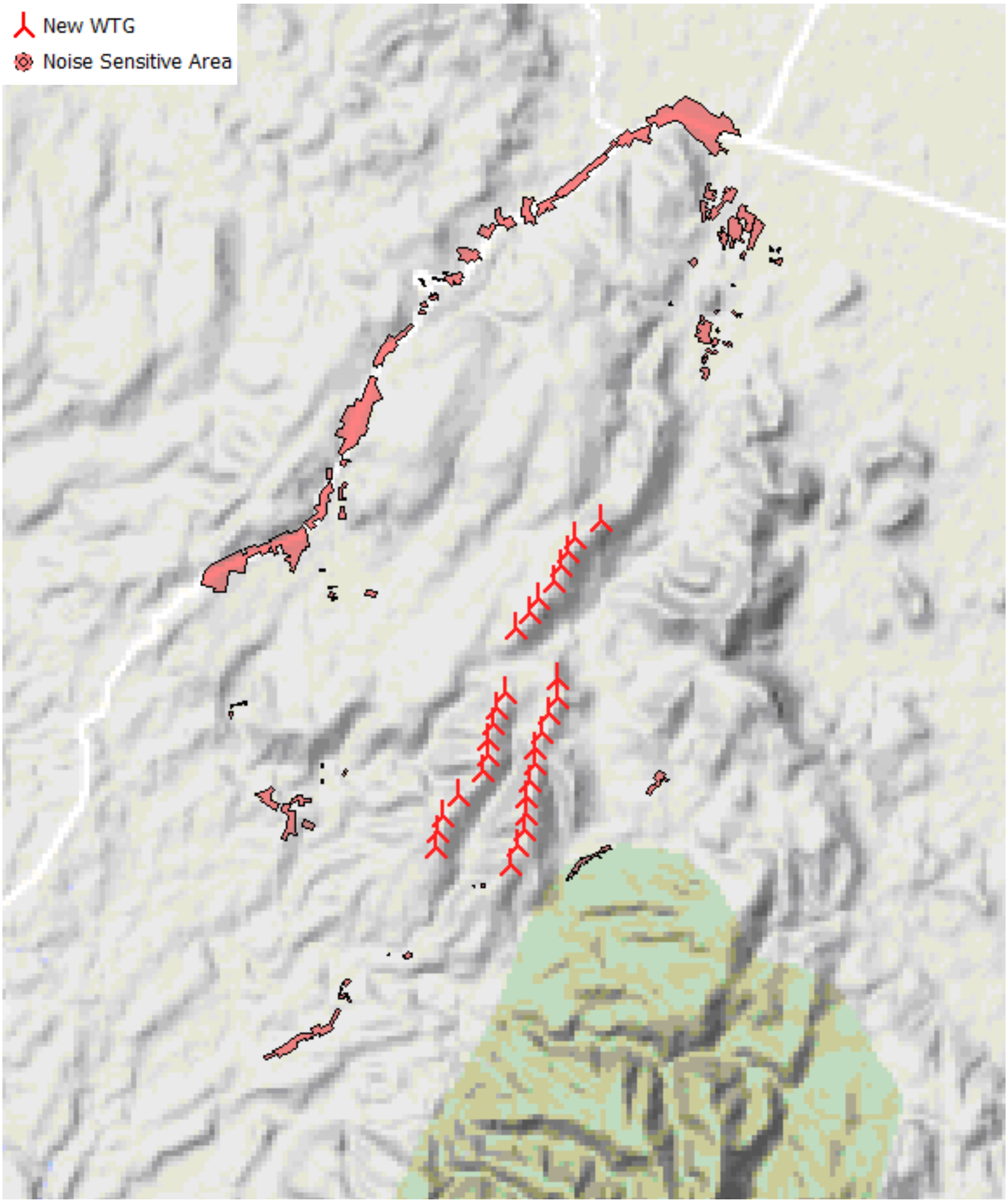
The noise model was configured to calculate the resultant noise impact at each point of reception within 4000m of the Project turbines. The air attenuation and ground attenuation calculation within the model were configured to a general option of 1.0.

The noise level at each NSA, for 4m height wind speed from 4 to 10m/s, is presented in The Appendix C.

7. Results and Compliance

The results of the noise modelling in Appendix C show that the Project is predicted to operate in compliance with the ISO 9613-2 noise level limits at all NSA within 4000 metres of the Project turbines. Appendix C includes noise contour maps for each integer at 4m height and wind speed from 4 to 10m/s.

APPENDIX A: Project Area


New WTG
Noise Sensitive Area

APPENDIX B – Acoustic Datasheets

Confidentiality: 3 / CLIENT INFORMATION

	GENERAL CHARACTERISTICS MANUAL (GCM)	Code: GD236864-en	Rev: 1
		Date: 25/11/2014	Page. 7 of 7
Title:	G114 2.625MW 50/60 Hz Wind Turbine Power Curve and Noise Emission Levels		

5.4 NOISE LEVELS

Estimate of aeroacoustic noise emitted by the rotor of the G114 2.625MW wind turbine, simulated for different tower heights (H) and wind speeds at 10m above ground level (W_{10}).

Table 6 includes the numerical values for the estimated Lw noise level in dB(A) for the different wind speeds, from the start-up speed, 3m/s.

	H = 80m		H = 93m		H = 125m	
W_{10}	W_S	SPL	W_S	SPL	W_S	SPL
[m/s]	[m/s]	[dB(A)]	[m/s]	[dB(A)]	[m/s]	[dB(A)]
3	4.2	95.1	4.3	95.1	4.5	95.1
3.5	4.9	95.1	5.0	95.1	5.2	95.1
4	5.6	96.9	5.7	97.5	6.0	98.6
4.5	6.3	99.7	6.4	100.3	6.7	101.4
5	7.0	102.2	7.1	102.8	7.5	103.8
5.5	7.7	104.4	7.9	104.9	8.2	106.0
6	8.4	106.3	8.6	106.6	9.0	106.6
6.5	9.1	106.6	9.3	106.6	9.7	106.6
7	9.8	106.6	10.0	106.6	10.5	106.6
7.5	10.5	106.6	10.7	106.6	11.2	106.6
8	11.2	106.6	11.4	106.6	12.0	106.6
8.5	11.9	106.6	12.1	106.6	12.7	106.6
9	12.6	106.6	12.9	106.6	13.5	106.6
9.5	13.3	106.6	13.6	106.6	14.2	106.6
10	13.9	106.6	14.3	106.6	15.0	106.6

Table 6 Noise levels of the G114 2.625MW wind turbine for different H [m], W_{10} [m/s] and W_S [m/s].
(ref: *20141125G114NLEV2p6MW*)

APPENDIX C – Noise results & noise contour map

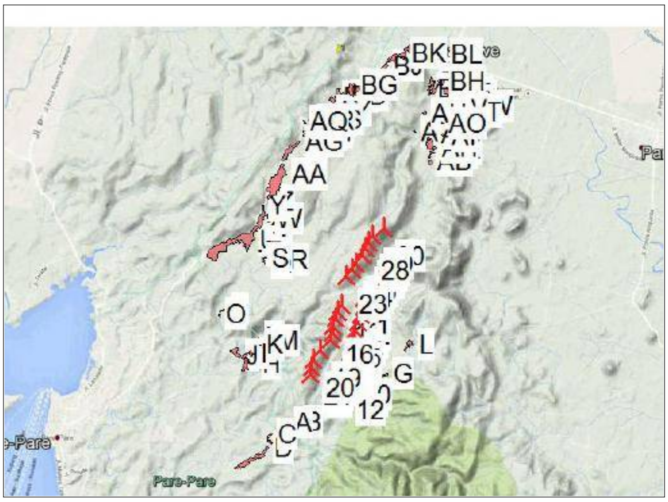
Project:
WP02 Sidrap

Licensed user:
UPC Philippines Management B.V. (Regional Headquarters)
20/F Accralaw Tower, 2nd Avenue corner 30th Street Crescent Park West, Bonifacio Global City
PH-TAGUIG CITY 0339 Metro Manila
+632 576 7961-64
Jonathan Sutanto / jonathan.sutanto@upcrenewables.co.id
Calculated:
29/09/2015 14:41/3.0.629

DECIBEL - Main Result

Calculation: EA216A Noise Calculation

Noise calculation model:
ISO 9613-2 General
Wind speed:
4.0 m/s - 10.0 m/s, step 1.0 m/s
Ground attenuation:
General, fixed, Ground factor: 1.0
Meteorological coefficient, C0:
2.0 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 tone penalty are added to demand: 5.0 dB(A)
Height above ground level, when no value in NSA object:
2.0 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 1:250,000
New WTG   Noise sensitive area

WTGs

	Easting	Southing	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	801,440	9,560,033	240.0	GAMESA G114 2625 114.0 !O! h...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	USER	Level 0 - Estimated - 106 dB(A) - 03-2013	4.0	96.9	10.0	106.6	No h
2	801,439	9,559,746	242.8	GAMESA G114 2625 114.0 !O! h...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	USER	Level 0 - Estimated - 106 dB(A) - 03-2013	4.0	96.9	10.0	106.6	No h
3	801,333	9,559,510	235.0	GAMESA G114 2625 114.0 !O! h...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	USER	Level 0 - Estimated - 106 dB(A) - 03-2013	4.0	96.9	10.0	106.6	No h
4	801,230	9,559,249	242.4	GAMESA G114 2625 114.0 !O! h...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	USER	Level 0 - Estimated - 106 dB(A) - 03-2013	4.0	96.9	10.0	106.6	No h
5	801,126	9,559,012	285.0	GAMESA G114 2625 114.0 !O! h...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	USER	Level 0 - Estimated - 106 dB(A) - 03-2013	4.0	96.9	10.0	106.6	No h
6	801,108	9,558,777	285.0	GAMESA G114 2625 114.0 !O! h...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	USER	Level 0 - Estimated - 106 dB(A) - 03-2013	4.0	96.9	10.0	106.6	No h
7	801,050	9,558,523	315.0	GAMESA G114 2625 114.0 !O! h...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	USER	Level 0 - Estimated - 106 dB(A) - 03-2013	4.0	96.9	10.0	106.6	No h
8	800,992	9,558,301	315.0	GAMESA G114 2625 114.0 !O! h...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	USER	Level 0 - Estimated - 106 dB(A) - 03-2013	4.0	96.9	10.0	106.6	No h
9	800,993	9,558,062	307.6	GAMESA G114 2625 114.0 !O! h...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	USER	Level 0 - Estimated - 106 dB(A) - 03-2013	4.0	96.9	10.0	106.6	No h
10	800,974	9,557,824	285.0	GAMESA G114 2625 114.0 !O! h...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	USER	Level 0 - Estimated - 106 dB(A) - 03-2013	4.0	96.9	10.0	106.6	No h
11	800,851	9,557,591	275.0	GAMESA G114 2625 114.0 !O! h...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	USER	Level 0 - Estimated - 106 dB(A) - 03-2013	4.0	96.9	10.0	106.6	No h
12	800,758	9,557,322	252.7	GAMESA G114 2625 114.0 !O! h...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	USER	Level 0 - Estimated - 106 dB(A) - 03-2013	4.0	96.9	10.0	106.6	No h
13	800,687	9,559,820	275.0	GAMESA G114 2625 114.0 !O! h...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	USER	Level 0 - Estimated - 106 dB(A) - 03-2013	4.0	96.9	10.0	106.6	No h
14	800,562	9,559,604	285.0	GAMESA G114 2625 114.0 !O! h...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	USER	Level 0 - Estimated - 106 dB(A) - 03-2013	4.0	96.9	10.0	106.6	No h
15	800,499	9,559,379	290.0	GAMESA G114 2625 114.0 !O! h...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	USER	Level 0 - Estimated - 106 dB(A) - 03-2013	4.0	96.9	10.0	106.6	No h
16	800,421	9,559,149	285.0	GAMESA G114 2625 114.0 !O! h...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	USER	Level 0 - Estimated - 106 dB(A) - 03-2013	4.0	96.9	10.0	106.6	No h
17	800,424	9,558,913	297.4	GAMESA G114 2625 114.0 !O! h...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	USER	Level 0 - Estimated - 106 dB(A) - 03-2013	4.0	96.9	10.0	106.6	No h
18	800,363	9,558,687	268.9	GAMESA G114 2625 114.0 !O! h...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	USER	Level 0 - Estimated - 106 dB(A) - 03-2013	4.0	96.9	10.0	106.6	No h
19	800,007	9,558,344	270.0	GAMESA G114 2625 114.0 !O! h...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	USER	Level 0 - Estimated - 106 dB(A) - 03-2013	4.0	96.9	10.0	106.6	No h
20	799,761	9,558,029	272.2	GAMESA G114 2625 114.0 !O! h...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	USER	Level 0 - Estimated - 106 dB(A) - 03-2013	4.0	96.9	10.0	106.6	No h
21	799,700	9,557,808	270.6	GAMESA G114 2625 114.0 !O! h...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	USER	Level 0 - Estimated - 106 dB(A) - 03-2013	4.0	96.9	10.0	106.6	No h
22	799,664	9,557,576	247.2	GAMESA G114 2625 114.0 !O! h...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	USER	Level 0 - Estimated - 106 dB(A) - 03-2013	4.0	96.9	10.0	106.6	No h
23	800,849	9,560,768	255.0	GAMESA G114 2625 114.0 !O! h...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	USER	Level 0 - Estimated - 106 dB(A) - 03-2013	4.0	96.9	10.0	106.6	No h
24	801,056	9,560,981	274.3	GAMESA G114 2625 114.0 !O! h...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	USER	Level 0 - Estimated - 106 dB(A) - 03-2013	4.0	96.9	10.0	106.6	No h
25	801,179	9,561,188	280.0	GAMESA G114 2625 114.0 !O! h...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	USER	Level 0 - Estimated - 106 dB(A) - 03-2013	4.0	96.9	10.0	106.6	No h
26	801,405	9,561,444	287.5	GAMESA G114 2625 114.0 !O! h...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	USER	Level 0 - Estimated - 106 dB(A) - 03-2013	4.0	96.9	10.0	106.6	No h
27	801,497	9,561,666	292.7	GAMESA G114 2625 114.0 !O! h...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	USER	Level 0 - Estimated - 106 dB(A) - 03-2013	4.0	96.9	10.0	106.6	No h
28	801,599	9,561,872	303.5	GAMESA G114 2625 114.0 !O! h...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	USER	Level 0 - Estimated - 106 dB(A) - 03-2013	4.0	96.9	10.0	106.6	No h
29	801,706	9,562,079	310.0	GAMESA G114 2625 114.0 !O! h...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	USER	Level 0 - Estimated - 106 dB(A) - 03-2013	4.0	96.9	10.0	106.6	No h
30	802,097	9,562,330	296.9	GAMESA G114 2625 114.0 !O! h...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	USER	Level 0 - Estimated - 106 dB(A) - 03-2013	4.0	96.9	10.0	106.6	No h

h) Generic octave distribution used

Calculation Results

Sound Level

Noise sensitive area No.	Name	Easting	Southing	Z	Imission height	Demands Min Noise	Sound Level Max From WTGs	Distance to noise demand	Demands fulfilled ? Noise
				[m]	[m]	[dB(A)]	[dB(A)]	[m]	
A	Noise sensitive area: Danish 2007 - Open land (1)	798,964	9,556,044	93.5	2.0	42.0	30.7	1,263	Yes
B	Noise sensitive area: Danish 2007 - Open land (2)	799,257	9,556,063	113.4	2.0	42.0	31.5	1,143	Yes
C	Noise sensitive area: Danish 2007 - Open land (3)	798,359	9,555,670	84.4	2.0	42.0	27.6	1,890	Yes
D	Noise sensitive area: Danish 2007 - Open land (4)	798,265	9,555,204	85.0	2.0	42.0	26.1	2,332	Yes
E	Noise sensitive area: Danish 2007 - Open land (5)	800,223	9,557,021	213.5	2.0	42.0	41.2	114	Yes
F	Noise sensitive area: Danish 2007 - Open land (6)	800,366	9,557,044	225.8	2.0	42.0	42.2	6	Yes
G	Noise sensitive area: Danish 2007 - Open land (7)	801,627	9,557,191	142.0	2.0	42.0	38.9	295	Yes
H	Noise sensitive area: Danish 2007 - Open land (8)	797,887	9,557,919	82.3	2.0	42.0	31.1	1,280	Yes
I	Noise sensitive area: Danish 2007 - Open land (9)	797,842	9,558,250	105.7	2.0	42.0	30.9	1,367	Yes
J	Noise sensitive area: Danish 2007 - Open land (10)	797,371	9,558,208	103.9	2.0	42.0	28.8	1,823	Yes
K	Noise sensitive area: Danish 2007 - Open land (11)	798,020	9,558,525	88.6	2.0	42.0	31.7	1,272	Yes

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DECIBEL - Main Result

Calculation: EA216A Noise Calculation

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Noise sensitive area						**Demands**	**Sound Level**		**Demands fulfilled ?**
No.	Name	Easting	Southing	Z [m]	Imission height [m]	Min Noise [dB(A)]	Max From WTGs [dB(A)]	Distance to noise demand [m]	Noise
L	Noise sensitive area: Danish 2007 - Open land (12)	802,753	9,558,351	187.0	2.0	42.0	34.5	979	Yes
M	Noise sensitive area: Danish 2007 - Open land (13)	798,378	9,558,684	100.0	2.0	42.0	33.6	995	Yes
N	Noise sensitive area: Danish 2007 - Open land (14)	798,009	9,558,752	95.0	2.0	42.0	31.5	1,362	Yes
O	Noise sensitive area: Danish 2007 - Open land (15)	796,694	9,559,525	71.4	2.0	42.0	26.1	2,876	Yes
P	Noise sensitive area: Danish 2007 - Open land (16)	796,887	9,559,670	67.4	2.0	42.0	26.6	2,767	Yes
Q	Noise sensitive area: Danish 2007 - Open land (17)	798,226	9,561,195	115.0	2.0	42.0	29.1	2,179	Yes
R	Noise sensitive area: Danish 2007 - Open land (18)	798,787	9,561,227	125.0	2.0	42.0	31.0	1,632	Yes
S	Noise sensitive area: Danish 2007 - Open land (19)	798,212	9,561,367	115.0	2.0	42.0	28.8	2,223	Yes
T	Noise sensitive area: Danish 2007 - Open land (20)	798,036	9,561,595	115.0	2.0	42.0	27.9	2,448	Yes
U	Noise sensitive area: Danish 2007 - Open land (21)	797,817	9,561,959	133.3	2.0	42.0	26.7	2,764	Yes
V	Noise sensitive area: Danish 2007 - Open land (22)	798,342	9,562,368	148.1	2.0	42.0	27.4	2,444	Yes
W	Noise sensitive area: Danish 2007 - Open land (23)	798,349	9,562,653	152.0	2.0	42.0	26.8	2,573	Yes
X	Noise sensitive area: Danish 2007 - Open land (24)	798,009	9,562,341	131.9	2.0	42.0	26.5	2,731	Yes
Y	Noise sensitive area: Danish 2007 - Open land (25)	798,142	9,562,954	162.0	2.0	42.0	25.8	2,904	Yes
Z	Noise sensitive area: Danish 2007 - Open land (26)	798,422	9,563,208	162.8	2.0	42.0	25.9	2,799	Yes
AA	Noise sensitive area: Danish 2007 - Open land (27)	798,540	9,563,443	208.9	2.0	42.0	25.7	2,823	Yes
AB	Noise sensitive area: Danish 2007 - Open land (28)	803,583	9,564,387	48.6	2.0	42.0	25.1	2,185	Yes
AC	Noise sensitive area: Danish 2007 - Open land (29)	803,593	9,564,605	46.7	2.0	42.0	24.5	2,369	Yes
AD	Noise sensitive area: Danish 2007 - Open land (30)	803,624	9,564,789	45.0	2.0	42.0	24.0	2,541	Yes
AE	Noise sensitive area: Danish 2007 - Open land (31)	803,876	9,564,896	46.5	2.0	42.0	23.3	2,769	Yes
AF	Noise sensitive area: Danish 2007 - Open land (32)	803,772	9,565,068	44.4	2.0	42.0	23.0	2,856	Yes
AG	Noise sensitive area: Danish 2007 - Open land (33)	798,890	9,564,599	138.1	2.0	42.0	23.8	3,258	Yes
AH	Noise sensitive area: Danish 2007 - Open land (34)	803,524	9,564,934	43.1	2.0	42.0	23.7	2,616	Yes
AI	Noise sensitive area: Danish 2007 - Open land (35)	804,030	9,565,318	51.2	2.0	42.0	22.1	3,205	Yes
AJ	Noise sensitive area: Danish 2007 - Open land (36)	803,764	9,565,344	45.0	2.0	42.0	22.4	3,091	Yes
AK	Noise sensitive area: Danish 2007 - Open land (37)	799,523	9,565,336	136.9	2.0	42.0	22.9	3,426	Yes
AL	Noise sensitive area: Danish 2007 - Open land (38)	803,107	9,565,457	51.4	2.0	42.0	22.9	2,931	Yes
AM	Noise sensitive area: Danish 2007 - Open land (39)	799,555	9,565,458	141.0	2.0	42.0	22.7	3,511	Yes
AN	Noise sensitive area: Danish 2007 - Open land (40)	799,664	9,565,536	140.3	2.0	42.0	22.6	3,521	Yes
AO	Noise sensitive area: Danish 2007 - Open land (41)	804,010	9,565,739	43.7	2.0	42.0	21.3	3,556	Yes
AP	Noise sensitive area: Danish 2007 - Open land (42)	799,513	9,565,740	141.8	2.0	42.0	22.0	3,774	Yes
AQ	Noise sensitive area: Danish 2007 - Open land (43)	799,499	9,565,801	137.4	2.0	42.0	21.9	3,833	Yes
AR	Noise sensitive area: Danish 2007 - Open land (44)	799,749	9,565,823	128.8	2.0	42.0	22.0	3,731	Yes
AS	Noise sensitive area: Danish 2007 - Open land (45)	800,039	9,565,781	132.3	2.0	42.0	22.3	3,566	Yes
AT	Noise sensitive area: Danish 2007 - Open land (46)	804,563	9,566,097	36.9	2.0	42.0	20.1	4,149	Yes
AU	Noise sensitive area: Danish 2007 - Open land (47)	803,461	9,566,024	37.1	2.0	42.0	21.3	3,583	Yes
AV	Noise sensitive area: Danish 2007 - Open land (48)	804,139	9,566,147	39.5	2.0	42.0	20.4	3,976	Yes
AW	Noise sensitive area: Danish 2007 - Open land (49)	804,675	9,566,228	30.6	2.0	42.0	19.8	4,320	Yes
AX	Noise sensitive area: Danish 2007 - Open land (50)	804,585	9,566,250	33.1	2.0	42.0	19.8	4,289	Yes
AY	Noise sensitive area: Danish 2007 - Open land (51)	800,148	9,566,070	100.3	2.0	42.0	21.7	3,787	Yes
AZ	Noise sensitive area: Danish 2007 - Open land (52)	803,879	9,566,275	33.5	2.0	42.0	20.4	3,977	Yes
BA	Noise sensitive area: Danish 2007 - Open land (53)	800,458	9,566,434	73.4	2.0	42.0	21.1	4,019	Yes
BB	Noise sensitive area: Danish 2007 - Open land (54)	804,240	9,566,270	36.7	2.0	42.0	20.1	4,132	Yes
BC	Noise sensitive area: Danish 2007 - Open land (55)	803,996	9,566,297	33.3	2.0	42.0	20.3	4,046	Yes
BD	Noise sensitive area: Danish 2007 - Open land (56)	800,728	9,566,564	63.7	2.0	42.0	20.9	4,064	Yes
BE	Noise sensitive area: Danish 2007 - Open land (57)	804,204	9,566,544	32.3	2.0	42.0	19.7	4,359	Yes
BF	Noise sensitive area: Danish 2007 - Open land (58)	803,580	9,566,671	35.0	2.0	42.0	20.0	4,233	Yes
BG	Noise sensitive area: Danish 2007 - Open land (59)	801,103	9,566,633	42.7	2.0	42.0	20.8	4,042	Yes
BH	Noise sensitive area: Danish 2007 - Open land (60)	803,680	9,566,710	33.6	2.0	42.0	19.8	4,303	Yes
BI	Noise sensitive area: Danish 2007 - Open land (61)	803,602	9,567,026	30.4	2.0	42.0	19.3	4,576	Yes
BJ	Noise sensitive area: Danish 2007 - Open land (62)	801,197	9,566,757	40.5	2.0	42.0	20.6	4,146	Yes
BK	Noise sensitive area: Danish 2007 - Open land (63)	802,186	9,567,674	28.7	2.0	42.0	18.8	4,985	Yes
BL	Noise sensitive area: Danish 2007 - Open land (64)	803,782	9,567,622	20.7	2.0	42.0	18.3	5,199	Yes

Distances (m)

	WTG																					
NSA	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
A	4695	4453	4199	3925	3672	3474	3240	3034	2862	2684	2438	2199	4151	3902	3671	3430	3219	2990	2525	2139	1911	1684
B	4530	4279	4022	3745	3488	3281	3039	2826	2640	2450	2197	1945	4020	3774	3541	3298	3080	2848	2401	2030	1800	1567
C	5341	5109	4858	4588	4339	4149	3922	3722	3558	3386	3143	2906	4758	4509	4282	4044	3845	3622	3141	2744	2524	2310
D	5779	5541	5288	5015	4763	4566	4333	4126	3951	3769	3519	3271	5208	4958	4731	4492	4290	4065	3588	3192	2970	2752
E	3249	2984	2726	2445	2186	1966	1715	1493	1295	1099	848	614	2837	2605	2374	2137	1903	1672	1341	1108	940	778
F	3176	2907	2649	2368	2110	1885	1629	1404	1196	989	731	481	2794	2567	2339	2106	1870	1643	1335	1130	981	841

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DECIBEL - Main Result

Calculation: EA216A Noise Calculation

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	WTG																					
NSA	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
G	2541	2265	2075	1877	1723	1517	1323	1181	1012	895	873	848	2640	2502	2342	2199	2016	1898	1988	2042	2007	1971
H	4134	3994	3796	3598	3418	3333	3220	3128	3109	3088	2982	2932	3384	3162	2992	2817	2725	2592	2162	1877	1816	1810
I	4002	3884	3702	3524	3365	3304	3218	3150	3157	3161	3080	3060	3235	3025	2875	2722	2659	2554	2167	1931	1910	1943
J	4448	4349	4171	3997	3840	3780	3693	3622	3625	3623	3534	3501	3670	3476	3340	3192	3133	3030	2640	2396	2363	2379
K	3720	3615	3444	3280	3135	3092	3028	2980	3009	3036	2981	2991	2946	2745	2607	2469	2427	2343	1995	1810	1827	1898
L	2012	1820	1769	1742	1756	1699	1711	1762	1784	1855	2048	2245	2483	2496	2473	2465	2396	2414	2746	3010	3101	3185
M	3346	3240	3069	2907	2768	2732	2677	2642	2688	2735	2704	2742	2573	2370	2232	2095	2059	1985	1664	1530	1586	1697
N	3646	3557	3398	3250	3121	3095	3049	3017	3063	3107	3070	3099	2866	2677	2555	2435	2414	2352	2039	1895	1937	2030
O	4773	4750	4639	4544	4462	4477	4470	4469	4538	4600	4576	4610	4004	3869	3808	3746	3780	3763	3514	3402	3448	3535
P	4563	4550	4449	4363	4290	4314	4319	4327	4410	4485	4476	4527	3800	3675	3624	3572	3617	3612	3390	3309	3373	3478
Q	3418	3525	3535	3579	3630	3762	3888	4003	4180	4349	4459	4627	2819	2827	2909	3001	3168	3295	3362	3518	3694	3894
R	2909	3038	3071	3143	3221	3375	3527	3664	3858	4045	4181	4374	2364	2406	2519	2643	2834	2989	3131	3342	3539	3755
S	3493	3611	3632	3687	3747	3885	4018	4139	4319	4492	4607	4780	2919	2938	3030	3130	3304	3436	3516	3679	3858	4060
T	3745	3873	3901	3963	4027	4169	4304	4426	4607	4780	4895	5066	3190	3217	3313	3416	3591	3724	3802	3961	4136	4336
U	4103	4245	4278	4323	4371	4499	4618	4726	4895	5056	5153	5308	3563	3570	3648	3732	3892	4008	4040	4162	4323	4510
V	3879	4058	4137	4251	4360	4533	4703	4854	5057	5251	5396	5595	3463	3545	3686	3832	4034	4199	4355	4565	4758	4971
W	4052	4242	4334	4460	4579	4758	4935	5092	5298	5496	5647	5850	3673	3768	3917	4071	4277	4448	4617	4834	5030	5245
X	4135	4301	4366	4465	4560	4723	4879	5014	5204	5385	5508	5688	3678	3743	3870	3995	4182	4327	4428	4598	4776	4978
Y	4406	4600	4695	4823	4944	5123	5300	5456	5662	5860	6008	6210	4037	4133	4282	4435	4641	4810	4973	5184	5377	5589
Z	4381	4592	4704	4846	4979	5165	5352	5515	5726	5930	6087	6297	4064	4175	4334	4498	4710	4887	5073	5299	5497	5714
AA	4476	4698	4824	4980	5115	5303	5491	5656	5868	6072	6230	6440	4200	4312	4474	4639	4852	5030	5218	5445	5643	5859
AB	4853	5112	5370	5651	5910	6132	6388	6615	6835	7063	7325	7609	5408	5657	5881	6118	6320	6547	7022	7418	7639	7858
AC	5054	5315	5573	5854	6113	6336	6592	6820	7041	7269	7531	7815	5598	5848	6073	6311	6515	6742	7215	7611	7833	8053
AD	5233	5496	5754	6035	6294	6517	6774	7002	7223	7452	7714	7998	5772	6022	6248	6486	6691	6919	7391	7786	8008	8229
AE	5439	5697	5956	6236	6495	6716	6972	7198	7417	7644	7907	8191	5995	6244	6468	6706	6907	7134	7609	8005	8227	8445
AF	5549	5811	6069	6350	6609	6832	7089	7316	7537	7766	8027	8312	6088	6337	6563	6802	7007	7235	7706	8101	8324	8544
AG	5228	5477	5637	5829	6005	6216	6432	6621	6848	7068	7255	7489	5091	5250	5442	5639	5866	6068	6324	6593	6805	7030
AH	5326	5591	5849	6130	6389	6614	6872	7100	7323	7553	7814	8099	5848	6098	6325	6565	6772	7001	7470	7863	8087	8309
AI	5883	6141	6399	6680	6938	7159	7415	7641	7860	8086	8349	8633	6435	6684	6909	7147	7350	7577	8051	8447	8669	8888
AJ	5797	6062	6320	6601	6860	7084	7341	7569	7791	8021	8282	8567	6323	6573	6800	7039	7247	7475	7944	8338	8562	8784
AK	5639	5909	6100	6322	6524	6748	6982	7187	7421	7651	7858	8109	5637	5826	6036	6252	6486	6702	7009	7310	7530	7761
AL	5674	5950	6205	6486	6743	6973	7233	7462	7691	7925	8183	8467	6135	6382	6614	6856	7073	7305	7759	8147	8373	8600
AM	5743	6015	6208	6431	6633	6857	7091	7295	7530	7759	7966	8216	5746	5934	6144	6359	6593	6809	7114	7415	7634	7865
AN	5782	6056	6252	6479	6686	6912	7149	7356	7591	7822	8033	8287	5807	6000	6213	6432	6666	6885	7200	7507	7728	7960
AO	6258	6521	6779	7060	7319	7543	7800	8027	8249	8477	8739	9023	6788	7037	7265	7504	7711	7939	8409	8803	9026	9248
AP	6024	6296	6490	6714	6919	7143	7379	7585	7819	8050	8258	8510	6035	6225	6437	6653	6888	7104	7412	7714	7934	8165
AQ	6086	6358	6552	6777	6981	7206	7442	7647	7882	8112	8321	8572	6098	6288	6499	6716	6950	7166	7474	7776	7996	8227
AR	6032	6308	6508	6739	6949	7176	7415	7624	7860	8092	8305	8561	6076	6272	6487	6708	6943	7162	7483	7794	8015	8247
AS	5916	6195	6402	6636	6850	7078	7320	7531	7768	8001	8217	8475	5985	6185	6403	6626	6861	7082	7412	7728	7951	8184
AT	6821	7078	7336	7616	7875	8094	8349	8575	8792	9018	9281	9564	7377	7627	7852	8089	8291	8518	8993	9389	9610	9829
AU	6323	6596	6852	7133	7391	7619	7879	8108	8336	8569	8828	9112	6796	7044	7275	7517	7732	7964	8421	8809	9036	9262
AV	6683	6947	7205	7486	7745	7969	8226	8454	8675	8904	9166	9450	7207	7457	7685	7924	8132	8361	8830	9223	9447	9669
AW	6989	7245	7503	7783	8042	8261	8515	8741	8958	9183	9446	9729	7548	7797	8022	8259	8461	8687	9162	9559	9780	9998
AX	6967	7225	7483	7763	8022	8242	8497	8723	8941	9167	9430	9714	7519	7769	7994	8232	8435	8662	9136	9532	9753	9973
AY	6174	6454	6666	6906	7125	7356	7601	7815	8052	8287	8508	8769	6273	6479	6700	6926	7162	7386	7727	8050	8274	8508
AZ	6702	6970	7228	7509	7767	7994	8252	8481	8705	8936	9197	9481	7201	7450	7680	7921	8132	8363	8826	9217	9442	9666
BA	6476	6760	6979	7226	7452	7685	7933	8151	8389	8625	8852	9117	6618	6831	7055	7285	7521	7748	8103	8433	8659	8894
BB	6837	7100	7358	7639	7898	8121	8378	8605	8827	9055	9317	9602	7364	7613	7841	8080	8288	8517	8986	9379	9603	9825
BC	6765	7032	7290	7571	7830	8055	8314	8542	8765	8996	9257	9541	7273	7522	7752	7992	8203	8433	8897	9289	9514	9738
BD	6570	6855	7079	7332	7562	7796	8048	8267	8506	8743	8974	9242	6744	6962	7189	7421	7657	7885	8252	8589	8816	9051
BE	7069	7333	7591	7872	8130	8354	8611	8839	9061	9290	9551	9836	7588	7837	8066	8306	8516	8746	9212	9604	9829	10052
BF	6974	7248	7505	7785	8043	8272	8532	8761	8989	9223	9481	9766	7437	7684	7916	8158	8375	8608	9061	9448	9675	9902
BG	6609	6895	7126	7385	7621	7856	8110	8333	8572	8810	9046	9317	6826	7050	7279	7515	7750	7980	8361	8708	8936	9171
BH	7043	7316	7572	7853	8111	8340	8599	8828	9056	9289	9548	9832	7512	7760	7991	8233	8450	8682	9137	9524	9751	9978
BI	7317	7590	7846	8127	8385	8614	8873	9102	9330	9563	9822	10106	7773	8020	8253	8495	8713	8946	9397	9782	10010	10238
BJ	6728	7015	7248	7508	7745	7980	8236	8458	8697	8936	9173	9445	6956	7181	7411	7647	7882	8113	8497	8845	9073	9308
BK	7677	7963	8208	8479	8727	8962	9221	9449	9686	9924	10171	10450	7996	8232	8465	8706	8936	9170	9581	9945	10174	10408
BL	7942	8217	8473	8753	9010	9240	9500	9730	9959	10192	10450	10735	8393	8640	8873	9115	9334	9567	10017	10401	10629	10857

	WTG							
NSA	23	24	25	26	27	28	29	30
A	5086	5362	5601	5926	6166	6396	6629	7023
B	4967	5237	5474	5794	6034	6263	6495	6880
C	5674	5957	6197	6528	6768	6997	7230	7637
D	6127	6409	6649	6979	7219	7449	7682	8086
E	3799	4047	4275	4578	4817	5042	5271	5630
F	3755	3997	4223	4521	4758	4983	5210	5562
G	3422	3557	3725	3922	4123	4311	4502	4726
H	4110	4407	4639	4980	5203	5423	5647	6098

To be continued on next page...

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29/09/2015 14:41/3.0.629

DECIBEL - Main Result

Calculation: EA216A Noise Calculation

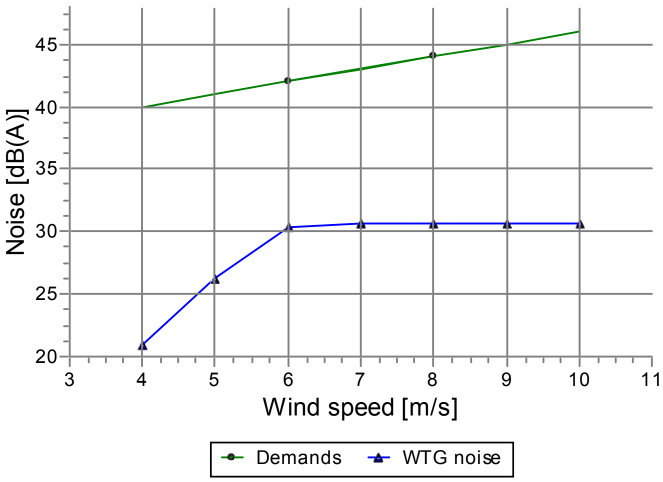
...continued from previous page

	WTG							
NSA	23	24	25	26	27	28	29	30
I	3902	4198	4426	4764	4982	5197	5418	5874
J	4258	4549	4768	5101	5308	5515	5729	6190
K	3585	3880	4106	4443	4659	4873	5093	5549
L	2950	2971	3062	3159	3313	3459	3613	3742
M	3232	3528	3757	4096	4315	4532	4754	5208
N	3459	3751	3973	4308	4519	4730	4947	5406
O	4332	4593	4776	5078	5249	5427	5613	6076
P	4100	4358	4539	4840	5008	5185	5371	5833
Q	2658	2838	2953	3188	3303	3438	3587	4030
R	2112	2276	2379	2606	2718	2853	3005	3450
S	2704	2870	2972	3194	3298	3422	3562	3998
T	2932	3082	3169	3372	3462	3573	3699	4123
U	3258	3383	3449	3625	3692	3783	3891	4296
V	2974	3048	3073	3199	3232	3295	3376	3755
W	3131	3182	3187	3286	3299	3343	3406	3762
X	3242	3323	3351	3480	3491	3531	3589	3938
Y	3479	3519	3513	3595	3594	3622	3670	4004
Z	3442	3449	3418	3466	3440	3446	3473	3778
AA	3534	3520	3471	3493	3439	3417	3415	3669
AB	4536	4241	4002	3661	3429	3203	2975	2538
AC	4717	4424	4184	3844	3610	3383	3153	2723
AD	4886	4593	4353	4014	3779	3551	3320	2895
AE	5119	4825	4585	4245	4012	3785	3556	3122
AF	5199	4907	4667	4329	4093	3865	3634	3210
AG	4298	4217	4108	4035	3924	3844	3779	3925
AH	4951	4660	4419	4083	3846	3617	3385	2969
AI	5552	5259	5018	4680	4444	4217	3986	3559
AJ	5426	5135	4894	4558	4321	4092	3859	3444
AK	4757	4617	4466	4323	4167	4038	3921	3957
AL	5204	4924	4684	4359	4119	3889	3657	3286
AM	4865	4722	4568	4420	4260	4128	4006	4031
AN	4913	4763	4604	4447	4282	4141	4011	4015
AO	5891	5600	5360	5023	4786	4557	4325	3909
AP	5148	5003	4847	4694	4531	4395	4268	4278
AQ	5211	5065	4909	4756	4592	4455	4327	4336
AR	5173	5015	4851	4682	4510	4363	4225	4209
AS	5073	4907	4732	4547	4366	4209	4060	4018
AT	6496	6203	5962	5623	5388	5161	4930	4502
AU	5869	5587	5347	5020	4780	4550	4318	3938
AV	6305	6016	5775	5440	5202	4973	4740	4329
AW	6667	6374	6134	5795	5560	5333	5102	4673
AX	6634	6342	6101	5763	5527	5299	5068	4643
AY	5348	5169	4990	4794	4606	4438	4276	4192
AZ	6286	6000	5759	5428	5188	4958	4725	4329
BA	5679	5486	5295	5079	4880	4703	4530	4419
BB	6463	6173	5933	5597	5359	5130	4898	4485
BC	6362	6075	5834	5501	5262	5033	4800	4398
BD	5797	5593	5395	5165	4958	4772	4590	4450
BE	6680	6392	6151	5818	5579	5349	5116	4711
BF	6504	6225	5986	5661	5421	5192	4960	4587
BG	5870	5652	5446	5198	4983	4787	4594	4414
BH	6582	6301	6062	5736	5496	5267	5034	4657
BI	6837	6559	6321	5999	5759	5530	5298	4931
BJ	5999	5778	5569	5317	5100	4902	4706	4518
BK	7034	6788	6564	6279	6047	5832	5616	5345
BL	7455	7179	6941	6620	6379	6150	5919	5554

DECIBEL - Detailed results

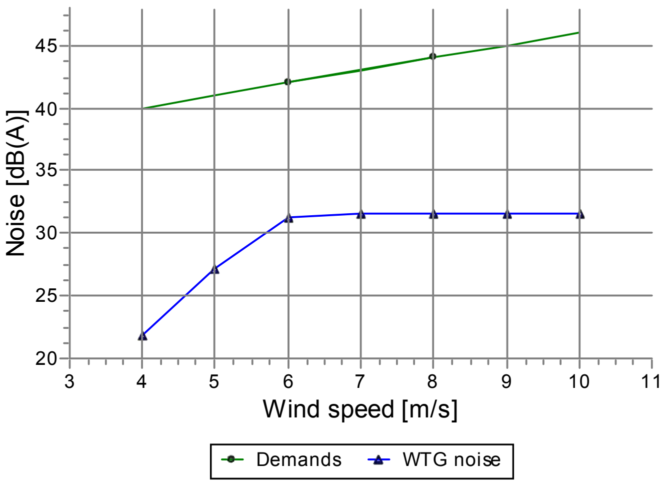
Calculation: EA216A Noise Calculation**Noise calculation model:** ISO 9613-2 General

Noise sensitive area: Danish 2007 - Open land (1) (A)



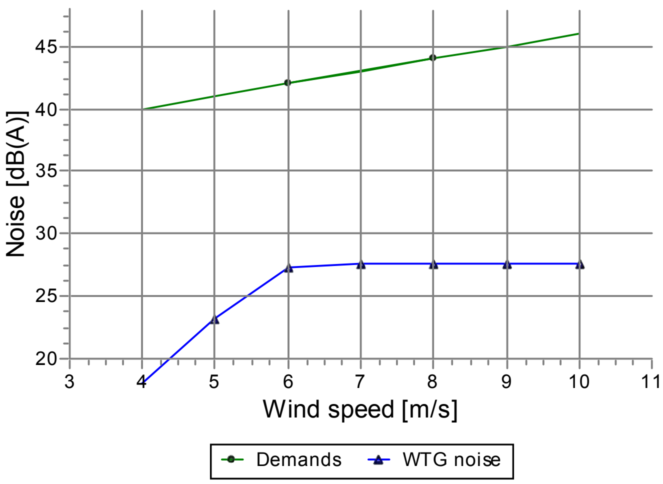
		Sound Level	
Wind speed [m/s]	Demands [dB(A)]	WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	21.0	Yes
5.0	41.0	26.3	Yes
6.0	42.0	30.4	Yes
7.0	43.0	30.7	Yes
8.0	44.0	30.7	Yes
9.0	45.0	30.7	Yes
10.0	46.0	30.7	Yes

Noise sensitive area: Danish 2007 - Open land (2) (B)



		Sound Level	
Wind speed [m/s]	Demands [dB(A)]	WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	21.9	Yes
5.0	41.0	27.1	Yes
6.0	42.0	31.2	Yes
7.0	43.0	31.5	Yes
8.0	44.0	31.5	Yes
9.0	45.0	31.5	Yes
10.0	46.0	31.5	Yes

Noise sensitive area: Danish 2007 - Open land (3) (C)

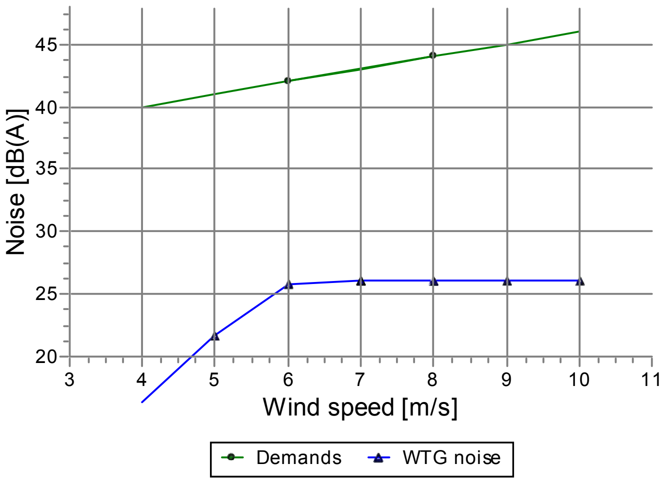


		Sound Level	
Wind speed [m/s]	Demands [dB(A)]	WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	18.0	Yes
5.0	41.0	23.2	Yes
6.0	42.0	27.3	Yes
7.0	43.0	27.6	Yes
8.0	44.0	27.6	Yes
9.0	45.0	27.6	Yes
10.0	46.0	27.6	Yes

DECIBEL - Detailed results

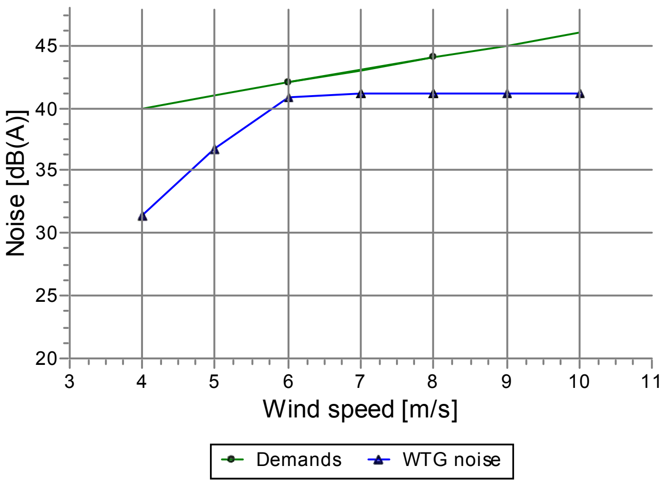
Calculation: EA216A Noise Calculation**Noise calculation model:** ISO 9613-2 General

Noise sensitive area: Danish 2007 - Open land (4) (D)



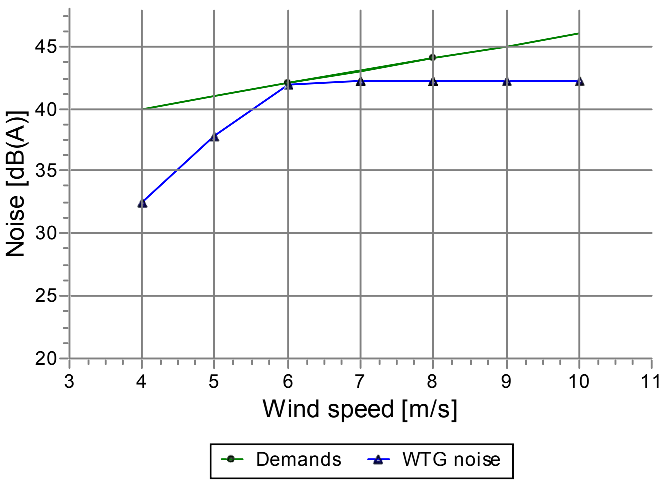
	Sound Level		
Wind speed [m/s]	Demands [dB(A)]	WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	16.4	Yes
5.0	41.0	21.7	Yes
6.0	42.0	25.8	Yes
7.0	43.0	26.1	Yes
8.0	44.0	26.1	Yes
9.0	45.0	26.1	Yes
10.0	46.0	26.1	Yes

Noise sensitive area: Danish 2007 - Open land (5) (E)



	Sound Level		
Wind speed [m/s]	Demands [dB(A)]	WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	31.5	Yes
5.0	41.0	36.8	Yes
6.0	42.0	40.9	Yes
7.0	43.0	41.2	Yes
8.0	44.0	41.2	Yes
9.0	45.0	41.2	Yes
10.0	46.0	41.2	Yes

Noise sensitive area: Danish 2007 - Open land (6) (F)

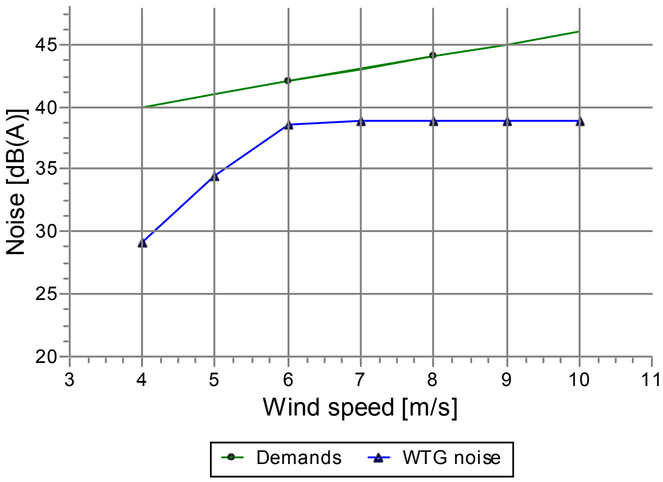


	Sound Level		
Wind speed [m/s]	Demands [dB(A)]	WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	32.5	Yes
5.0	41.0	37.8	Yes
6.0	42.0	41.9	Yes
7.0	43.0	42.2	Yes
8.0	44.0	42.2	Yes
9.0	45.0	42.2	Yes
10.0	46.0	42.2	Yes

DECIBEL - Detailed results

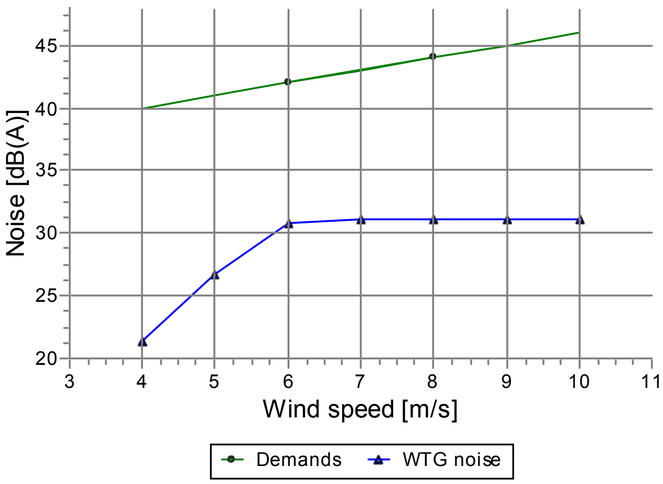
Calculation: EA216A Noise Calculation**Noise calculation model:** ISO 9613-2 General

Noise sensitive area: Danish 2007 - Open land (7) (G)



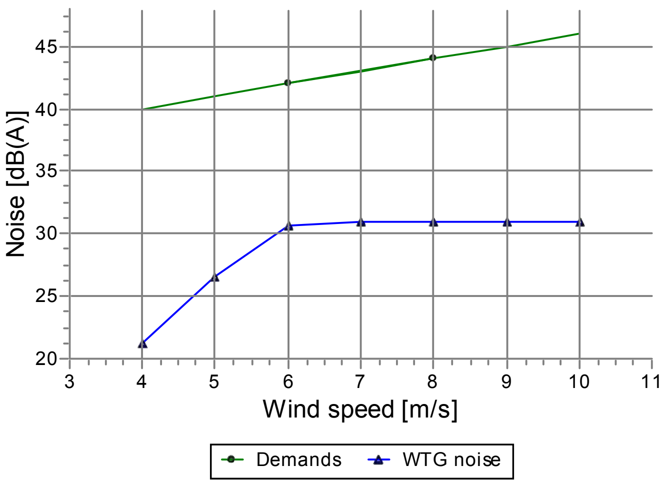
		Sound Level	
Wind speed [m/s]	Demands [dB(A)]	WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	29.2	Yes
5.0	41.0	34.5	Yes
6.0	42.0	38.6	Yes
7.0	43.0	38.9	Yes
8.0	44.0	38.9	Yes
9.0	45.0	38.9	Yes
10.0	46.0	38.9	Yes

Noise sensitive area: Danish 2007 - Open land (8) (H)



		Sound Level	
Wind speed [m/s]	Demands [dB(A)]	WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	21.4	Yes
5.0	41.0	26.7	Yes
6.0	42.0	30.8	Yes
7.0	43.0	31.1	Yes
8.0	44.0	31.1	Yes
9.0	45.0	31.1	Yes
10.0	46.0	31.1	Yes

Noise sensitive area: Danish 2007 - Open land (9) (I)

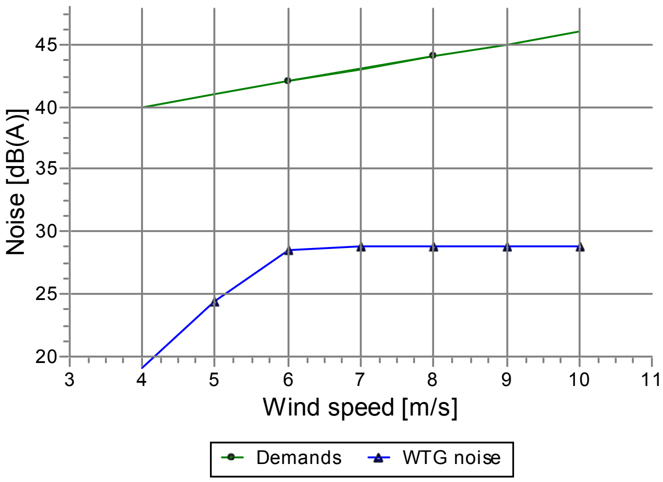


		Sound Level	
Wind speed [m/s]	Demands [dB(A)]	WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	21.2	Yes
5.0	41.0	26.5	Yes
6.0	42.0	30.6	Yes
7.0	43.0	30.9	Yes
8.0	44.0	30.9	Yes
9.0	45.0	30.9	Yes
10.0	46.0	30.9	Yes

DECIBEL - Detailed results

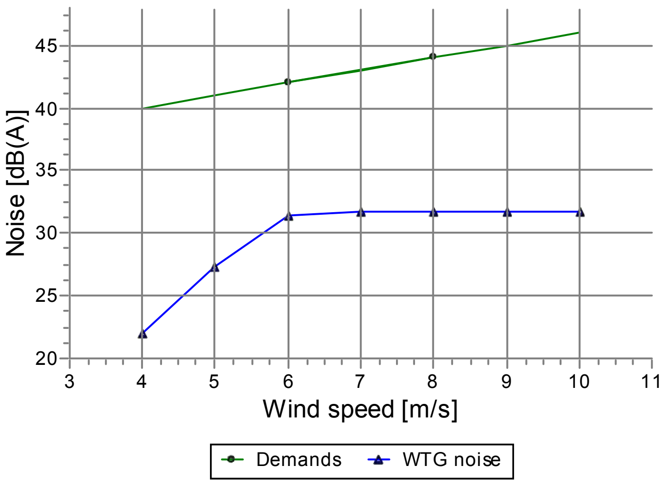
Calculation: EA216A Noise Calculation**Noise calculation model:** ISO 9613-2 General

Noise sensitive area: Danish 2007 - Open land (10) (J)



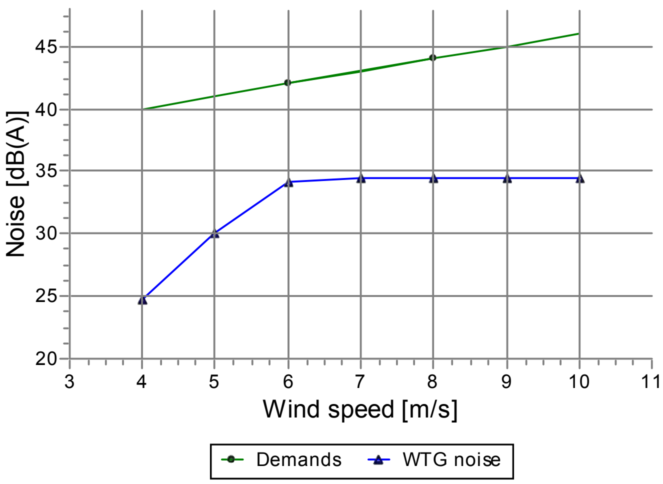
	Sound Level		
Wind speed [m/s]	Demands [dB(A)]	WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	19.1	Yes
5.0	41.0	24.4	Yes
6.0	42.0	28.5	Yes
7.0	43.0	28.8	Yes
8.0	44.0	28.8	Yes
9.0	45.0	28.8	Yes
10.0	46.0	28.8	Yes

Noise sensitive area: Danish 2007 - Open land (11) (K)



	Sound Level		
Wind speed [m/s]	Demands [dB(A)]	WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	22.0	Yes
5.0	41.0	27.3	Yes
6.0	42.0	31.4	Yes
7.0	43.0	31.7	Yes
8.0	44.0	31.7	Yes
9.0	45.0	31.7	Yes
10.0	46.0	31.7	Yes

Noise sensitive area: Danish 2007 - Open land (12) (L)

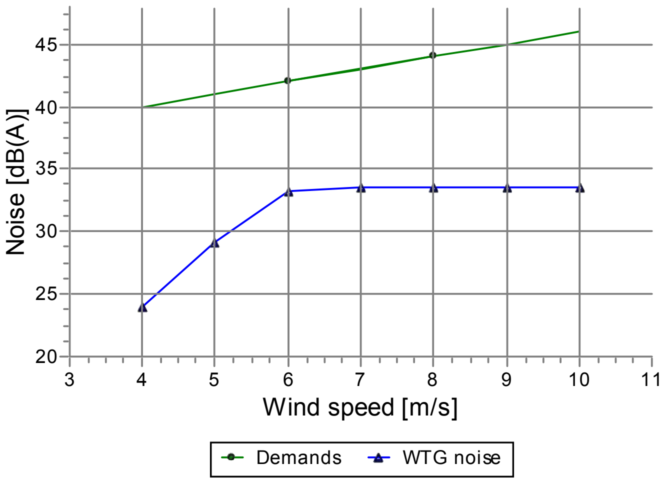


	Sound Level		
Wind speed [m/s]	Demands [dB(A)]	WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	24.8	Yes
5.0	41.0	30.1	Yes
6.0	42.0	34.2	Yes
7.0	43.0	34.5	Yes
8.0	44.0	34.5	Yes
9.0	45.0	34.5	Yes
10.0	46.0	34.5	Yes

DECIBEL - Detailed results

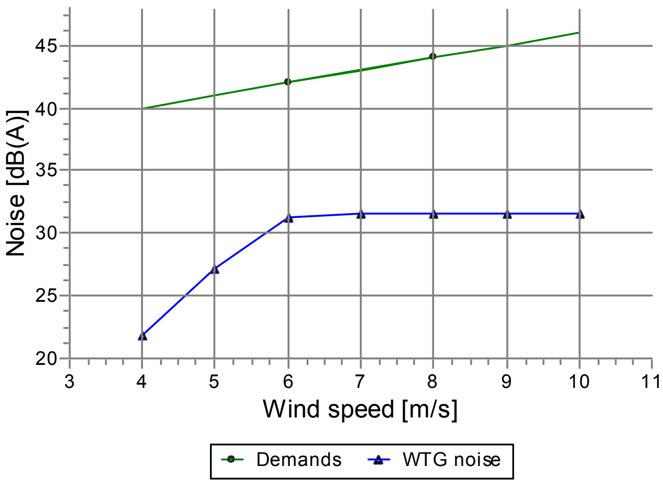
Calculation: EA216A Noise Calculation**Noise calculation model:** ISO 9613-2 General

Noise sensitive area: Danish 2007 - Open land (13) (M)



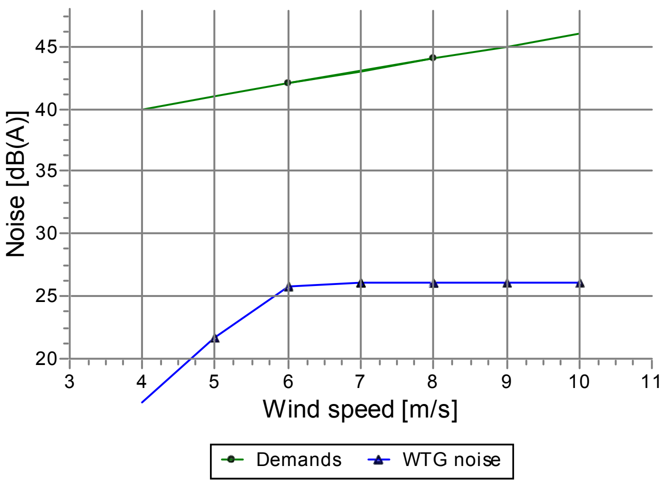
Wind speed	Demands	WTG noise	Demands fulfilled ?
	Sound Level		
[m/s]	[dB(A)]	[dB(A)]	
4.0	40.0	23.9	Yes
5.0	41.0	29.2	Yes
6.0	42.0	33.3	Yes
7.0	43.0	33.6	Yes
8.0	44.0	33.6	Yes
9.0	45.0	33.6	Yes
10.0	46.0	33.6	Yes

Noise sensitive area: Danish 2007 - Open land (14) (N)



Wind speed	Demands	WTG noise	Demands fulfilled ?
	Sound Level		
[m/s]	[dB(A)]	[dB(A)]	
4.0	40.0	21.8	Yes
5.0	41.0	27.1	Yes
6.0	42.0	31.2	Yes
7.0	43.0	31.5	Yes
8.0	44.0	31.5	Yes
9.0	45.0	31.5	Yes
10.0	46.0	31.5	Yes

Noise sensitive area: Danish 2007 - Open land (15) (O)

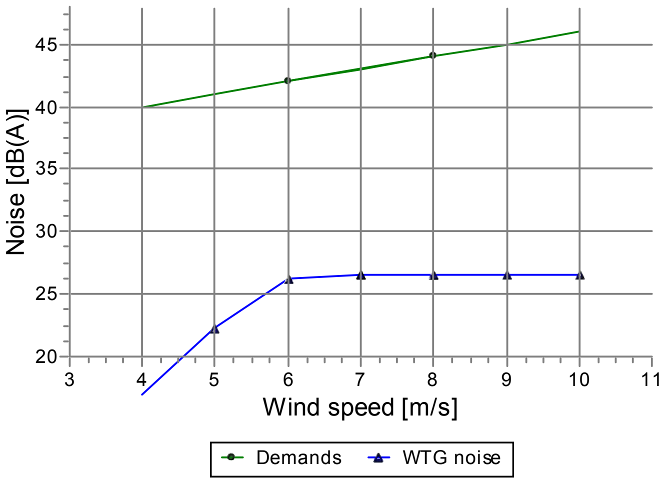


Wind speed	Demands	WTG noise	Demands fulfilled ?
	Sound Level		
[m/s]	[dB(A)]	[dB(A)]	
4.0	40.0	16.4	Yes
5.0	41.0	21.7	Yes
6.0	42.0	25.8	Yes
7.0	43.0	26.1	Yes
8.0	44.0	26.1	Yes
9.0	45.0	26.1	Yes
10.0	46.0	26.1	Yes

DECIBEL - Detailed results

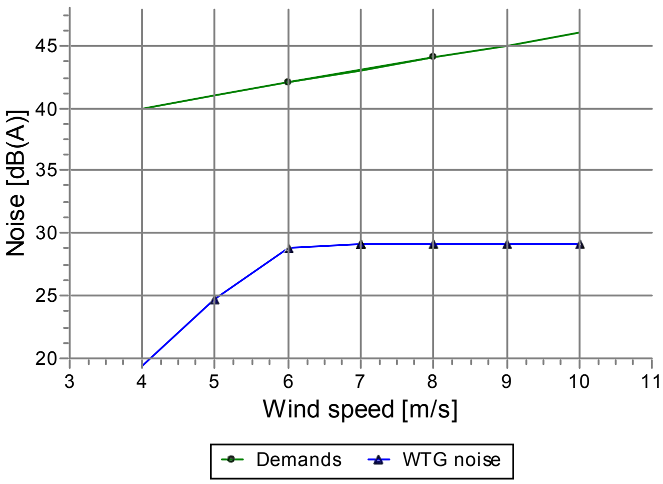
Calculation: EA216A Noise Calculation**Noise calculation model:** ISO 9613-2 General

Noise sensitive area: Danish 2007 - Open land (16) (P)



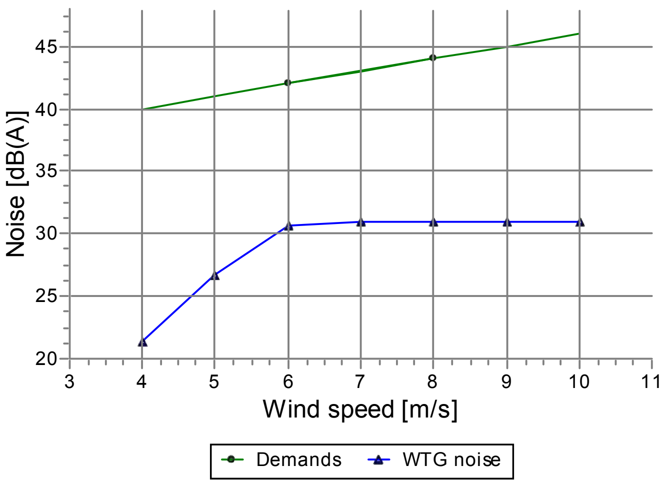
Wind speed [m/s]	Demands [dB(A)]	Sound Level WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	16.9	Yes
5.0	41.0	22.2	Yes
6.0	42.0	26.3	Yes
7.0	43.0	26.6	Yes
8.0	44.0	26.6	Yes
9.0	45.0	26.6	Yes
10.0	46.0	26.6	Yes

Noise sensitive area: Danish 2007 - Open land (17) (Q)



Wind speed [m/s]	Demands [dB(A)]	Sound Level WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	19.4	Yes
5.0	41.0	24.7	Yes
6.0	42.0	28.8	Yes
7.0	43.0	29.1	Yes
8.0	44.0	29.1	Yes
9.0	45.0	29.1	Yes
10.0	46.0	29.1	Yes

Noise sensitive area: Danish 2007 - Open land (18) (R)

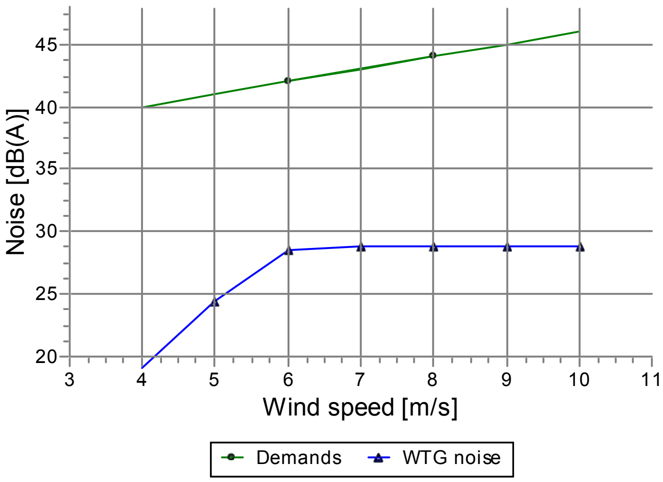


Wind speed [m/s]	Demands [dB(A)]	Sound Level WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	21.3	Yes
5.0	41.0	26.6	Yes
6.0	42.0	30.7	Yes
7.0	43.0	31.0	Yes
8.0	44.0	31.0	Yes
9.0	45.0	31.0	Yes
10.0	46.0	31.0	Yes

DECIBEL - Detailed results

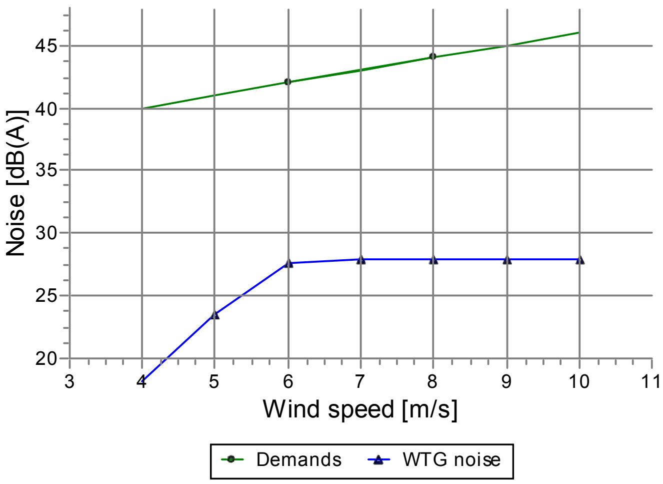
Calculation: EA216A Noise Calculation**Noise calculation model:** ISO 9613-2 General

Noise sensitive area: Danish 2007 - Open land (19) (S)



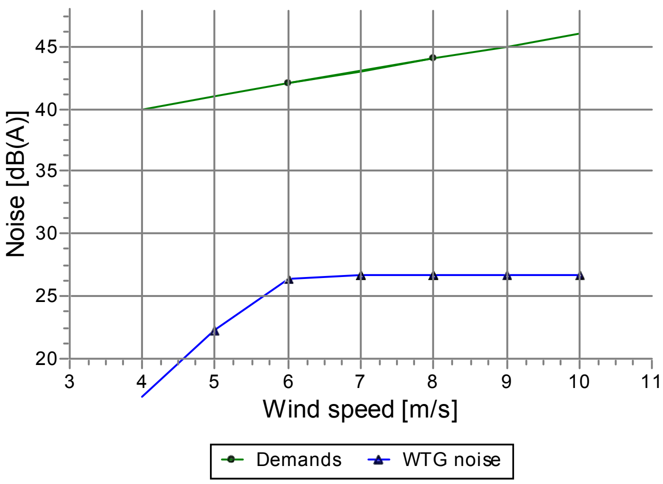
Wind speed [m/s]	Demands [dB(A)]	Sound Level WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	19.1	Yes
5.0	41.0	24.4	Yes
6.0	42.0	28.5	Yes
7.0	43.0	28.8	Yes
8.0	44.0	28.8	Yes
9.0	45.0	28.8	Yes
10.0	46.0	28.8	Yes

Noise sensitive area: Danish 2007 - Open land (20) (T)



Wind speed [m/s]	Demands [dB(A)]	Sound Level WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	18.2	Yes
5.0	41.0	23.5	Yes
6.0	42.0	27.6	Yes
7.0	43.0	27.9	Yes
8.0	44.0	27.9	Yes
9.0	45.0	27.9	Yes
10.0	46.0	27.9	Yes

Noise sensitive area: Danish 2007 - Open land (21) (U)

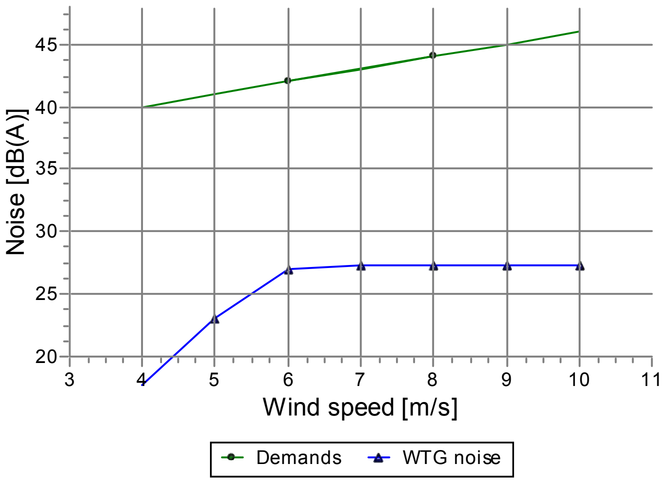


Wind speed [m/s]	Demands [dB(A)]	Sound Level WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	17.0	Yes
5.0	41.0	22.3	Yes
6.0	42.0	26.4	Yes
7.0	43.0	26.7	Yes
8.0	44.0	26.7	Yes
9.0	45.0	26.7	Yes
10.0	46.0	26.7	Yes

DECIBEL - Detailed results

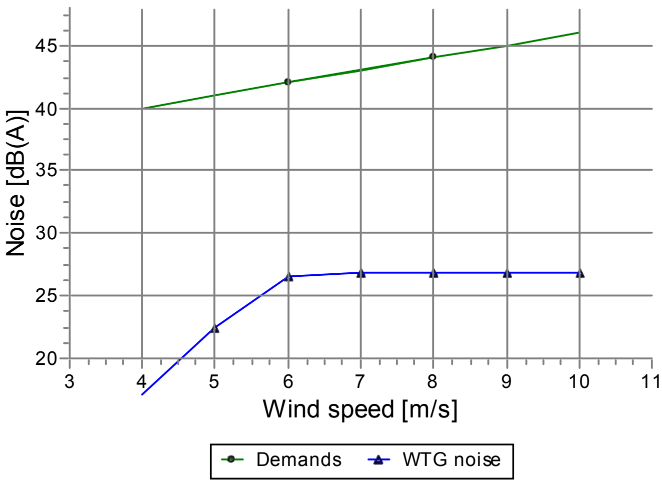
Calculation: EA216A Noise Calculation**Noise calculation model:** ISO 9613-2 General

Noise sensitive area: Danish 2007 - Open land (22) (V)



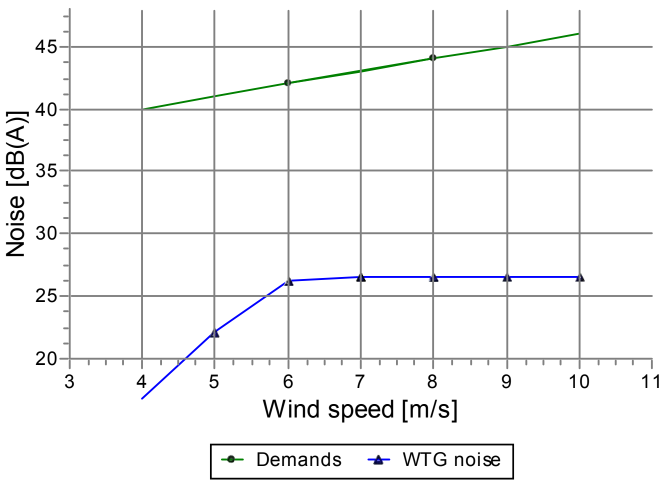
		Sound Level	
Wind speed [m/s]	Demands [dB(A)]	WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	17.7	Yes
5.0	41.0	23.0	Yes
6.0	42.0	27.1	Yes
7.0	43.0	27.4	Yes
8.0	44.0	27.4	Yes
9.0	45.0	27.4	Yes
10.0	46.0	27.4	Yes

Noise sensitive area: Danish 2007 - Open land (23) (W)



		Sound Level	
Wind speed [m/s]	Demands [dB(A)]	WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	17.2	Yes
5.0	41.0	22.4	Yes
6.0	42.0	26.5	Yes
7.0	43.0	26.8	Yes
8.0	44.0	26.8	Yes
9.0	45.0	26.8	Yes
10.0	46.0	26.8	Yes

Noise sensitive area: Danish 2007 - Open land (24) (X)

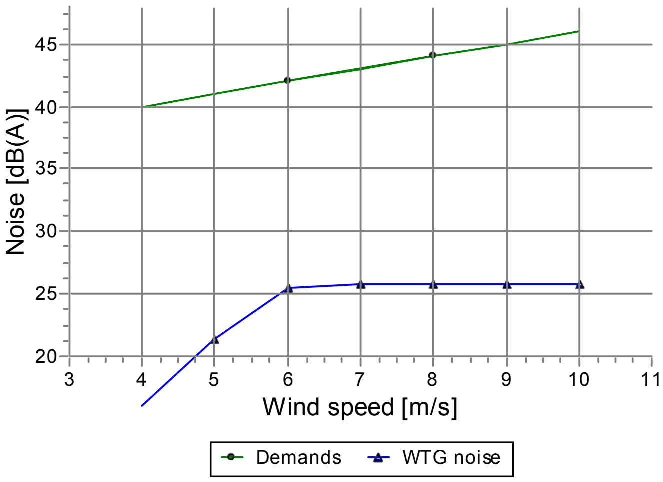


		Sound Level	
Wind speed [m/s]	Demands [dB(A)]	WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	16.9	Yes
5.0	41.0	22.1	Yes
6.0	42.0	26.2	Yes
7.0	43.0	26.5	Yes
8.0	44.0	26.5	Yes
9.0	45.0	26.5	Yes
10.0	46.0	26.5	Yes

DECIBEL - Detailed results

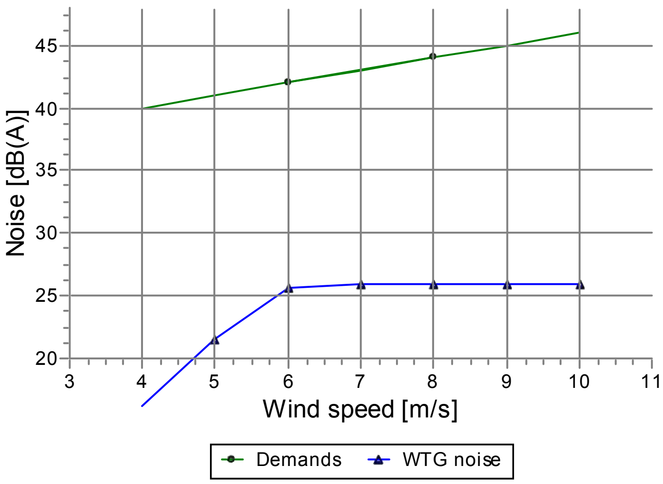
Calculation: EA216A Noise Calculation**Noise calculation model:** ISO 9613-2 General

Noise sensitive area: Danish 2007 - Open land (25) (Y)



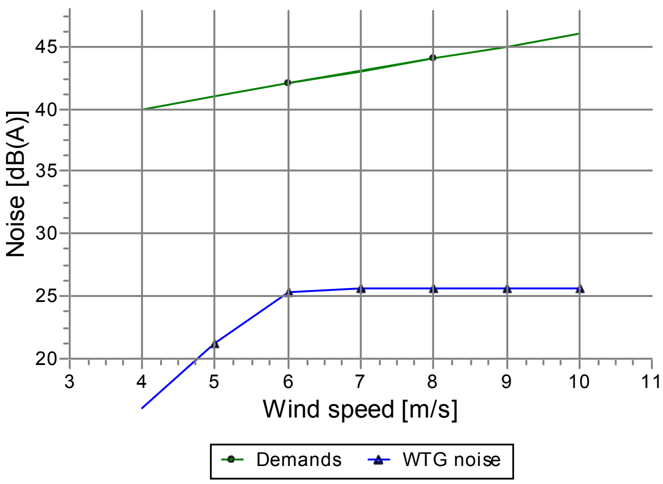
	Sound Level		
Wind speed [m/s]	Demands [dB(A)]	WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	16.1	Yes
5.0	41.0	21.4	Yes
6.0	42.0	25.5	Yes
7.0	43.0	25.8	Yes
8.0	44.0	25.8	Yes
9.0	45.0	25.8	Yes
10.0	46.0	25.8	Yes

Noise sensitive area: Danish 2007 - Open land (26) (Z)



	Sound Level		
Wind speed [m/s]	Demands [dB(A)]	WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	16.2	Yes
5.0	41.0	21.5	Yes
6.0	42.0	25.6	Yes
7.0	43.0	25.9	Yes
8.0	44.0	25.9	Yes
9.0	45.0	25.9	Yes
10.0	46.0	25.9	Yes

Noise sensitive area: Danish 2007 - Open land (27) (AA)



	Sound Level		
Wind speed [m/s]	Demands [dB(A)]	WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	16.0	Yes
5.0	41.0	21.3	Yes
6.0	42.0	25.4	Yes
7.0	43.0	25.7	Yes
8.0	44.0	25.7	Yes
9.0	45.0	25.7	Yes
10.0	46.0	25.7	Yes

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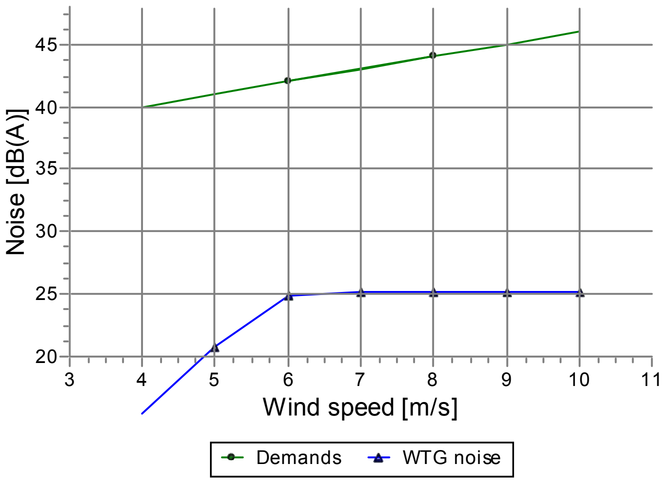
Calculated:
29/09/2015 14:41/3.0.629

DECIBEL - Detailed results

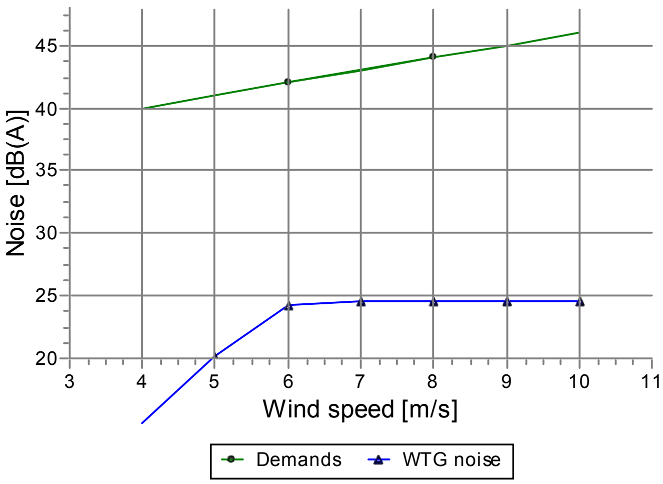
Calculation: EA216A Noise Calculation**Noise calculation model:** ISO 9613-2 General

Noise sensitive area: Danish 2007 - Open land (28) (AB)



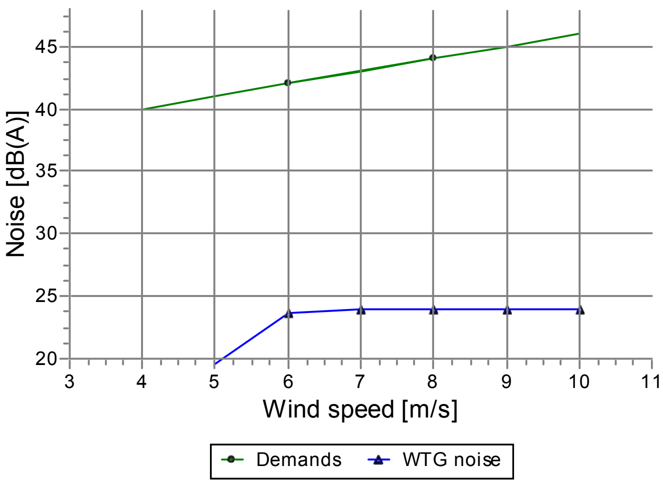
		Sound Level	
Wind speed [m/s]	Demands [dB(A)]	WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	15.4	Yes
5.0	41.0	20.7	Yes
6.0	42.0	24.8	Yes
7.0	43.0	25.1	Yes
8.0	44.0	25.1	Yes
9.0	45.0	25.1	Yes
10.0	46.0	25.1	Yes

Noise sensitive area: Danish 2007 - Open land (29) (AC)



		Sound Level	
Wind speed [m/s]	Demands [dB(A)]	WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	14.8	Yes
5.0	41.0	20.1	Yes
6.0	42.0	24.2	Yes
7.0	43.0	24.5	Yes
8.0	44.0	24.5	Yes
9.0	45.0	24.5	Yes
10.0	46.0	24.5	Yes

Noise sensitive area: Danish 2007 - Open land (30) (AD)

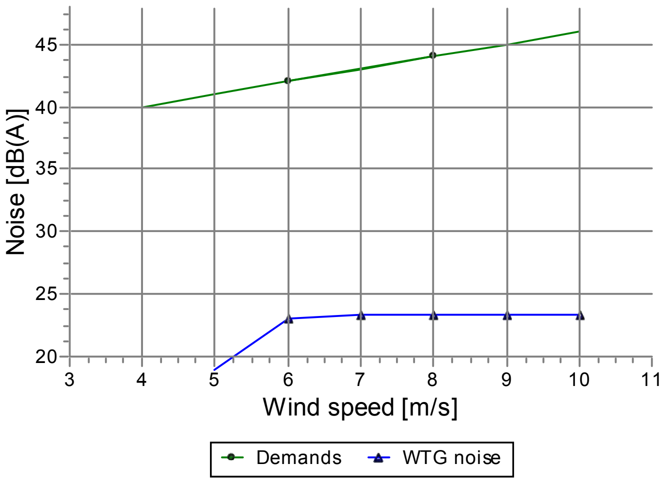


		Sound Level	
Wind speed [m/s]	Demands [dB(A)]	WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	14.3	Yes
5.0	41.0	19.6	Yes
6.0	42.0	23.7	Yes
7.0	43.0	24.0	Yes
8.0	44.0	24.0	Yes
9.0	45.0	24.0	Yes
10.0	46.0	24.0	Yes

DECIBEL - Detailed results

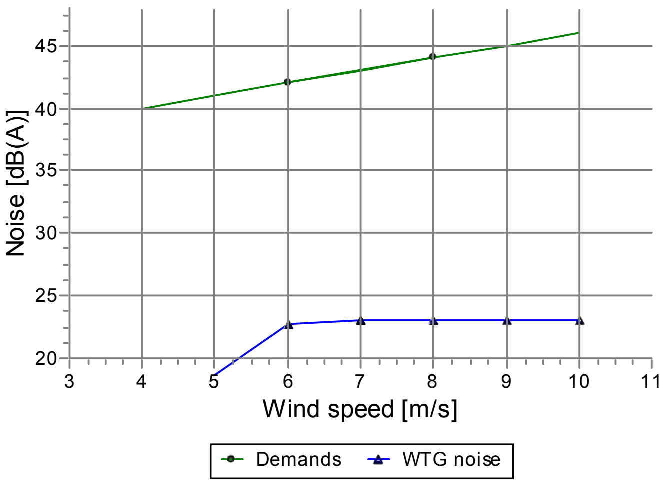
Calculation: EA216A Noise Calculation**Noise calculation model:** ISO 9613-2 General

Noise sensitive area: Danish 2007 - Open land (31) (AE)



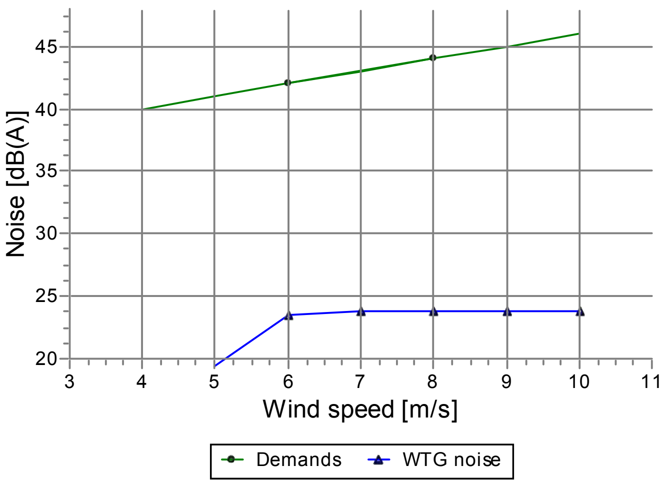
	Sound Level		
Wind speed [m/s]	Demands [dB(A)]	WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	13.6	Yes
5.0	41.0	18.9	Yes
6.0	42.0	23.0	Yes
7.0	43.0	23.3	Yes
8.0	44.0	23.3	Yes
9.0	45.0	23.3	Yes
10.0	46.0	23.3	Yes

Noise sensitive area: Danish 2007 - Open land (32) (AF)



	Sound Level		
Wind speed [m/s]	Demands [dB(A)]	WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	13.4	Yes
5.0	41.0	18.6	Yes
6.0	42.0	22.7	Yes
7.0	43.0	23.0	Yes
8.0	44.0	23.0	Yes
9.0	45.0	23.0	Yes
10.0	46.0	23.0	Yes

Noise sensitive area: Danish 2007 - Open land (33) (AG)

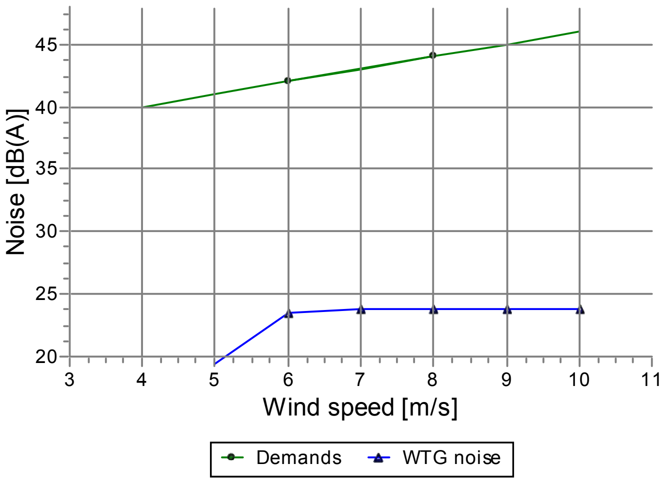


	Sound Level		
Wind speed [m/s]	Demands [dB(A)]	WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	14.1	Yes
5.0	41.0	19.4	Yes
6.0	42.0	23.5	Yes
7.0	43.0	23.8	Yes
8.0	44.0	23.8	Yes
9.0	45.0	23.8	Yes
10.0	46.0	23.8	Yes

DECIBEL - Detailed results

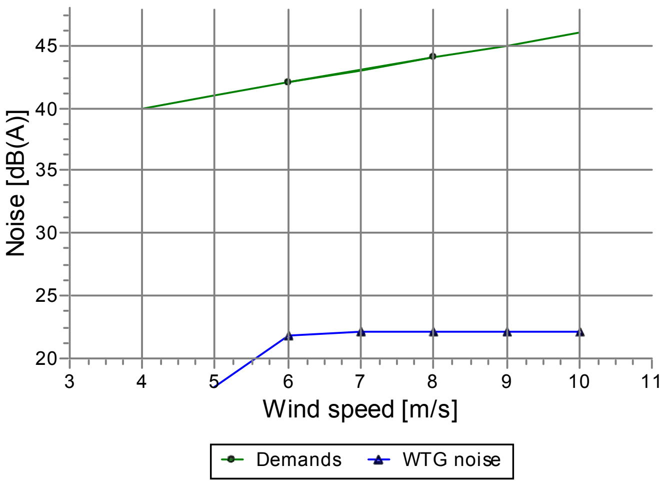
Calculation: EA216A Noise Calculation**Noise calculation model:** ISO 9613-2 General

Noise sensitive area: Danish 2007 - Open land (34) (AH)



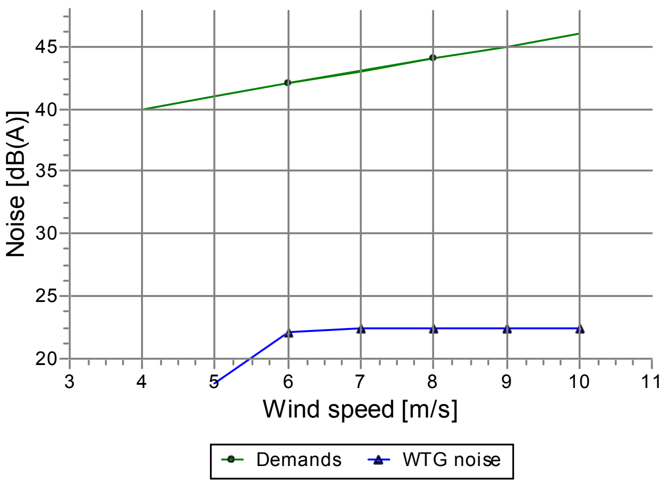
Wind speed [m/s]	Sound Level Demands [dB(A)]	WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	14.0	Yes
5.0	41.0	19.3	Yes
6.0	42.0	23.4	Yes
7.0	43.0	23.7	Yes
8.0	44.0	23.7	Yes
9.0	45.0	23.7	Yes
10.0	46.0	23.7	Yes

Noise sensitive area: Danish 2007 - Open land (35) (AI)



Wind speed [m/s]	Sound Level Demands [dB(A)]	WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	12.5	Yes
5.0	41.0	17.7	Yes
6.0	42.0	21.8	Yes
7.0	43.0	22.1	Yes
8.0	44.0	22.1	Yes
9.0	45.0	22.1	Yes
10.0	46.0	22.1	Yes

Noise sensitive area: Danish 2007 - Open land (36) (AJ)



Wind speed [m/s]	Sound Level Demands [dB(A)]	WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	12.7	Yes
5.0	41.0	18.0	Yes
6.0	42.0	22.1	Yes
7.0	43.0	22.4	Yes
8.0	44.0	22.4	Yes
9.0	45.0	22.4	Yes
10.0	46.0	22.4	Yes

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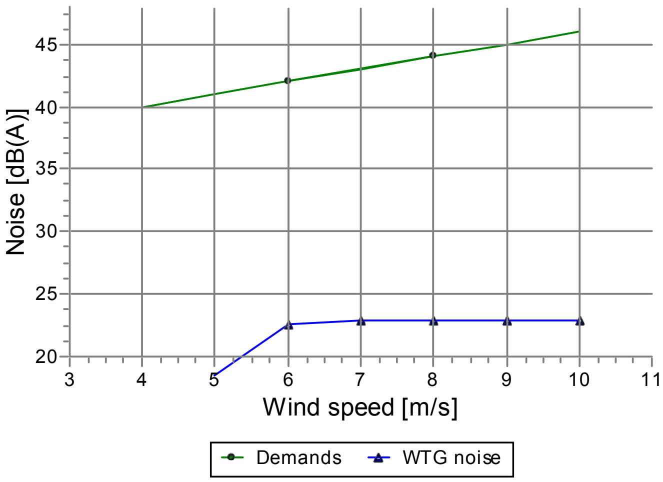
Calculated:
29/09/2015 14:41/3.0.629

DECIBEL - Detailed results

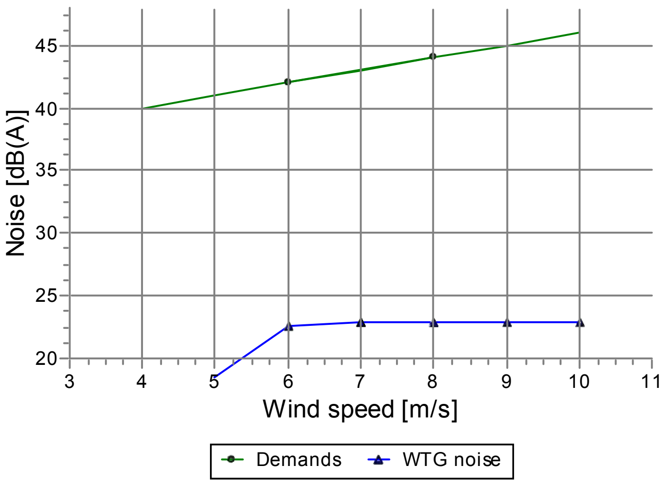
Calculation: EA216A Noise Calculation**Noise calculation model:** ISO 9613-2 General

Noise sensitive area: Danish 2007 - Open land (37) (AK)



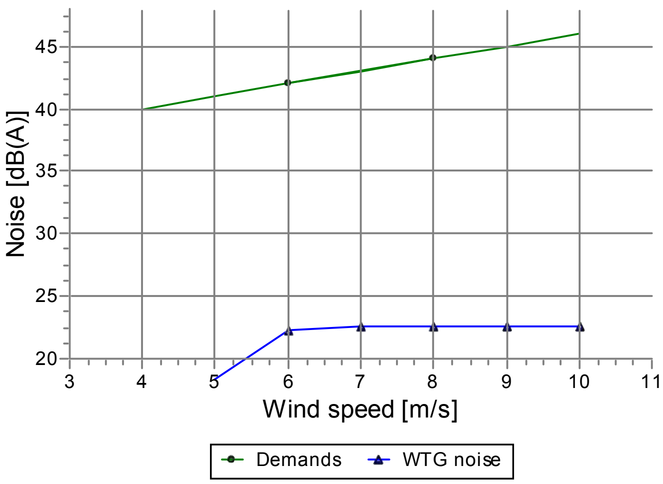
	Sound Level		
Wind speed [m/s]	Demands [dB(A)]	WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	13.2	Yes
5.0	41.0	18.5	Yes
6.0	42.0	22.6	Yes
7.0	43.0	22.9	Yes
8.0	44.0	22.9	Yes
9.0	45.0	22.9	Yes
10.0	46.0	22.9	Yes

Noise sensitive area: Danish 2007 - Open land (38) (AL)



	Sound Level		
Wind speed [m/s]	Demands [dB(A)]	WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	13.2	Yes
5.0	41.0	18.5	Yes
6.0	42.0	22.6	Yes
7.0	43.0	22.9	Yes
8.0	44.0	22.9	Yes
9.0	45.0	22.9	Yes
10.0	46.0	22.9	Yes

Noise sensitive area: Danish 2007 - Open land (39) (AM)

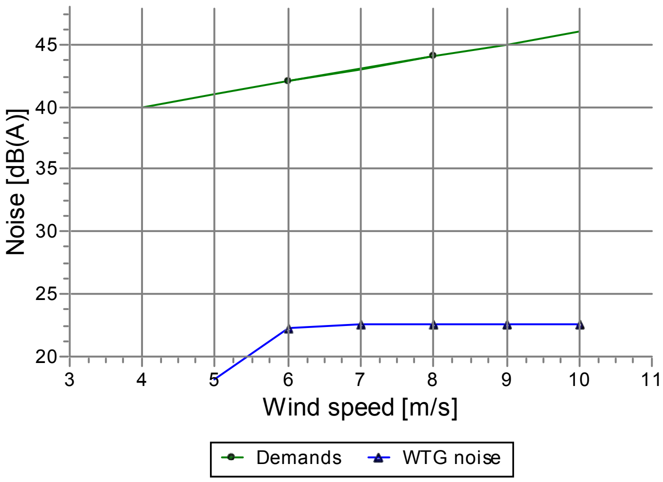


	Sound Level		
Wind speed [m/s]	Demands [dB(A)]	WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	13.0	Yes
5.0	41.0	18.3	Yes
6.0	42.0	22.4	Yes
7.0	43.0	22.7	Yes
8.0	44.0	22.7	Yes
9.0	45.0	22.7	Yes
10.0	46.0	22.7	Yes

DECIBEL - Detailed results

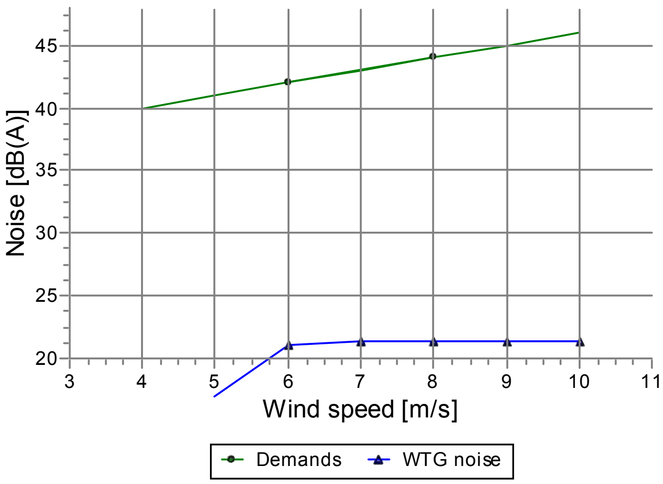
Calculation: EA216A Noise Calculation**Noise calculation model:** ISO 9613-2 General

Noise sensitive area: Danish 2007 - Open land (40) (AN)



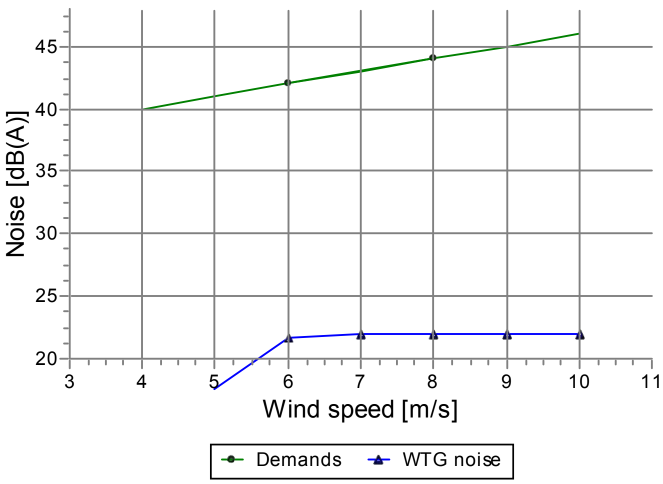
		Sound Level	
Wind speed [m/s]	Demands [dB(A)]	WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	12.9	Yes
5.0	41.0	18.2	Yes
6.0	42.0	22.3	Yes
7.0	43.0	22.6	Yes
8.0	44.0	22.6	Yes
9.0	45.0	22.6	Yes
10.0	46.0	22.6	Yes

Noise sensitive area: Danish 2007 - Open land (41) (AO)



		Sound Level	
Wind speed [m/s]	Demands [dB(A)]	WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	11.6	Yes
5.0	41.0	16.9	Yes
6.0	42.0	21.0	Yes
7.0	43.0	21.3	Yes
8.0	44.0	21.3	Yes
9.0	45.0	21.3	Yes
10.0	46.0	21.3	Yes

Noise sensitive area: Danish 2007 - Open land (42) (AP)

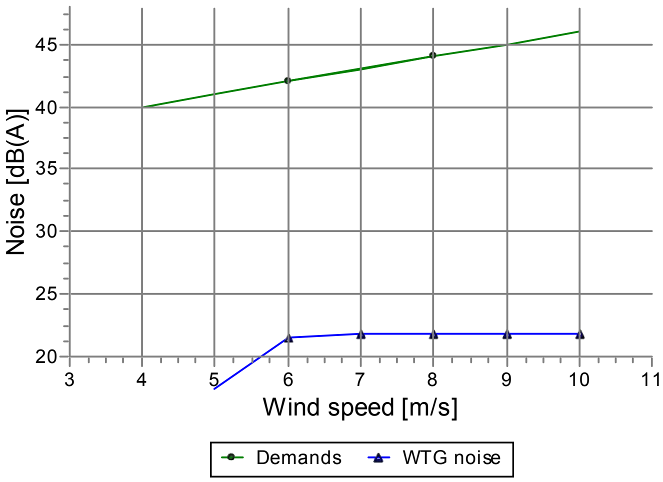


		Sound Level	
Wind speed [m/s]	Demands [dB(A)]	WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	12.3	Yes
5.0	41.0	17.6	Yes
6.0	42.0	21.7	Yes
7.0	43.0	22.0	Yes
8.0	44.0	22.0	Yes
9.0	45.0	22.0	Yes
10.0	46.0	22.0	Yes

DECIBEL - Detailed results

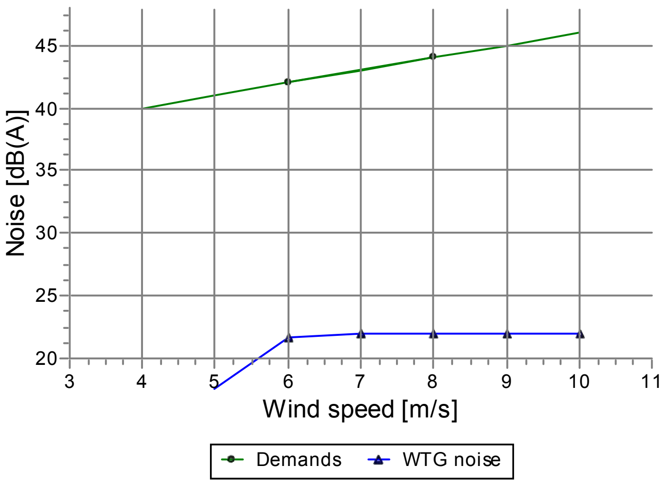
Calculation: EA216A Noise Calculation**Noise calculation model:** ISO 9613-2 General

Noise sensitive area: Danish 2007 - Open land (43) (AQ)



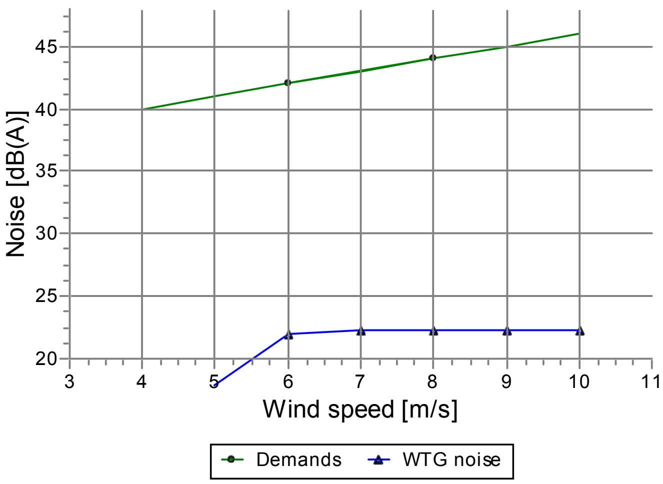
Wind speed [m/s]	Demands [dB(A)]	Sound Level WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	12.2	Yes
5.0	41.0	17.5	Yes
6.0	42.0	21.6	Yes
7.0	43.0	21.9	Yes
8.0	44.0	21.9	Yes
9.0	45.0	21.9	Yes
10.0	46.0	21.9	Yes

Noise sensitive area: Danish 2007 - Open land (44) (AR)



Wind speed [m/s]	Demands [dB(A)]	Sound Level WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	12.3	Yes
5.0	41.0	17.6	Yes
6.0	42.0	21.7	Yes
7.0	43.0	22.0	Yes
8.0	44.0	22.0	Yes
9.0	45.0	22.0	Yes
10.0	46.0	22.0	Yes

Noise sensitive area: Danish 2007 - Open land (45) (AS)



Wind speed [m/s]	Demands [dB(A)]	Sound Level WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	12.6	Yes
5.0	41.0	17.9	Yes
6.0	42.0	22.0	Yes
7.0	43.0	22.3	Yes
8.0	44.0	22.3	Yes
9.0	45.0	22.3	Yes
10.0	46.0	22.3	Yes

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Calculated:
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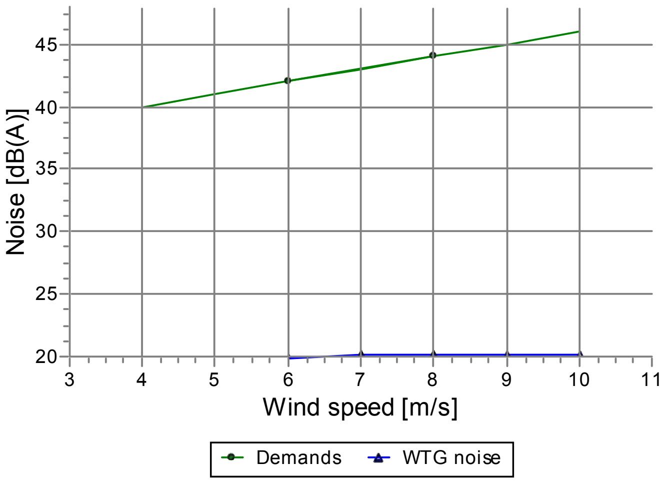
DECIBEL - Detailed results

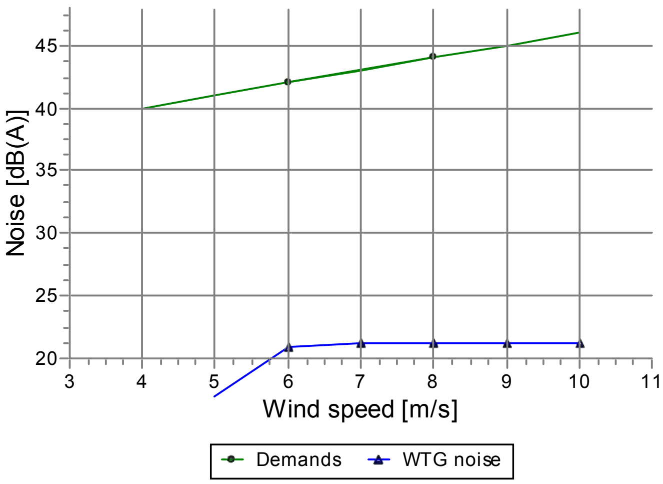
Calculation: EA216A Noise Calculation**Noise calculation model:** ISO 9613-2 General

Noise sensitive area: Danish 2007 - Open land (46) (AT)



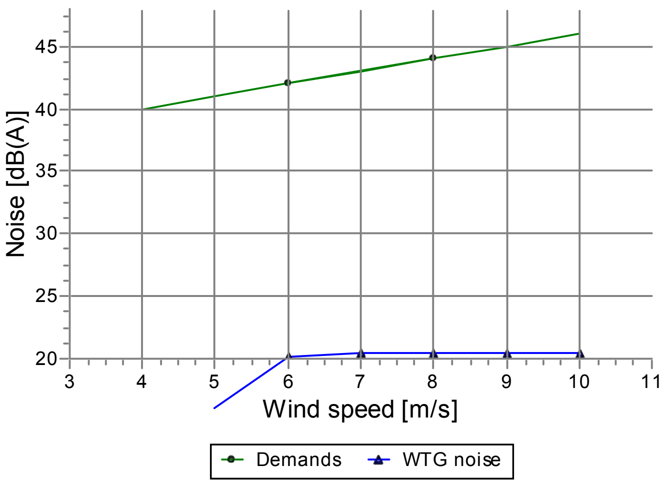
		Sound Level	
Wind speed [m/s]	Demands [dB(A)]	WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	10.4	Yes
5.0	41.0	15.7	Yes
6.0	42.0	19.8	Yes
7.0	43.0	20.1	Yes
8.0	44.0	20.1	Yes
9.0	45.0	20.1	Yes
10.0	46.0	20.1	Yes

Noise sensitive area: Danish 2007 - Open land (47) (AU)



		Sound Level	
Wind speed [m/s]	Demands [dB(A)]	WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	11.6	Yes
5.0	41.0	16.9	Yes
6.0	42.0	21.0	Yes
7.0	43.0	21.3	Yes
8.0	44.0	21.3	Yes
9.0	45.0	21.3	Yes
10.0	46.0	21.3	Yes

Noise sensitive area: Danish 2007 - Open land (48) (AV)

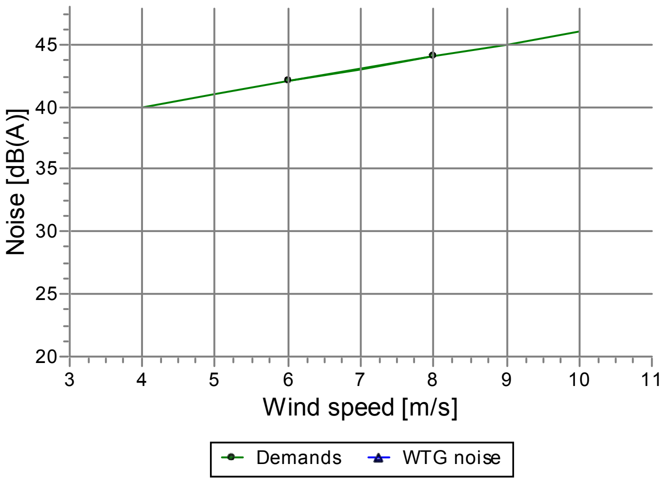


		Sound Level	
Wind speed [m/s]	Demands [dB(A)]	WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	10.7	Yes
5.0	41.0	16.0	Yes
6.0	42.0	20.1	Yes
7.0	43.0	20.4	Yes
8.0	44.0	20.4	Yes
9.0	45.0	20.4	Yes
10.0	46.0	20.4	Yes

DECIBEL - Detailed results

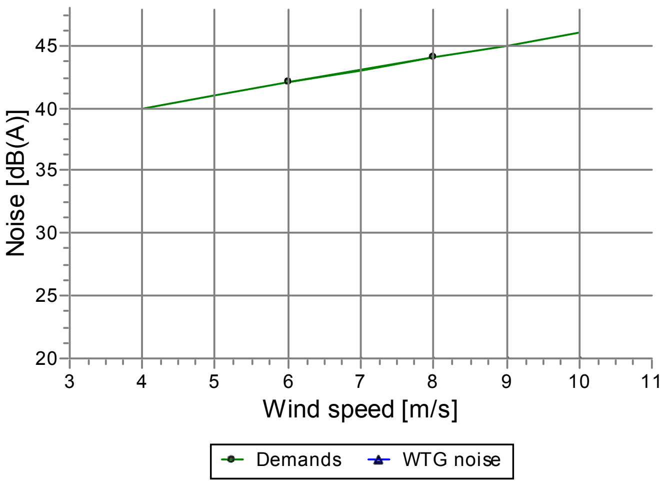
Calculation: EA216A Noise Calculation**Noise calculation model:** ISO 9613-2 General

Noise sensitive area: Danish 2007 - Open land (49) (AW)



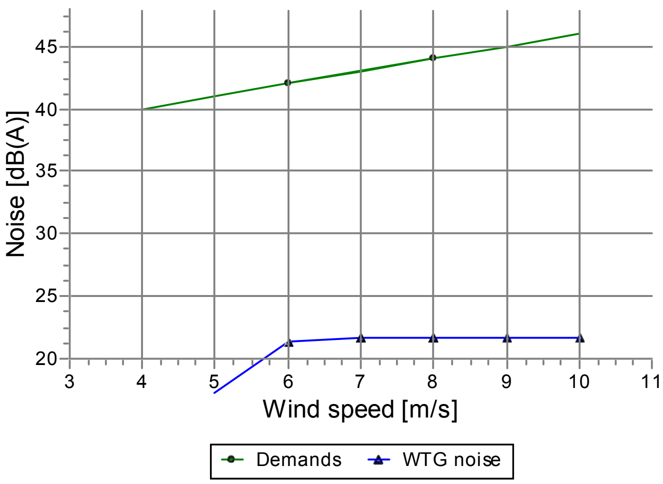
	Sound Level		
Wind speed [m/s]	Demands [dB(A)]	WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	10.1	Yes
5.0	41.0	15.4	Yes
6.0	42.0	19.5	Yes
7.0	43.0	19.8	Yes
8.0	44.0	19.8	Yes
9.0	45.0	19.8	Yes
10.0	46.0	19.8	Yes

Noise sensitive area: Danish 2007 - Open land (50) (AX)



	Sound Level		
Wind speed [m/s]	Demands [dB(A)]	WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	10.1	Yes
5.0	41.0	15.4	Yes
6.0	42.0	19.5	Yes
7.0	43.0	19.8	Yes
8.0	44.0	19.8	Yes
9.0	45.0	19.8	Yes
10.0	46.0	19.8	Yes

Noise sensitive area: Danish 2007 - Open land (51) (AY)



	Sound Level		
Wind speed [m/s]	Demands [dB(A)]	WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	12.0	Yes
5.0	41.0	17.3	Yes
6.0	42.0	21.4	Yes
7.0	43.0	21.7	Yes
8.0	44.0	21.7	Yes
9.0	45.0	21.7	Yes
10.0	46.0	21.7	Yes

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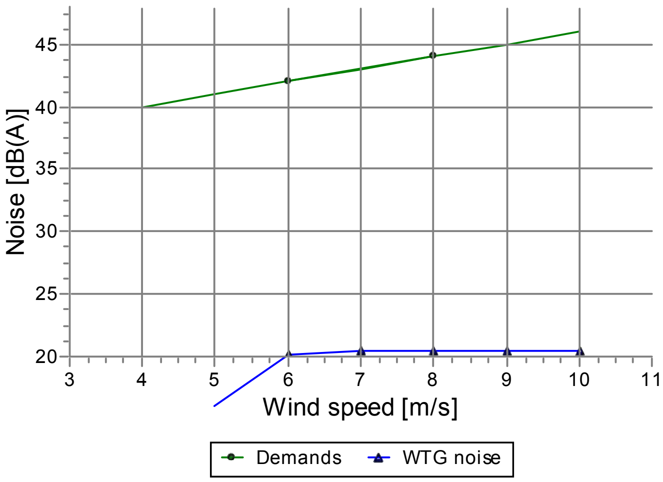
DECIBEL - Detailed results

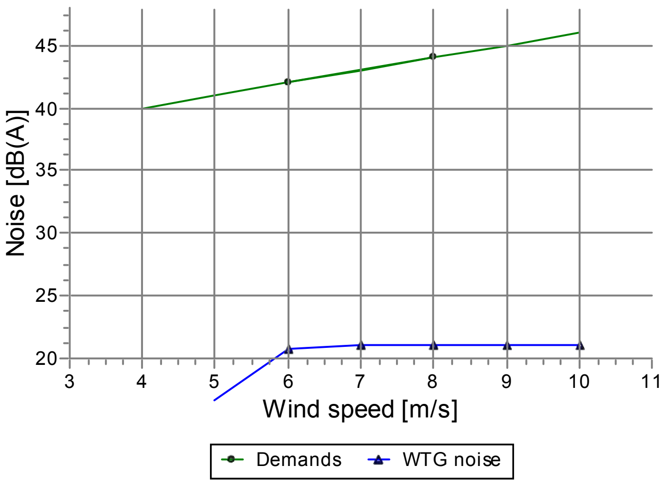
Calculation: EA216A Noise Calculation**Noise calculation model:** ISO 9613-2 General

Noise sensitive area: Danish 2007 - Open land (52) (AZ)



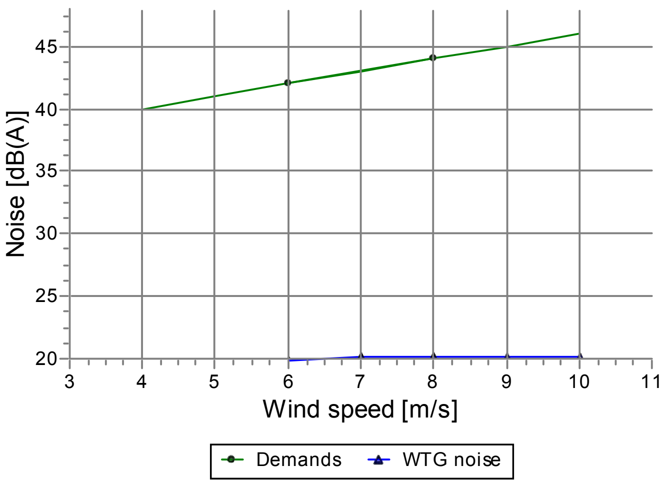
		Sound Level	
Wind speed [m/s]	Demands [dB(A)]	WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	10.7	Yes
5.0	41.0	16.0	Yes
6.0	42.0	20.1	Yes
7.0	43.0	20.4	Yes
8.0	44.0	20.4	Yes
9.0	45.0	20.4	Yes
10.0	46.0	20.4	Yes

Noise sensitive area: Danish 2007 - Open land (53) (BA)



		Sound Level	
Wind speed [m/s]	Demands [dB(A)]	WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	11.4	Yes
5.0	41.0	16.7	Yes
6.0	42.0	20.8	Yes
7.0	43.0	21.1	Yes
8.0	44.0	21.1	Yes
9.0	45.0	21.1	Yes
10.0	46.0	21.1	Yes

Noise sensitive area: Danish 2007 - Open land (54) (BB)

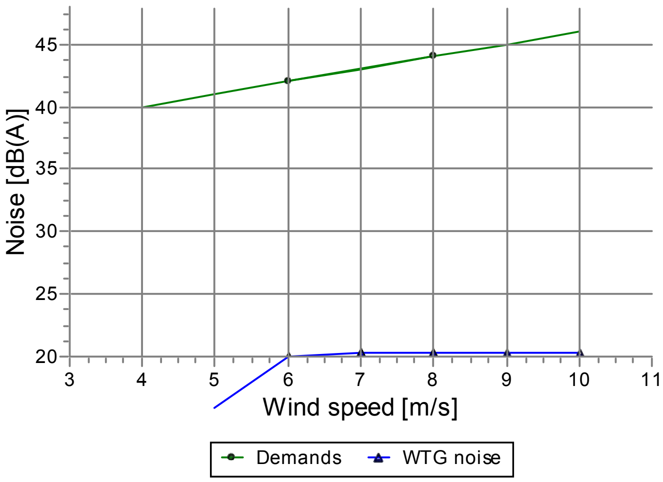


		Sound Level	
Wind speed [m/s]	Demands [dB(A)]	WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	10.4	Yes
5.0	41.0	15.7	Yes
6.0	42.0	19.8	Yes
7.0	43.0	20.1	Yes
8.0	44.0	20.1	Yes
9.0	45.0	20.1	Yes
10.0	46.0	20.1	Yes

DECIBEL - Detailed results

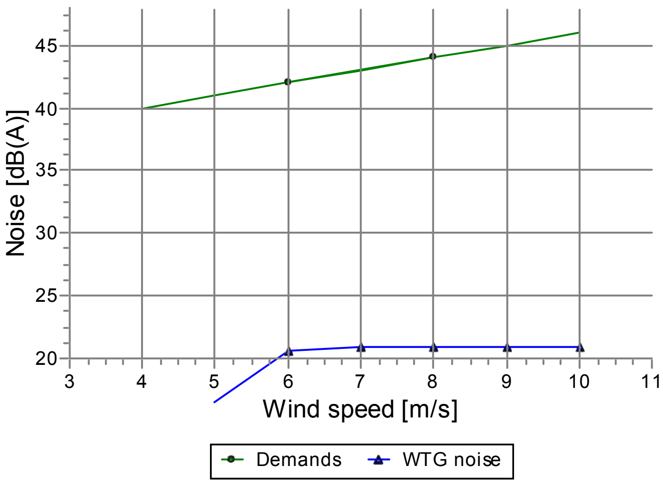
Calculation: EA216A Noise Calculation**Noise calculation model:** ISO 9613-2 General

Noise sensitive area: Danish 2007 - Open land (55) (BC)



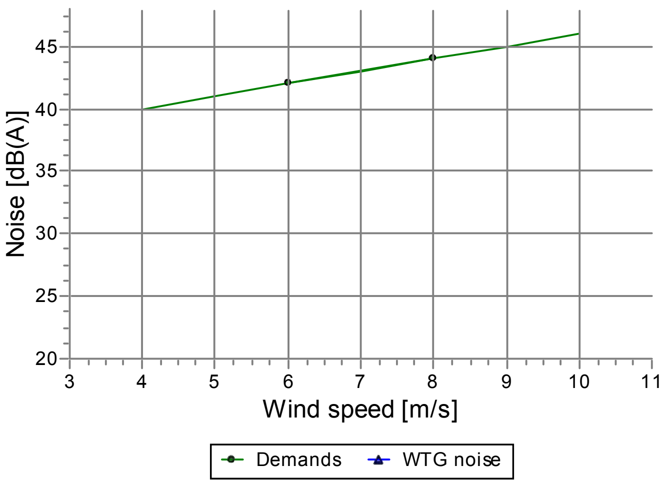
Wind speed [m/s]	Demands [dB(A)]	Sound Level WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	10.6	Yes
5.0	41.0	15.9	Yes
6.0	42.0	20.0	Yes
7.0	43.0	20.3	Yes
8.0	44.0	20.3	Yes
9.0	45.0	20.3	Yes
10.0	46.0	20.3	Yes

Noise sensitive area: Danish 2007 - Open land (56) (BD)



Wind speed [m/s]	Demands [dB(A)]	Sound Level WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	11.2	Yes
5.0	41.0	16.5	Yes
6.0	42.0	20.6	Yes
7.0	43.0	20.9	Yes
8.0	44.0	20.9	Yes
9.0	45.0	20.9	Yes
10.0	46.0	20.9	Yes

Noise sensitive area: Danish 2007 - Open land (57) (BE)

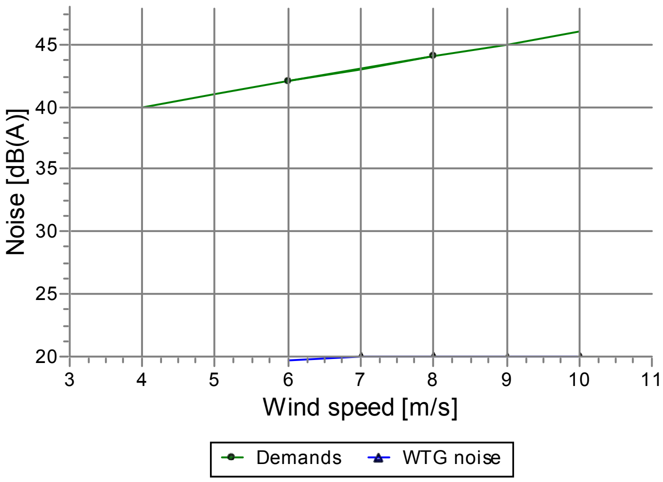


Wind speed [m/s]	Demands [dB(A)]	Sound Level WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	10.0	Yes
5.0	41.0	15.3	Yes
6.0	42.0	19.4	Yes
7.0	43.0	19.7	Yes
8.0	44.0	19.7	Yes
9.0	45.0	19.7	Yes
10.0	46.0	19.7	Yes

DECIBEL - Detailed results

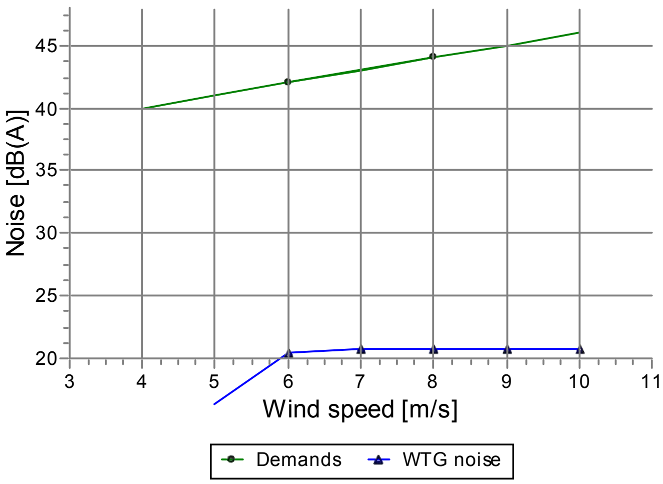
Calculation: EA216A Noise Calculation**Noise calculation model:** ISO 9613-2 General

Noise sensitive area: Danish 2007 - Open land (58) (BF)



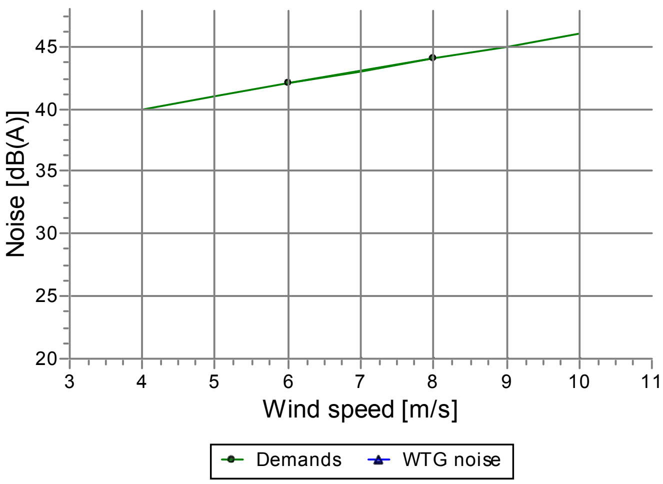
Wind speed [m/s]	Sound Level Demands [dB(A)]	WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	10.3	Yes
5.0	41.0	15.6	Yes
6.0	42.0	19.7	Yes
7.0	43.0	20.0	Yes
8.0	44.0	20.0	Yes
9.0	45.0	20.0	Yes
10.0	46.0	20.0	Yes

Noise sensitive area: Danish 2007 - Open land (59) (BG)



Wind speed [m/s]	Sound Level Demands [dB(A)]	WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	11.1	Yes
5.0	41.0	16.4	Yes
6.0	42.0	20.5	Yes
7.0	43.0	20.8	Yes
8.0	44.0	20.8	Yes
9.0	45.0	20.8	Yes
10.0	46.0	20.8	Yes

Noise sensitive area: Danish 2007 - Open land (60) (BH)



Wind speed [m/s]	Sound Level Demands [dB(A)]	WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	10.1	Yes
5.0	41.0	15.4	Yes
6.0	42.0	19.5	Yes
7.0	43.0	19.8	Yes
8.0	44.0	19.8	Yes
9.0	45.0	19.8	Yes
10.0	46.0	19.8	Yes

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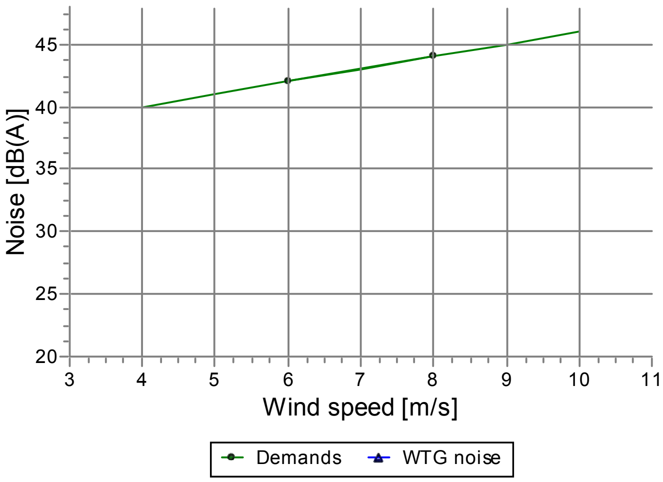
DECIBEL - Detailed results

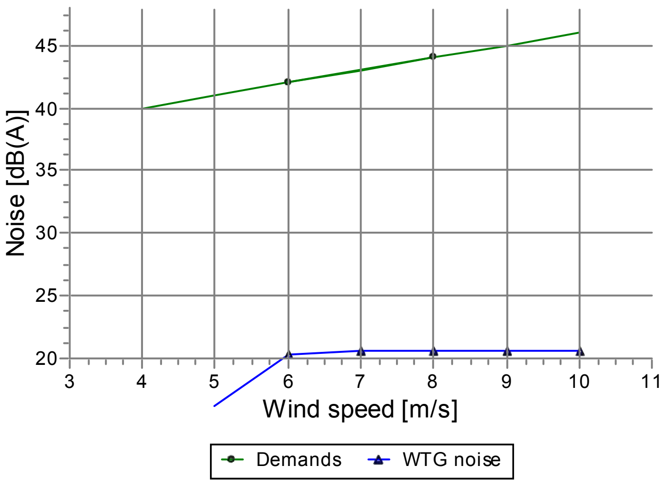
Calculation: EA216A Noise Calculation**Noise calculation model:** ISO 9613-2 General

Noise sensitive area: Danish 2007 - Open land (61) (BI)



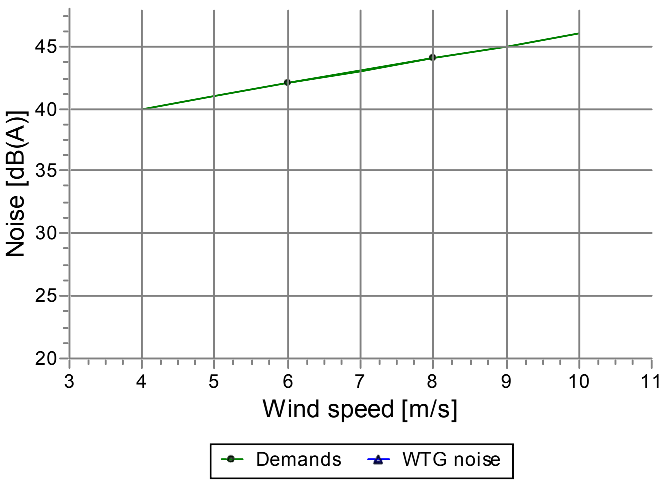
	Sound Level		
Wind speed [m/s]	Demands [dB(A)]	WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	9.6	Yes
5.0	41.0	14.9	Yes
6.0	42.0	19.0	Yes
7.0	43.0	19.3	Yes
8.0	44.0	19.3	Yes
9.0	45.0	19.3	Yes
10.0	46.0	19.3	Yes

Noise sensitive area: Danish 2007 - Open land (62) (BJ)



	Sound Level		
Wind speed [m/s]	Demands [dB(A)]	WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	10.9	Yes
5.0	41.0	16.2	Yes
6.0	42.0	20.3	Yes
7.0	43.0	20.6	Yes
8.0	44.0	20.6	Yes
9.0	45.0	20.6	Yes
10.0	46.0	20.6	Yes

Noise sensitive area: Danish 2007 - Open land (63) (BK)



	Sound Level		
Wind speed [m/s]	Demands [dB(A)]	WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	9.1	Yes
5.0	41.0	14.4	Yes
6.0	42.0	18.5	Yes
7.0	43.0	18.8	Yes
8.0	44.0	18.8	Yes
9.0	45.0	18.8	Yes
10.0	46.0	18.8	Yes

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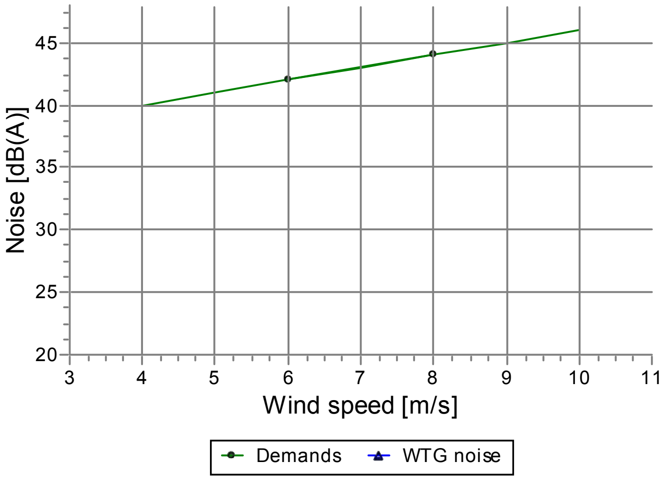
DECIBEL - Detailed results

Calculation: EA216A Noise Calculation**Noise calculation model:** ISO 9613-2 General

Noise sensitive area: Danish 2007 - Open land (64) (BL)



	Sound Level		
Wind speed [m/s]	Demands [dB(A)]	WTG noise [dB(A)]	Demands fulfilled ?
4.0	40.0	8.6	Yes
5.0	41.0	13.9	Yes
6.0	42.0	18.0	Yes
7.0	43.0	18.3	Yes
8.0	44.0	18.3	Yes
9.0	45.0	18.3	Yes
10.0	46.0	18.3	Yes

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Calculated:
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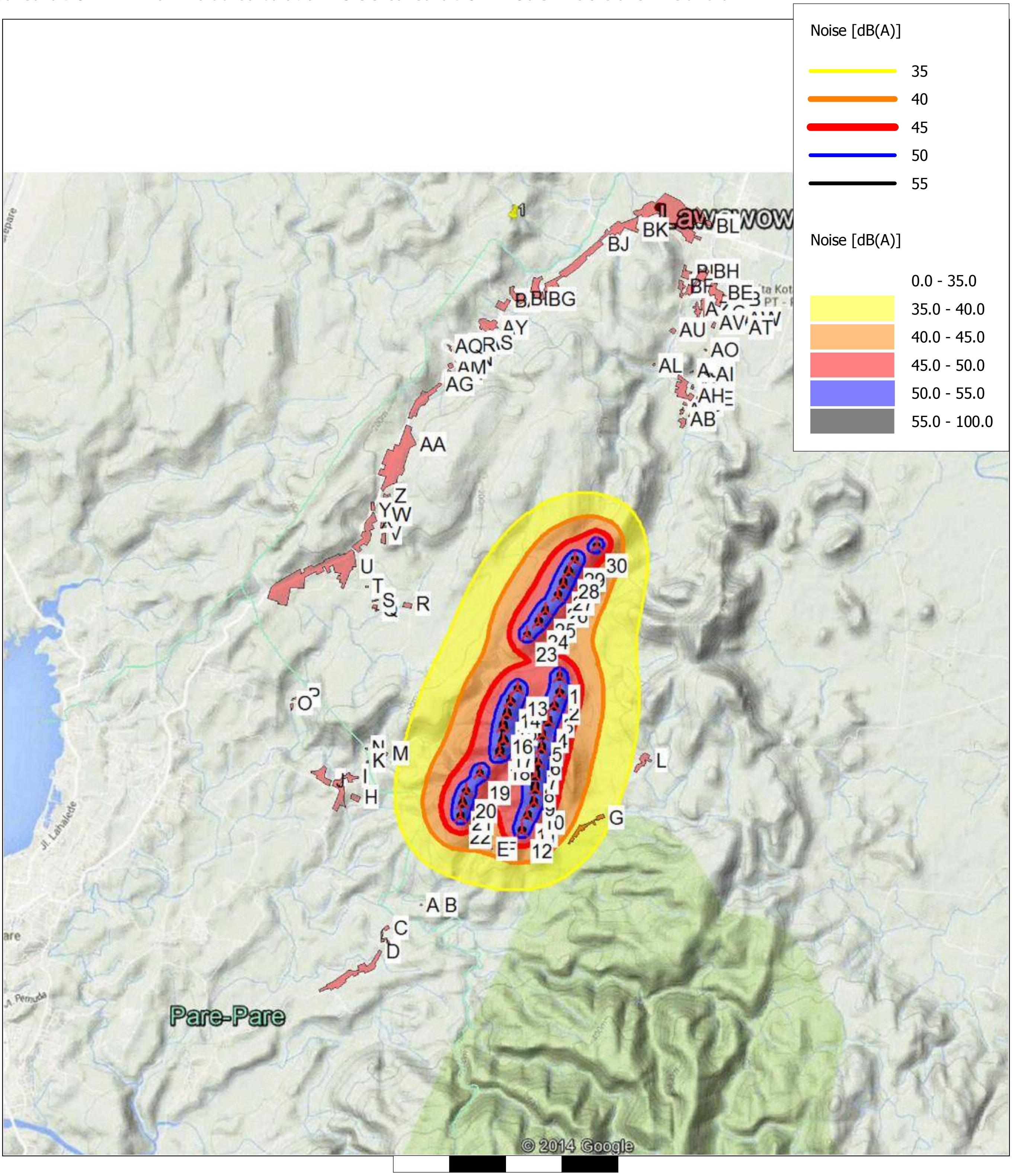
DECIBEL - Map 10.0 m/s

Calculation: EA216A Noise Calculation**Noise calculation model:** ISO 9613-2 General



Map: WP02 Sidrap Georeference , Print scale 1:100,000, Map center UTM (south)-WGS84 Zone: 50 East: 800,494 North: 9,561,502
New WTG   Noise sensitive area
Noise calculation model: ISO 9613-2 General. Wind speed: 10.0 m/s
Height above sea level from active line object

Project:
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Calculated:
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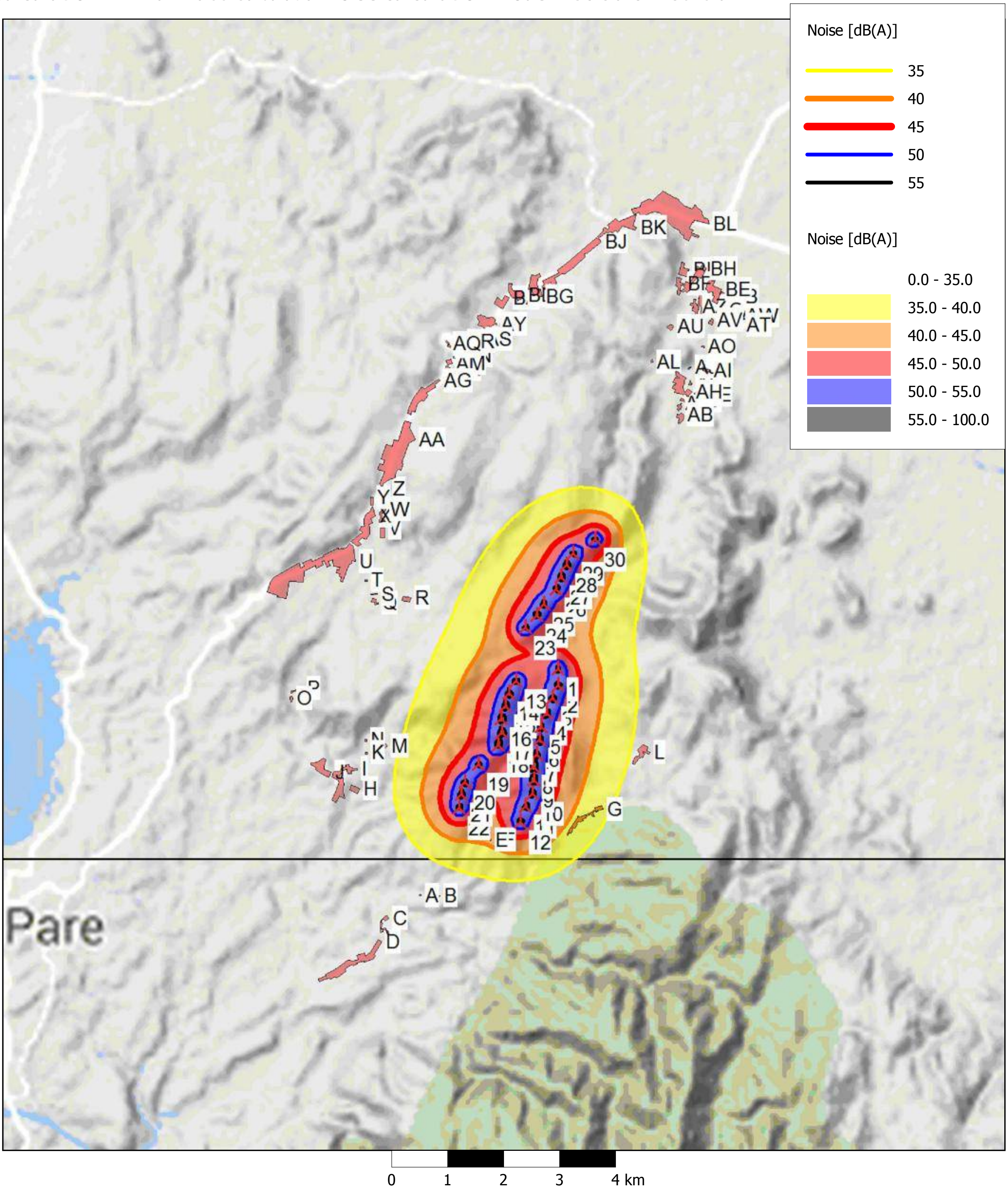
DECIBEL - Map 9.0 m/s

Calculation: EA216A Noise Calculation**Noise calculation model:** ISO 9613-2 General



Map: Google map , Print scale 1:100,000, Map center UTM (south)-WGS84 Zone: 50 East: 800,494 North: 9,561,502
New WTG Noise sensitive area
Noise calculation model: ISO 9613-2 General. Wind speed: 9.0 m/s
Height above sea level from active line object

Project:
WP02 Sidrap

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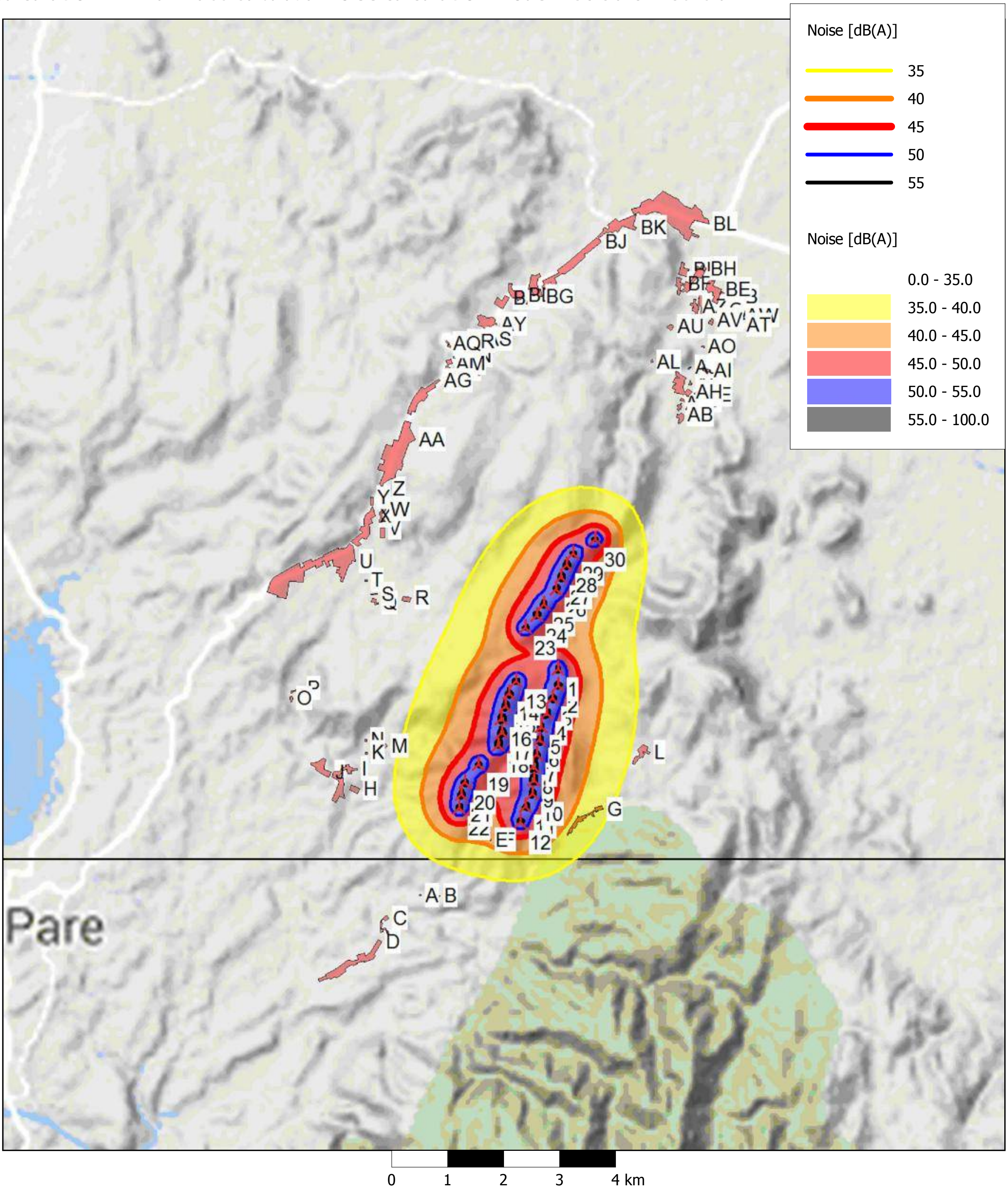
DECIBEL - Map 8.0 m/s

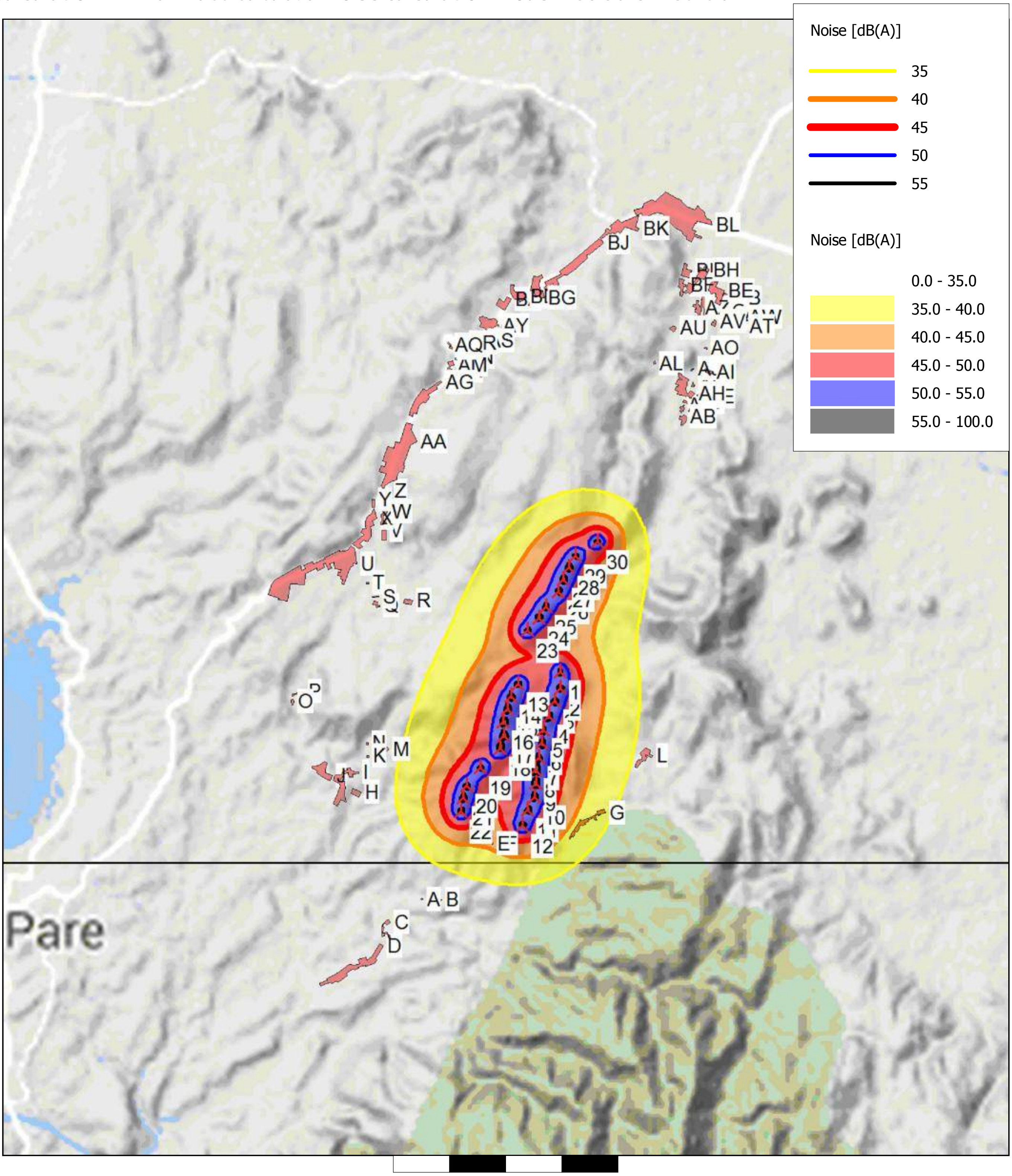
Calculation: EA216A Noise Calculation**Noise calculation model:** ISO 9613-2 General



Map: Google map , Print scale 1:100,000, Map center UTM (south)-WGS84 Zone: 50 East: 800,494 North: 9,561,502
New WTG   Noise sensitive area
Noise calculation model: ISO 9613-2 General. Wind speed: 8.0 m/s
Height above sea level from active line object

DECIBEL - Map 7.0 m/s

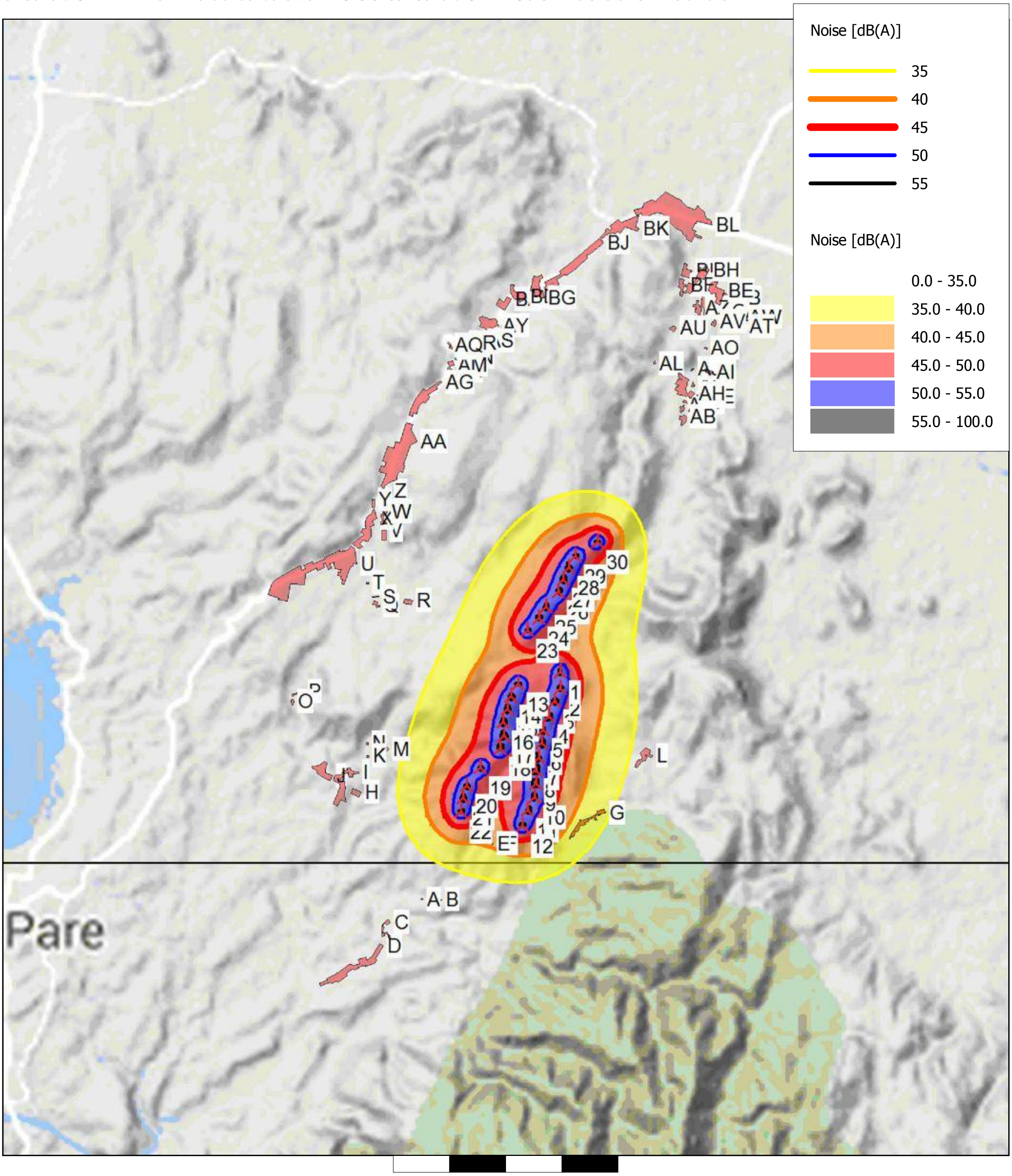
Calculation: EA216A Noise Calculation**Noise calculation model:** ISO 9613-2 General



Map: Google map , Print scale 1:100,000, Map center UTM (south)-WGS84 Zone: 50 East: 800,494 North: 9,561,502
New WTG Noise sensitive area
Noise calculation model: ISO 9613-2 General. Wind speed: 7.0 m/s
Height above sea level from active line object

DECIBEL - Map 6.0 m/s

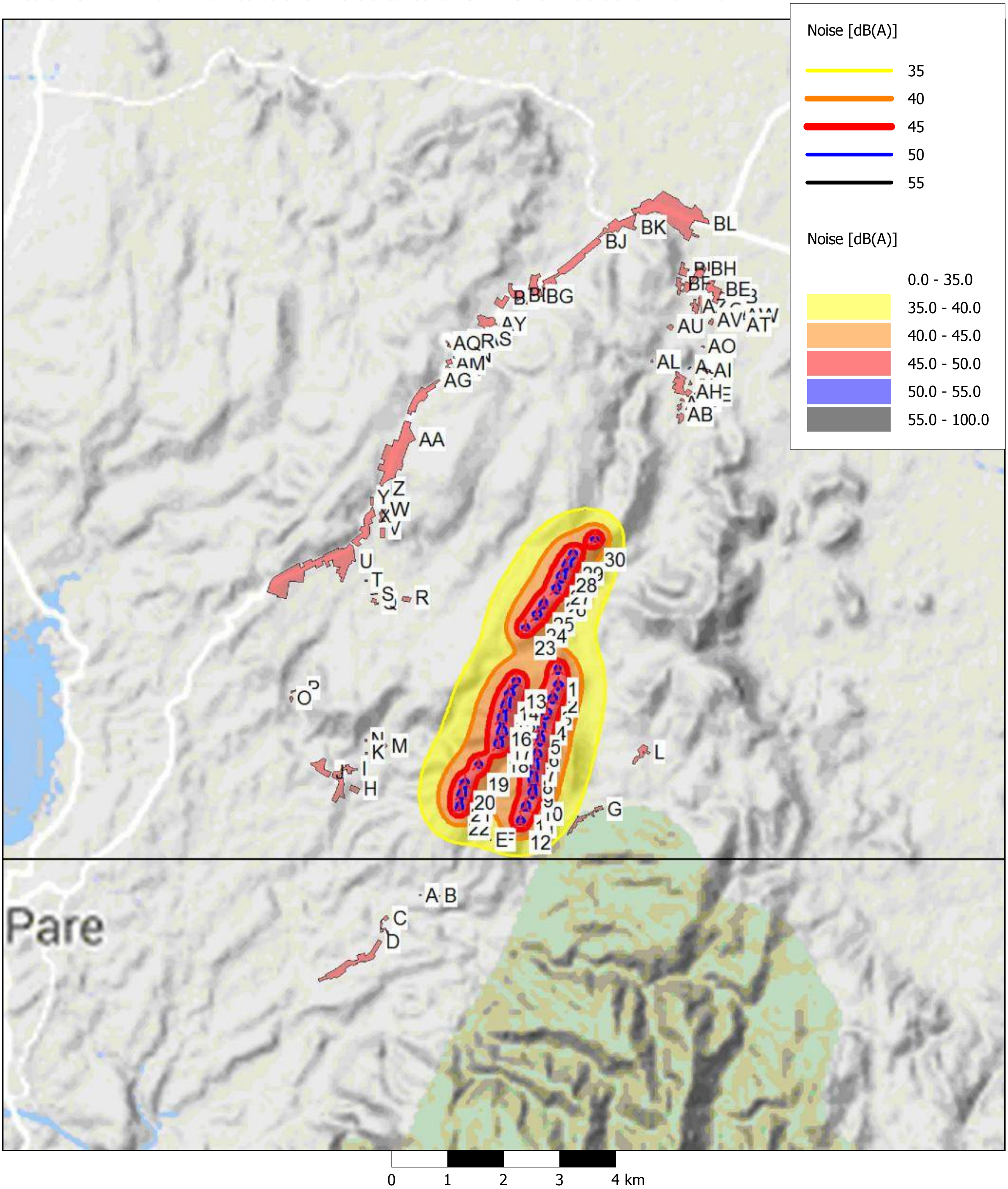
Calculation: EA216A Noise Calculation**Noise calculation model:** ISO 9613-2 General



Map: Google map , Print scale 1:100,000, Map center UTM (south)-WGS84 Zone: 50 East: 800,494 North: 9,561,502
New WTG Noise sensitive area
Noise calculation model: ISO 9613-2 General. Wind speed: 6.0 m/s
Height above sea level from active line object

DECIBEL - Map 5.0 m/s

Calculation: EA216A Noise Calculation**Noise calculation model:** ISO 9613-2 General



Map: Google map , Print scale 1:100,000, Map center UTM (south)-WGS84 Zone: 50 East: 800,494 North: 9,561,502
New WTG Noise sensitive area
Noise calculation model: ISO 9613-2 General. Wind speed: 5.0 m/s
Height above sea level from active line object

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Calculated:
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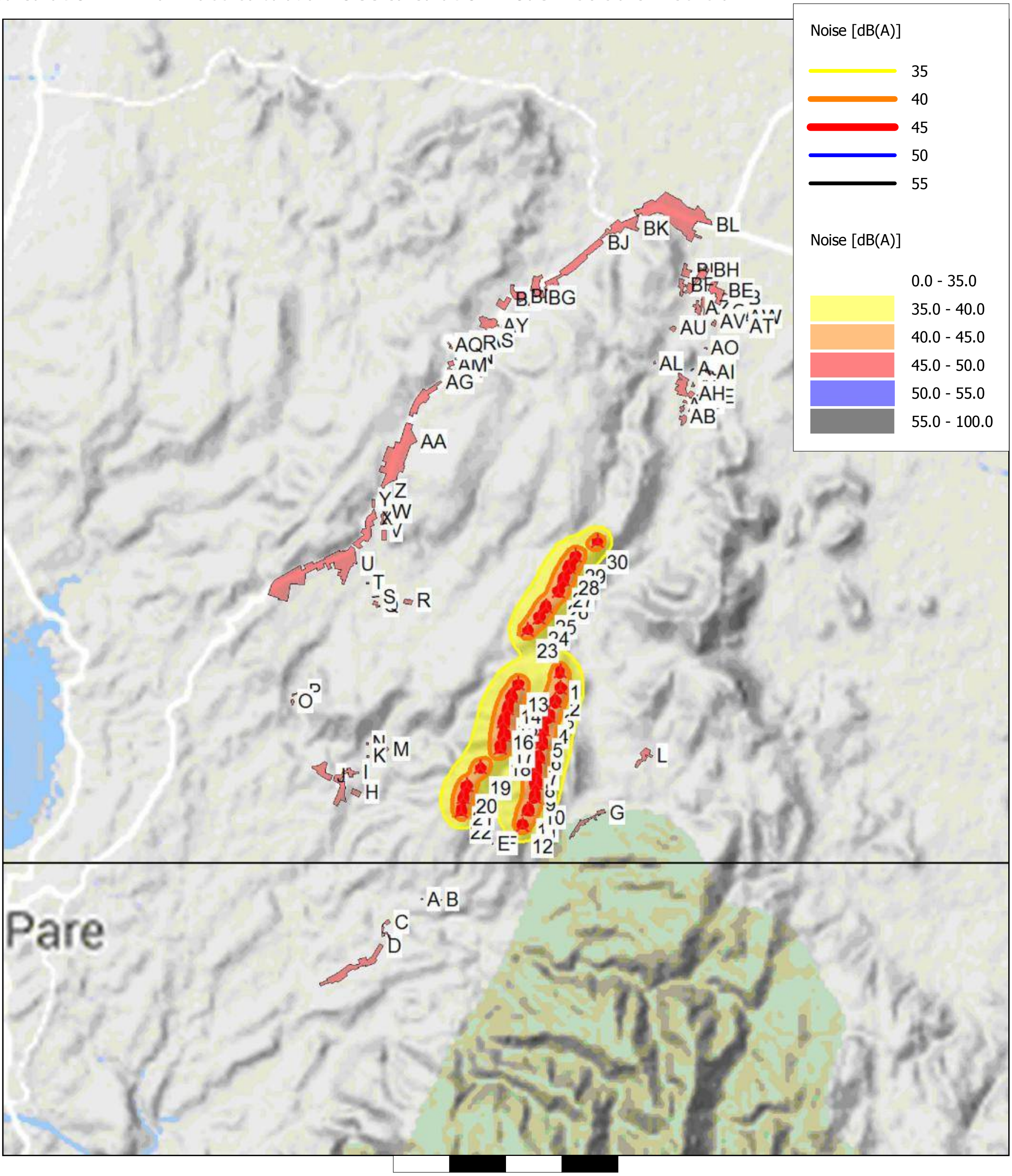
DECIBEL - Map 4.0 m/s

Calculation: EA216A Noise Calculation**Noise calculation model:** ISO 9613-2 General



Map: Google map , Print scale 1:100,000, Map center UTM (south)-WGS84 Zone: 50 East: 800,494 North: 9,561,502

New WTG Noise sensitive area

Noise calculation model: ISO 9613-2 General. Wind speed: 4.0 m/s
Height above sea level from active line object

Appendix F

Flicker Report

75MW SIDRAP WIND POWER PLANT PROJECT

FLICKER ASSESSMENT

PT UPC SIDRAP BAYU ENERGI – PROJECT COMPANY

PT UPC RENEWABLES INDONESIA – DEVELOPMENT MANAGEMENT COMPANY

Table of Contents

Record of Changes

Rev.	Date	Author	Description
0	12/11/2015	Eugene Kohar	Initial Version (24G52 at 65 m hub height)
1	15/12/2015	Eugene Kohar	Using nearby meteorological station

1. Introduction

PT UPC Renewables Indonesia is proposing to construct a wind farm project in Sidrap. The project will be referred to as the 75MW Sidrap Wind Power Plant (the "Project") and will be located on Sidrap, South Sulawesi, Indonesia.

2. Project Layout

Approval is being sought for thirty (30) wind turbine locations, with each turbine rated at 2.5 Megawatts maximum generation capacity.

The location of the Project Study Area was defined early in the planning process for the proposed wind energy facility, based on the availability of wind resources, approximate area required for the proposed project, and availability of existing infrastructure for connection to the electrical grid.

A figure showing the project location, wind turbine layout and potential shadow receptors is provided in Appendix A.

3. Flicker Assessment Guideline

Shadow flicker is a temporary condition resulting from the sun casting intermittent shadows from the rotating blades of a wind turbine onto a sensitive receptor such as a window in a building. The flicker is due to alternating light intensity between the direct beam of sunlight and the shadow from the turbine blades.

For shadow flicker to occur, the following criteria must be met:

- The sun must be shining and not obscured by any cloud cover.
- The wind turbine must be between the sun and the shadow receptor.
- The wind turbine must be facing directly towards (or away from) the sun such that the rotational plane of the blades is perpendicular to the azimuth of incident sun rays. For this to occur, the wind direction would have to perpetually be parallel to the azimuth of the incident sun rays throughout the day.
- The line of sight between the turbine and the shadow receptor must be clear. Light impermeable obstacles, such as trees, buildings or other structures, will prevent or reduce shadow flicker from occurring at the receptor.
- The receptor has to be close enough to the turbine to be in the shadow.
- The turbine is operational and not stationary due to a lack of wind or maintenance activities.

Due to the degree of difficulty in calculating the above occurrences, it is standard practice to undertake these calculations using commercially available computer modelling software. The software WindPRO SHADOW module, is used to predict the shadow flicker levels at the Points of Reception. The height contours for the area were taken from the NASA Shuttle Radar Topographic Mission (SRTM). For modelling purposes, the vegetation and other obstacles that block some of the shadow receptors from the sources have not been incorporated.

4. Shadow Flicker Sources

The wind turbine technology proposed for this Project is the Gamesa G114-2.5MW Wind Turbine. The turbines have a 114m rotor diameter with a swept area of 10,208 m^2; each blade is connected to the main shaft via the hub. This turbine model has a hub height of 80m. The turbine has a cut-in speed of 3m/s and a cut-out speed of 25 m/s.

The exposure time and amount of shadow flicker at each receptor can vary based on the following factors:

- The sun must be shining and not obscured by cloud cover.
- The turbine must be between the sun and the receptor and be facing directly towards (or away from) the sun such that the rotation of the blades is perpendicular to the sun rays. The shadow from a turbine extends furthest when the sun is low in the sky (sunrise and sunset) such that receptors to the east or west of a turbine will be exposed more than receptors to the north and south of a turbine
- The turbine must be close enough to the receptor to cause shadow flicker and be operational (not stationary due to lack of wind or maintenance activities).
- Terrain, other buildings and vegetation can affect the exposure at a receptor such that if there are trees between the turbine and a receptor, shadow flicker will not occur at the receptor.

The orientation of windows at each receptor location will determine what rooms at each receptor would be exposed to shadow flicker. UPC did not catalogue the number or orientation of windows at each receptor, but uses a “Green House” mode, where it is assumed that the window is perpendicular to all WTGs at a 90° slope.

The average daily sunshine hours used are from actual measurements at the nearest meteorological station (Dili Airport). The following two tables summarize the assumed operational hours of the WTGs per sector (for 12 sectors) and the average daily sunshine hours per month:

Sectors	Hours in Operation
N	39
NNE	74
ENE	471
E	2058
ESE	2365
SSE	377
S	83
SSW	532
WSW	1403
W	820
WNW	232
NNW	72

Month	Average Daily Sunshine Hours
Jan	6.30
Feb	6.18
Mar	6.60
Apr	9.05
May	8.67
Jun	9.10
Jul	9.43
Aug	9.97
Sep	9.68
Oct	9.66
Nov	8.52
Dec	7.10

5. Shadow Receptors

The Flicker Impact Summary Table, provided in Appendix B, lists all of the shadow receptors within 4000m of the project turbines and the associated coordinates. The location of each shadow receptors are based on satellite imagery combined with site confirmation of any roof clusters.

For this study, each shadow receptor is treated as a “Green House” window. The height and width of the window is 2m × 2m, situated 1m above ground.

6. Detailed Shadow Flicker Impact Assessment

The shadow flicker impact analysis for the Project was completed using EMD WindPRO modelling software.

The shadow flicker modelling was conducted using a real case basis, which is sourced from statistical user input data. To simulate a more realistic flicker study, the distance in which flicker is considered is not limited.

Zones of Visual Influence (ZVI) calculation is also included 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 an eye height of 1.5m and a grid resolution of 10m.

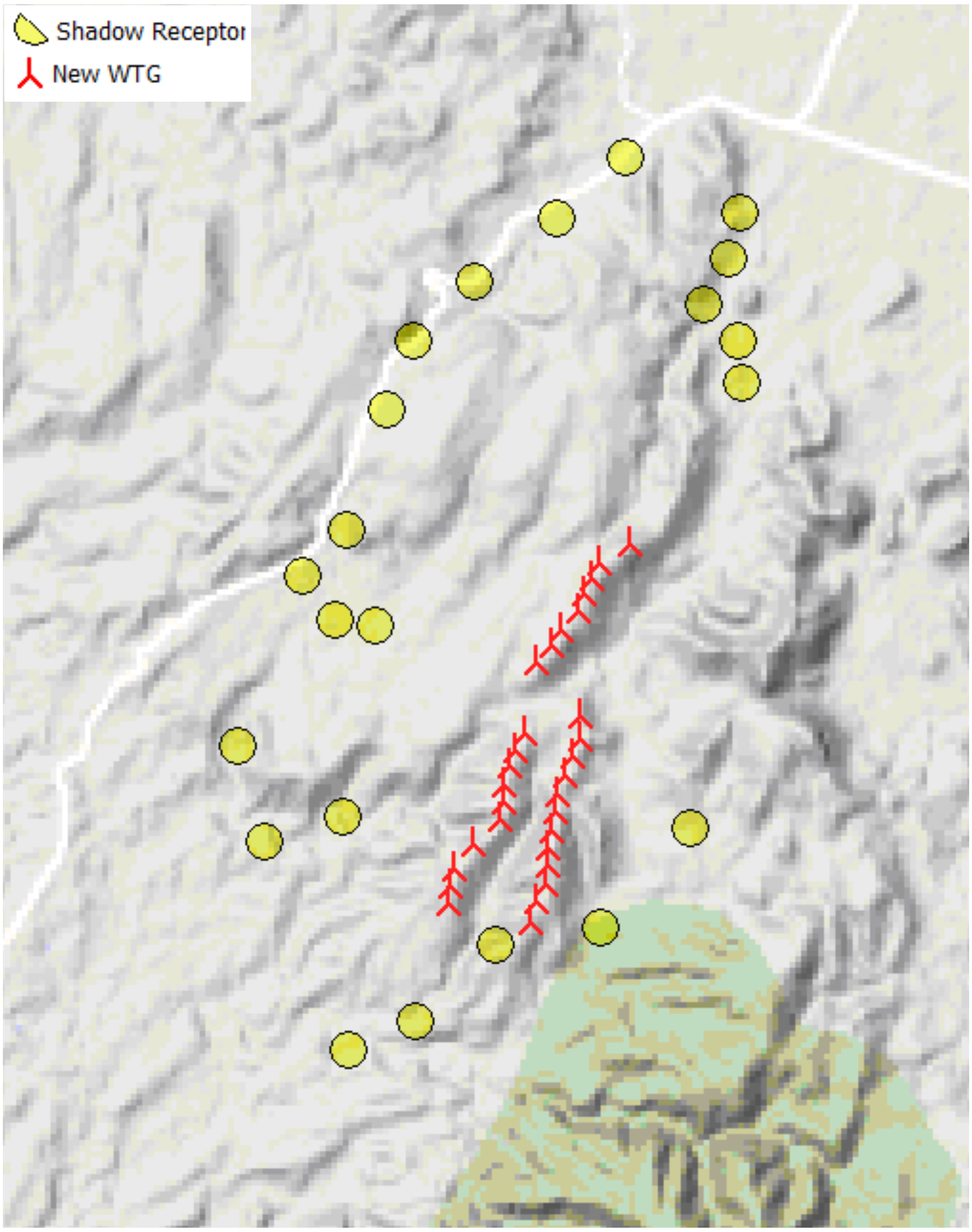
7. Results and Compliance

The results of the shadow flicker modelling in Appendix B show that the Project is predicted to at most affect 26.2 hours of flickering in a year for only one nearby shadow receptors. In the worst case scenario for the two shadow receptors, the events will last for no more than 11.3 minutes on any one day. Other receptors are considerably less affected by shadow flickering.

The maximum hours of shadow flicker per day cannot be corrected as there could be 100% sunshine for an entire day. The analysis accounts for the placement of turbines, receptors and sun angle such that the time when the turbine is in between the sun and the receptor is included in the total minutes per day and hours per year that shadow flicker could occur.

This is a conservative analysis that does not account for maintenance time, winds less than 3 m/s when the turbines will not operate (14% of the entire year), light permeable obstacles such as trees and other structures, or that the turbine will rarely be directly facing the sun which will shorten the shadow from the turbine blades. If considered, the results will drop significantly.

APPENDIX A - Project Area


Shadow Receptor
New WTG

APPENDIX B – Noise results & noise contour map

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PH-TAGUIG CITY 0339 Metro Manila
+632 576 7961-64
WindStation / jonathan.sutanto@upcrenewables.co.id

Calculated:
15/12/2015 12:15/3.0.578

SHADOW - Main Result

Calculation: EA216A

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) [DILLI ARPT]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
6.30	6.18	6.60	9.05	8.67	9.10	9.43	9.97	9.68	9.66	8.52	7.10

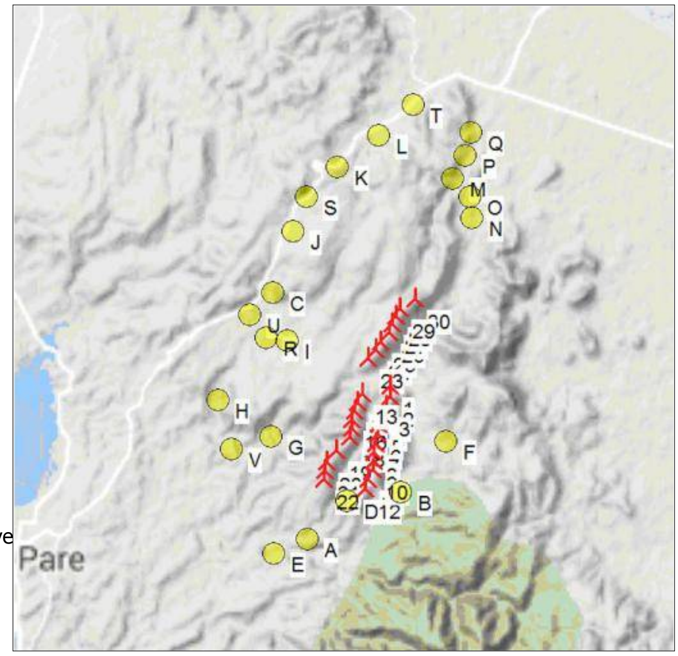
Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
39	74	471	2,058	2,365	377	83	532	1,403	820	232	72	8,526

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: Height Contours: Sidrap_Contour_5m_SRTM+TP-Surve
Obstacles used in calculation
Eye height: 1.5 m
Grid resolution: 10.0 m

All coordinates are in
UTM (south)-WGS84 Zone: 50



Scale 1:200,000
New WTG
Shadow receptor

WTGs

	Easting	Southing	Z [m]	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data Calculation distance [m]	RPM [RPM]
1	801,440	9,560,033	240.0	GAMESA G114 2625 114.0 !O! hub: 8...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	2,500	0.0
2	801,439	9,559,746	242.8	GAMESA G114 2625 114.0 !O! hub: 8...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	2,500	0.0
3	801,333	9,559,510	235.0	GAMESA G114 2625 114.0 !O! hub: 8...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	2,500	0.0
4	801,230	9,559,249	242.4	GAMESA G114 2625 114.0 !O! hub: 8...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	2,500	0.0
5	801,126	9,559,012	285.0	GAMESA G114 2625 114.0 !O! hub: 8...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	2,500	0.0
6	801,108	9,558,777	285.0	GAMESA G114 2625 114.0 !O! hub: 8...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	2,500	0.0
7	801,050	9,558,523	315.0	GAMESA G114 2625 114.0 !O! hub: 8...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	2,500	0.0
8	800,992	9,558,301	315.0	GAMESA G114 2625 114.0 !O! hub: 8...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	2,500	0.0
9	800,993	9,558,062	307.6	GAMESA G114 2625 114.0 !O! hub: 8...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	2,500	0.0
10	800,974	9,557,824	285.0	GAMESA G114 2625 114.0 !O! hub: 8...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	2,500	0.0
11	800,851	9,557,591	275.0	GAMESA G114 2625 114.0 !O! hub: 8...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	2,500	0.0
12	800,758	9,557,322	252.7	GAMESA G114 2625 114.0 !O! hub: 8...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	2,500	0.0
13	800,687	9,559,820	275.0	GAMESA G114 2625 114.0 !O! hub: 8...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	2,500	0.0
14	800,562	9,559,604	285.0	GAMESA G114 2625 114.0 !O! hub: 8...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	2,500	0.0
15	800,499	9,559,379	290.0	GAMESA G114 2625 114.0 !O! hub: 8...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	2,500	0.0
16	800,421	9,559,149	285.0	GAMESA G114 2625 114.0 !O! hub: 8...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	2,500	0.0
17	800,424	9,558,913	297.4	GAMESA G114 2625 114.0 !O! hub: 8...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	2,500	0.0
18	800,363	9,558,687	268.9	GAMESA G114 2625 114.0 !O! hub: 8...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	2,500	0.0
19	800,007	9,558,344	270.0	GAMESA G114 2625 114.0 !O! hub: 8...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	2,500	0.0
20	799,761	9,558,029	272.2	GAMESA G114 2625 114.0 !O! hub: 8...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	2,500	0.0
21	799,700	9,557,808	270.6	GAMESA G114 2625 114.0 !O! hub: 8...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	2,500	0.0
22	799,664	9,557,576	247.2	GAMESA G114 2625 114.0 !O! hub: 8...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	2,500	0.0
23	800,849	9,560,768	255.0	GAMESA G114 2625 114.0 !O! hub: 8...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	2,500	0.0
24	801,056	9,560,981	274.3	GAMESA G114 2625 114.0 !O! hub: 8...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	2,500	0.0
25	801,179	9,561,188	280.0	GAMESA G114 2625 114.0 !O! hub: 8...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	2,500	0.0
26	801,405	9,561,444	287.4	GAMESA G114 2625 114.0 !O! hub: 8...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	2,500	0.0
27	801,497	9,561,666	292.7	GAMESA G114 2625 114.0 !O! hub: 8...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	2,500	0.0
28	801,599	9,561,872	303.5	GAMESA G114 2625 114.0 !O! hub: 8...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	2,500	0.0
29	801,706	9,562,079	310.0	GAMESA G114 2625 114.0 !O! hub: 8...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	2,500	0.0
30	802,097	9,562,330	296.9	GAMESA G114 2625 114.0 !O! hub: 8...	Yes	GAMESA	G114-2,625	2,625	114.0	80.0	2,500	0.0

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+632 576 7961-64
WindStation / jonathan.sutanto@upcrenewables.co.id
Calculated:
15/12/2015 12:15/3.0.578

SHADOW - Main Result

Calculation: EA216A

Shadow receptor-Input

No.	Easting	Southing	Z [m]	Width [m]	Height [m]	Height a.g.l. [m]	Degrees from south cw [°]	Slope of window [°]	Direction mode
A	799,245	9,556,002	111.7	2.0	2.0	1.0	0.0	90.0	"Green house mode"
B	801,695	9,557,224	140.2	2.0	2.0	1.0	0.0	90.0	"Green house mode"
C	798,342	9,562,502	148.5	2.0	2.0	1.0	0.0	90.0	"Green house mode"
D	800,295	9,557,014	220.5	2.0	2.0	1.0	0.0	90.0	"Green house mode"
E	798,345	9,555,617	82.0	2.0	2.0	1.0	0.0	90.0	"Green house mode"
F	802,910	9,558,554	185.0	2.0	2.0	1.0	0.0	90.0	"Green house mode"
G	798,284	9,558,707	104.9	2.0	2.0	1.0	0.0	90.0	"Green house mode"
H	796,874	9,559,668	67.7	2.0	2.0	1.0	0.0	90.0	"Green house mode"
I	798,726	9,561,233	124.6	2.0	2.0	1.0	0.0	90.0	"Green house mode"
J	798,886	9,564,102	209.5	2.0	2.0	1.0	0.0	90.0	"Green house mode"
K	800,059	9,565,790	121.2	2.0	2.0	1.0	0.0	90.0	"Green house mode"
L	801,153	9,566,629	65.3	2.0	2.0	1.0	0.0	90.0	"Green house mode"
M	803,104	9,565,483	54.3	2.0	2.0	1.0	0.0	90.0	"Green house mode"
N	803,598	9,564,434	50.0	2.0	2.0	1.0	0.0	90.0	"Green house mode"
O	803,561	9,564,998	43.4	2.0	2.0	1.0	0.0	90.0	"Green house mode"
P	803,442	9,566,076	37.1	2.0	2.0	1.0	0.0	90.0	"Green house mode"
Q	803,596	9,566,690	48.7	2.0	2.0	1.0	0.0	90.0	"Green house mode"
R	798,169	9,561,312	115.0	2.0	2.0	1.0	0.0	90.0	"Green house mode"
S	799,235	9,565,005	139.9	2.0	2.0	1.0	0.0	90.0	"Green house mode"
T	802,058	9,567,439	43.9	2.0	2.0	1.0	0.0	90.0	"Green house mode"
U	797,738	9,561,913	123.9	2.0	2.0	1.0	0.0	90.0	"Green house mode"
V	797,240	9,558,378	104.2	2.0	2.0	1.0	0.0	90.0	"Green house mode"

Calculation Results

Shadow receptor

No.	**Shadow, expected values** Shadow hours per year [h/year]
A	0:00
B	26:18
C	0:00
D	0:00
E	0:00
F	19:50
G	14:00
H	0:00
I	3:37
J	0:00
K	0:00
L	0:00
M	0:00
N	0:00
O	0:00
P	0:00
Q	0:00
R	0:00
S	0:00
T	0:00
U	0:00
V	0:00

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

No.	Name	Worst case [h/year]	Expected [h/year]
1	GAMESA G114 2625 114.0 !O! hub: 80.0 m (TOT: 137.0 m) (378)	0:00	0:00
2	GAMESA G114 2625 114.0 !O! hub: 80.0 m (TOT: 137.0 m) (379)	0:00	0:00
3	GAMESA G114 2625 114.0 !O! hub: 80.0 m (TOT: 137.0 m) (380)	0:00	0:00
4	GAMESA G114 2625 114.0 !O! hub: 80.0 m (TOT: 137.0 m) (381)	11:26	6:09
5	GAMESA G114 2625 114.0 !O! hub: 80.0 m (TOT: 137.0 m) (382)	4:20	2:32
6	GAMESA G114 2625 114.0 !O! hub: 80.0 m (TOT: 137.0 m) (383)	3:41	2:14
7	GAMESA G114 2625 114.0 !O! hub: 80.0 m (TOT: 137.0 m) (384)	3:24	1:52

To be continued on next page...

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WindStation / jonathan.sutanto@upcrenewables.co.id

SHADOW - Main Result

Calculation: EA216A

...continued from previous page

No.	Name	Worst case [h/year]	Expected [h/year]
8	GAMESA G114 2625 114.0 !O! hub: 80.0 m (TOT: 137.0 m) (385)	3:16	1:46
9	GAMESA G114 2625 114.0 !O! hub: 80.0 m (TOT: 137.0 m) (386)	3:53	1:58
10	GAMESA G114 2625 114.0 !O! hub: 80.0 m (TOT: 137.0 m) (387)	6:29	3:07
11	GAMESA G114 2625 114.0 !O! hub: 80.0 m (TOT: 137.0 m) (388)	35:05	18:41
12	GAMESA G114 2625 114.0 !O! hub: 80.0 m (TOT: 137.0 m) (389)	13:01	7:34
13	GAMESA G114 2625 114.0 !O! hub: 80.0 m (TOT: 137.0 m) (390)	0:00	0:00
14	GAMESA G114 2625 114.0 !O! hub: 80.0 m (TOT: 137.0 m) (391)	4:53	3:03
15	GAMESA G114 2625 114.0 !O! hub: 80.0 m (TOT: 137.0 m) (392)	3:07	2:00
16	GAMESA G114 2625 114.0 !O! hub: 80.0 m (TOT: 137.0 m) (393)	2:48	1:50
17	GAMESA G114 2625 114.0 !O! hub: 80.0 m (TOT: 137.0 m) (394)	2:38	1:38
18	GAMESA G114 2625 114.0 !O! hub: 80.0 m (TOT: 137.0 m) (395)	2:45	1:30
19	GAMESA G114 2625 114.0 !O! hub: 80.0 m (TOT: 137.0 m) (396)	4:19	2:07
20	GAMESA G114 2625 114.0 !O! hub: 80.0 m (TOT: 137.0 m) (397)	4:52	1:54
21	GAMESA G114 2625 114.0 !O! hub: 80.0 m (TOT: 137.0 m) (398)	0:00	0:00
22	GAMESA G114 2625 114.0 !O! hub: 80.0 m (TOT: 137.0 m) (399)	0:00	0:00
23	GAMESA G114 2625 114.0 !O! hub: 80.0 m (TOT: 137.0 m) (400)	2:50	1:23
24	GAMESA G114 2625 114.0 !O! hub: 80.0 m (TOT: 137.0 m) (401)	2:11	1:09
25	GAMESA G114 2625 114.0 !O! hub: 80.0 m (TOT: 137.0 m) (402)	1:58	1:04
26	GAMESA G114 2625 114.0 !O! hub: 80.0 m (TOT: 137.0 m) (403)	0:00	0:00
27	GAMESA G114 2625 114.0 !O! hub: 80.0 m (TOT: 137.0 m) (404)	0:00	0:00
28	GAMESA G114 2625 114.0 !O! hub: 80.0 m (TOT: 137.0 m) (405)	0:00	0:00
29	GAMESA G114 2625 114.0 !O! hub: 80.0 m (TOT: 137.0 m) (406)	0:00	0:00
30	GAMESA G114 2625 114.0 !O! hub: 80.0 m (TOT: 137.0 m) (407)	0:00	0:00

Project:
WP02 Sidrap

Description:

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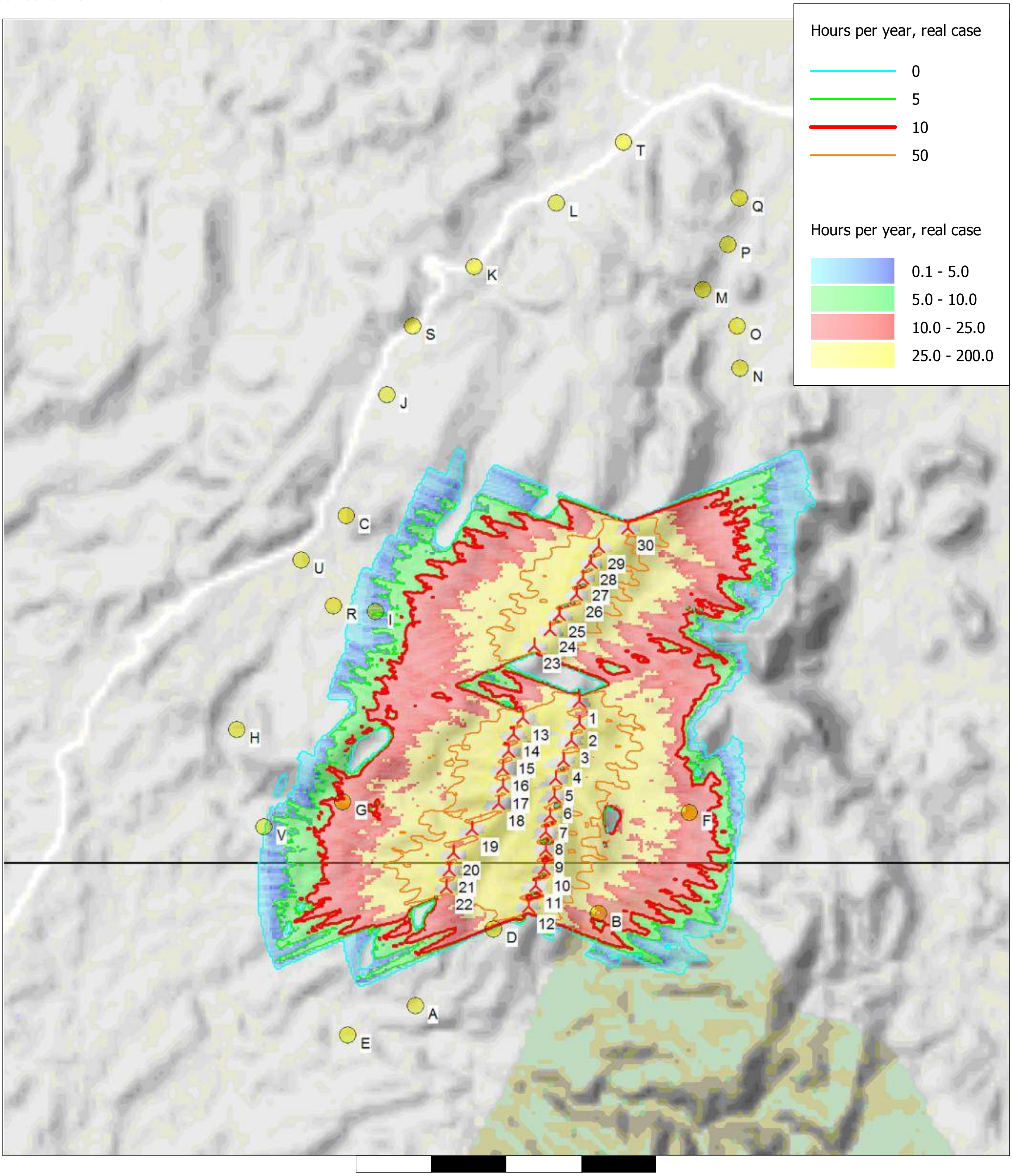
WindStation / jonathan.sutanto@upcrenewables.co.id
Calculated:
15/12/2015 12:15/3.0.578

SHADOW - Map

Calculation: EA216A



Map: Google map , Print scale 1:75,000, Map center UTM (south)-WGS84 Zone: 50 East: 800,490 North: 9,561,528
New WTG   Shadow receptor
Flicker map level: Height Contours: Sidrap_Contour_5m_SRTM+TP-Survey(1).map (2)

Appendix G

Stakeholder Engagement Plan

Stakeholders Engagement Plan

UPC Sidrap Bayu Energi

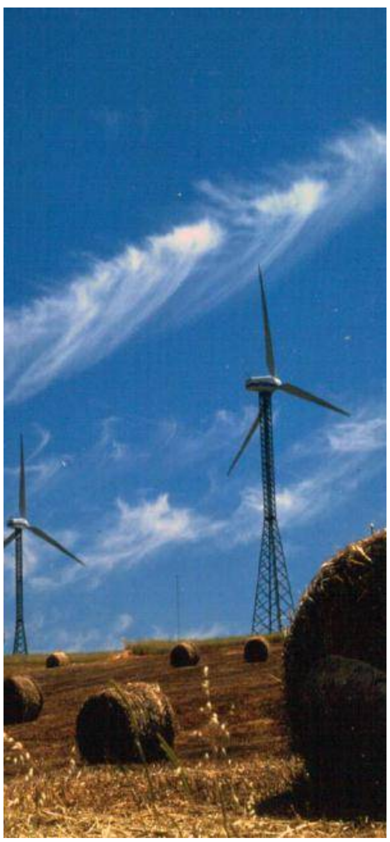


Table of Contents

List of Table

List of Figure

List of Appendix

1. Introduction

PT UPC Renewables Indonesia (UPC) is a subsidiary of the UPC Group, created as a response to the mandate set by the Government of Indonesia (GoI) of establishing 25% power generation from renewable energy by 2025. With experience in developing over 2000 MW of wind projects in America, Europe, Africa, and Asia, UPC has been entrusted by the GoI and PLN to develop Wind Projects in Indonesia. As of 2013, it is currently developing wind energy projects in Java and South Sulawesi.

Wind has been selected as a viable source of renewable energy generation in Indonesia following the 2012 New Plan for National Energy Policy. It is a zero emission no pollution fuel source resistant to commodity fluctuation, and its development is part of an upward trend for Global Wind Capacity. UPC will utilize new wind turbine technology to develop economical low wind projects which will help further Indonesia's stance as a renewable energy practitioner.

1.1. Project Description of SIDRAP Wind Farm by PT UPC Sidrap Bayu Energi

PT UPC Sidrap Bayu Energi (UPC - SBE) is a special Project Company formed by the joint operation of Binatek and UPC Renewables Indonesia to finance, construct and operate the Project's wind farms. UPC - SBE is a company formed and registered in Indonesia, to fully comply with the national law and regulation. UPC - SBE will act as the legal entity that will sign the PPA Contract, addressed as the holder of permits and licenses, and the sole authority of the Sidrap Wind Farm Project in Indonesia.

The Sidrap Wind Farm Project (the "Project") will be built in the hilly areas in central Southern Sulawesi peninsula, with a maximum equipment rating capacity of 75 MW and is located in Kecamatan Wattang Pulu, Sidenreng Rappang Regency ("Sidrap"), Province of South Sulawesi, Indonesia.

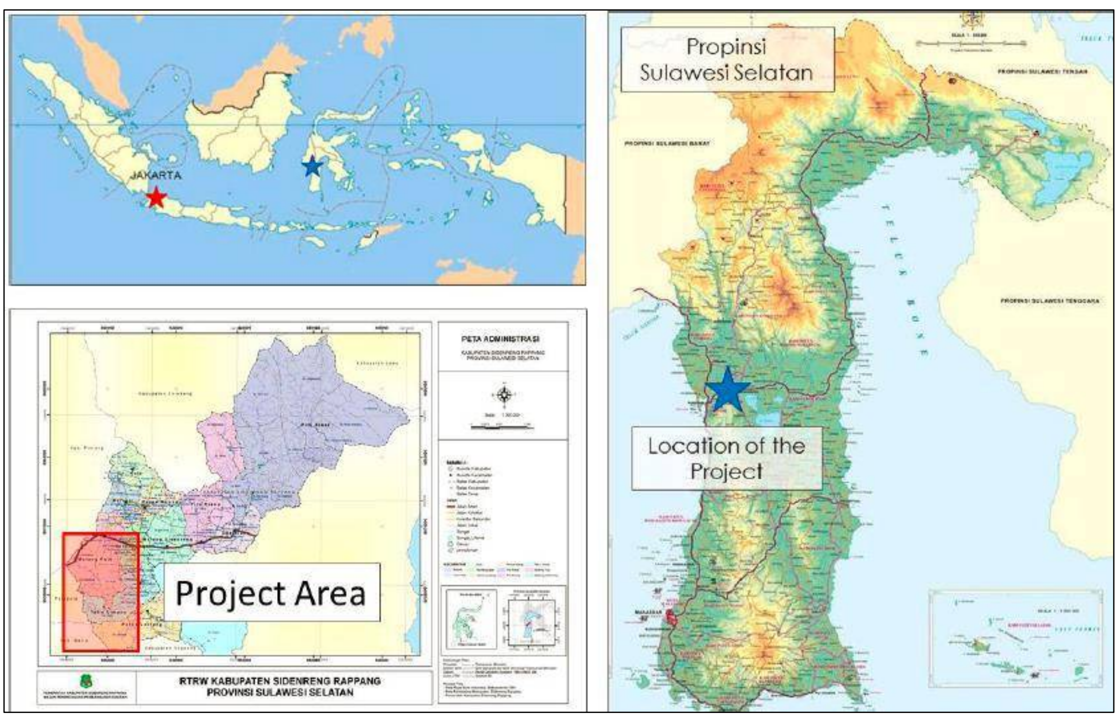


Figure 1-1 Project Location

Sidrap Regency is one of the twenty three regencies of the South Sulawesi Province, and is located approximately 183 km north of the province's capital city, Makassar. Geographically, Sidrap Regency is located between the 03°43' – 04°09' S and 119°41'– 120°10' E coordinates. The eastern side borders Luwu and Wajo Regencies, the northern side borders Enrekang Regency, the western side borders Pare-Pare Municipality, and the southern side borders Baru and Soppeng Regencies. Administratively, Sidrap Regency is divided into 11 Sub-district, which are further divided into 105 vilages.

The majority of the turbines will be erected on the either Production Forestry Land and Private Land located in Wattangpulu Sub-district.

The objectives for the development of the Sidrap Wind Farm Project are:

- Utilize Sidrap's good wind resource potential, constructible site and government permitting support to generate sustainable, clean and renewable electricity;
- Support the program of the Government of Indonesia to reduce fossil fuel consumption for power generation and increase the renewable energy portion of Indonesia's energy mix, and in turn reduce Indonesia's carbon footprint;
- Demonstrate that wind energy technology will be a key part of a clean low carbon energy future;
- Improve energy self-sufficiency, which in the long run can be expected to increase the economic benefit to the region;
- Add needed power generation to the South Sulawesi Grid;
- Add economic development and tourism to Sidrap Regency; and
- Strengthen the area's energy independence.

Figure 1-2 Pictures of Project Location

Under development windfarm project, UPC - SBE project's construction which will include, but are not limited to:

- Wind Turbine Locations; permanent until project decommissioning
- Laydown & Storage areas; permanent until project decommissioning
- Project access roads;
- Transmission towers between turbine and substation;

1.2. Assumption and Limitation

Stakeholders Engagement Plan (SEP) document is compiled as an initial framework and planning, which can be renewed or adjusted to current conditions. In this case, as a living document, changes made to SEP provide opportunities for various issues that arise to be handled and managed well based on IFC Performance Standard.

1.3. Structure of Document

This document is divided into eight sections as follows:

- Section 1: Introduction
- Section 2: Regulation, Policy and Institutional Framework
- Section 3: Summary of Previous Stakeholder Engagement Activities
- Section 4: Project Stakeholders
- Section 5: Stakeholders Engagement Program
- Section 6: Timetables
- Section 7: Resource and Responsibilities
- Section 8: Grievance Mechanism
- Section 9: Monitoring and Reporting
- Section 10: Management Functions

2. Regulation, Policy and Institutional Framework

2.1. UPC Commitment

UPC - SBE is committed to developing renewable energy projects that are sensitive to environmental impact and providing long term positive impact to local communities.

Environmental. We believe that providing Renewable Energy to power our world should have a minimal impact on the environment. We have a responsibility to provide energy to all our customers while doing so in a way that's sensitive to our environment. UPC takes its environmental responsibilities very seriously and consequently UPC has committed to complying with the exacting standards of the International Finance Corporation's Environmental Guidelines on Social Responsibility and Environmental sustainability. We strive to improve the environmental performance of every project that we construct.

Community. UPC understands that we have a long-term place in the communities where our projects are located. UPC works in collaboration with community leaders and other stakeholders to develop clean and safe Wind Farms. Every project and community is unique, so our team engages with them to create projects that are an investment in the people and infrastructure of the communities. We create custom-made community programs to meet local needs with the goal that our programs have a lasting positive impact.

2.2. National Policy

The Indonesian government stresses the importance of the community's role and involvement in the development of projects related to environmental protection and management. This is stipulated in the national policy; Law No.32 / 2009; Government Regulation No. 27/2012 and further stipulated in the Minister of Environment (MoE) Regulation No. 17/2012. The involvement and role of community to participate in environmental protection and management is based on the participatory principles.

In terms of community engagement in EIA and environmental permits process, it is intended as a reference for implementation of community engagement in the environmental impact assessment process and environmental permit approval. Referring to the Minister of Environment Regulation No. 17/2012, it states that the implementation of community engagement in the Environmental Impact Assessment (EIA/AMDAL) and the environmental permit process is based on the following basic principles: providing transparent and complete information; equality among the parties involved; fair and judicious conflict resolution; and to create coordination, communication and cooperation between EIA components.

Regarding MoE Regulation No. 17/2012, the objective of community engagement in the EIA (AMDAL) and environmental permit process are as follow:

1. The public gets information on business plans or activities that may have a significant impact on the environment;
2. The public can give suggestions, opinions or comments on the business plans or activities;
3. the public can be involved in the process of the decision making in relation to the worthiness or unworthiness of business plans or activities
4. The public can give suggestions, opinions and comments on the issuance process of environmental licenses.

2.3. IFC Performance Standards

The principle of stakeholder engagement is clearly stipulated in the IFC Performance Standard 1, which incorporate stakeholder's engagement on the element of Environmental and Social Management System (ESMS). An important part in stakeholder's engagement is to build communication and constructive relationships with stakeholders throughout the project, so it is beneficial for project decisions and creation of development benefits. Stakeholder Engagement is outlined in the IFC Performance Standard (PS) 1 and Guidance Notes (GN).

IFC PS 1, paragraph 25: Stakeholder engagement is the basis for building strong, constructive, and responsive relationships that are essential for the successful management of a project's environmental and social impacts. Stakeholder engagement is an ongoing process that may involve, in varying degrees, the following elements: stakeholder analysis and planning, disclosure and dissemination of information, consultation and participation, grievance mechanism, and ongoing reporting to Affected Communities. The nature, frequency, and level of effort of stakeholder engagement may vary considerably and will be commensurate with the project's risks and adverse impacts, and the project's phase of development.

IFC PS 1, GN 6. The purpose of stakeholder engagement is to establish and maintain a constructive relationship with a variety of external stakeholders over the life of the project and is an integral part of an efficient and adaptive ESMS. An effective engagement process allows the views, interests and concerns of different stakeholders, particularly of the local communities directly affected by the project (Affected Communities), to be heard, understood, and taken into account in project decisions and creation of development benefits.

3. Summary of Previous Stakeholder Engagement Activities

3.1. Community Consultation and Disclosure

UPC - SBE has undertaken stakeholder's engagement activities within the development framework of Sidrap wind farm project Phase 1 since the end of 2013 to present. The community engagement process is intended to establish communication and provide information on the description and status of the project to local stakeholders, at the government level (Regency and Provincial level); sub-district and village level; local NGOs; and local community. Context of local community engagement applied by UPC - SBE, include: inform and consultation related to project status and planning; local employee involvement in the development and pre-construction surveys activities, system grievance mechanism to deal with complaints from the local community; etc. Tools of information and project description used by UPC - SBE, include:

- UPC - SBE Tri-Fold General Leaflet (see Appendix A);
- UPC - SBE Flyers (see Appendix B);
- Project Description Presentation Material (see Appendix C);
- UPC – SBE Environmental Impact and Measurement (see Appendix D)

The following is summary of stakeholder engagement activities that have been carried out by UPC - SBE:

- EIA (AMDAL) Public Consultation and Disclosure. This public consultation is part of the drafting process of EIA (AMDAL) document and is intended to obtain input and opinions from local stakeholders. In terms of the EIA Public Meeting Report, see Appendix E.
- Stakeholder's engagement and Meeting. UPC - SBE has a system that records the entire community engagement activities, community meetings, and meetings with stakeholders from all levels (form of Engagement activity report (EAR) can be seen in Appendix F). Stakeholders meetings are monthly activities or tentative based on the needs of project development. EAR reported by the entire staff of the UPC -SBE of any engagement activity, will then be input into a database engagement tracking, see Appendix G.
- Inform and Consultation to the land owner. Regarding land acquisition activities, UPC - SBE land team staff will do a consultation and disclosure on the development of Sidrap wind farm project Phase 1 to all land owners. This process is carried out to give an opportunities for land owners to understand the whole plan of the project and especially the system and land acquisition process implemented by UPC - SBE.
- Gold Standard Stakeholders Meeting (GSSM). GSSM event is part of the Gold Standard certification process for the development of Sidrap wind farm project Phase 1. The stakeholders meeting was attended by local stakeholders from the government at provincial and regency level, sub-district and village level, Local NGOs, and local community. The output of this activity is for local stakeholders to provide an assessment of the 12 indicators of the Gold Standard, including inputs to the project.

3.2. Resume of Engagement Activities

In general, the UPC-SBE engagement activity trend, based on engagement tracking database data can be seen as follow.

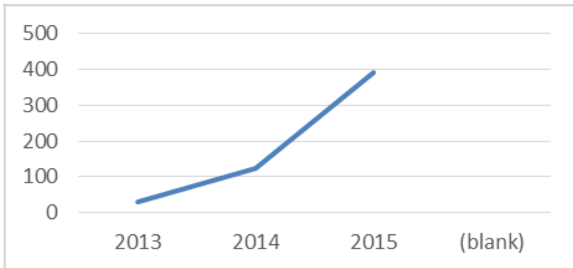


Figure 3-1 Engagement Activities Trend (Yearly)

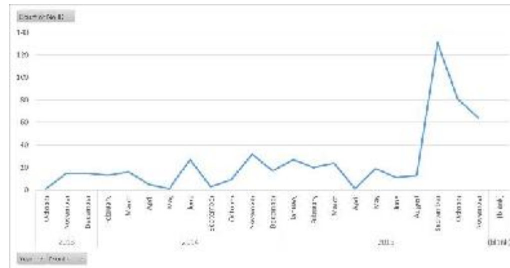


Figure 3-2 Engagement Activities Trend (Monthly)

In general, the trend of engagement activities from October 2013 to September 2015 experiences a significant increase in intensity. Comparing the increase from 2014 to 2015, it has increased to 218% (see Figure 3-1 and Figure 3-2). However, fluctuation occurs if we look at the trends per month. Especially at the end of August to October 2015, an increase in engagement is significant. This is possible due to project activities such as general development, technical survey for pre-construction and particularly land acquisition activities that are getting more intense.

Engagement location recorded of activities during the period of October 2013 to November 2015 occur dominantly in the Lainungan Village area. In general, the focus of engagement activity described tend to occur in the District of Watang Pulu, namely in Lainungan and Mattirotasi (see Figure 3-3).

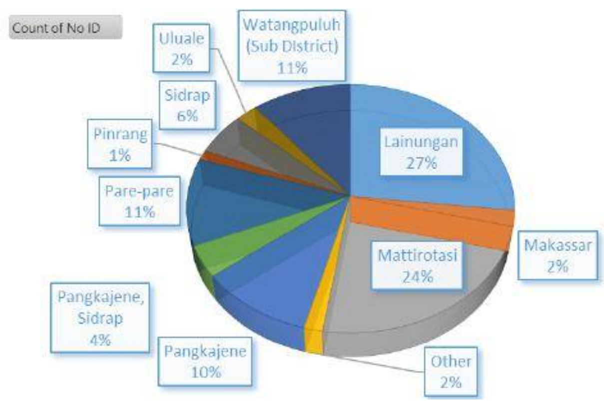


Figure 3-3 Engagement Location

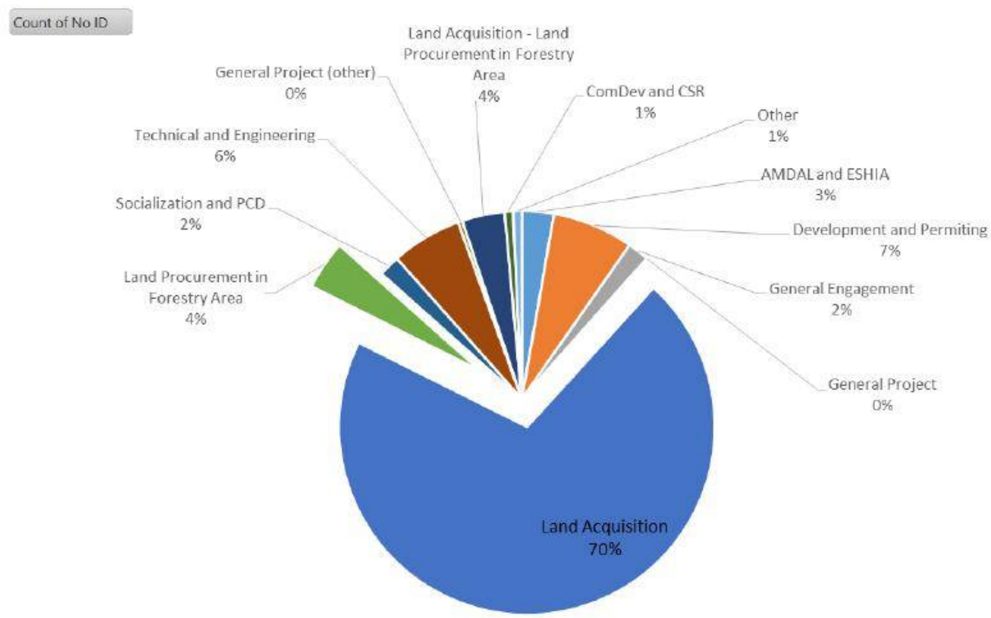


Figure 3-4 Trend of Subject of Engagement

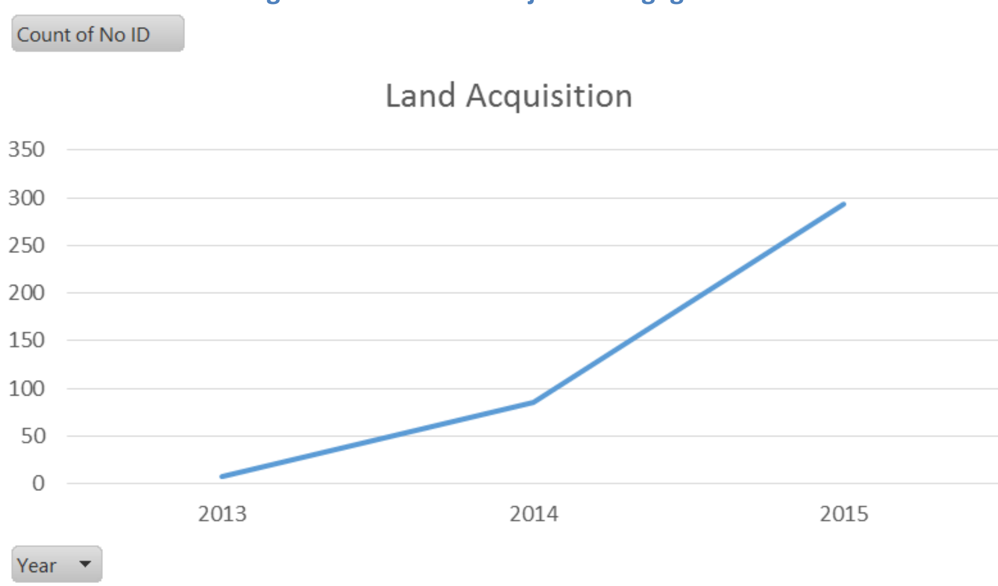


Figure 3-5 Trend of Engagement Subject of Land Issue

During the period of October 2013 to November 2015, the trend of engagement subject is dominantly in the context of land acquisition (see Figure 3-4 and Figure 3-5). This is also in line with the trend depicted in **Error! Reference source not found.**, where the subject engagement in the context of land cquisition has increased to 245% from October 2013 to September 2015.

Also associated with Figure 3-4 and Figure 3-5, the database provides an overview that engagement location tends to occur at sub-district level (see Figure 3-6). This also has the same trend with Figure 3-3.

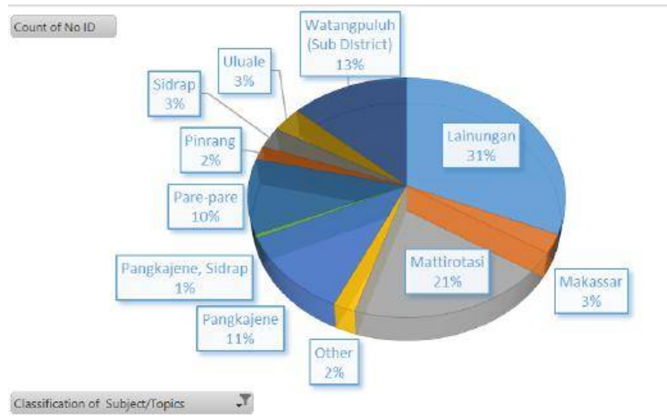


Figure 3-6 Engagement Location - Land Acquisition Activities

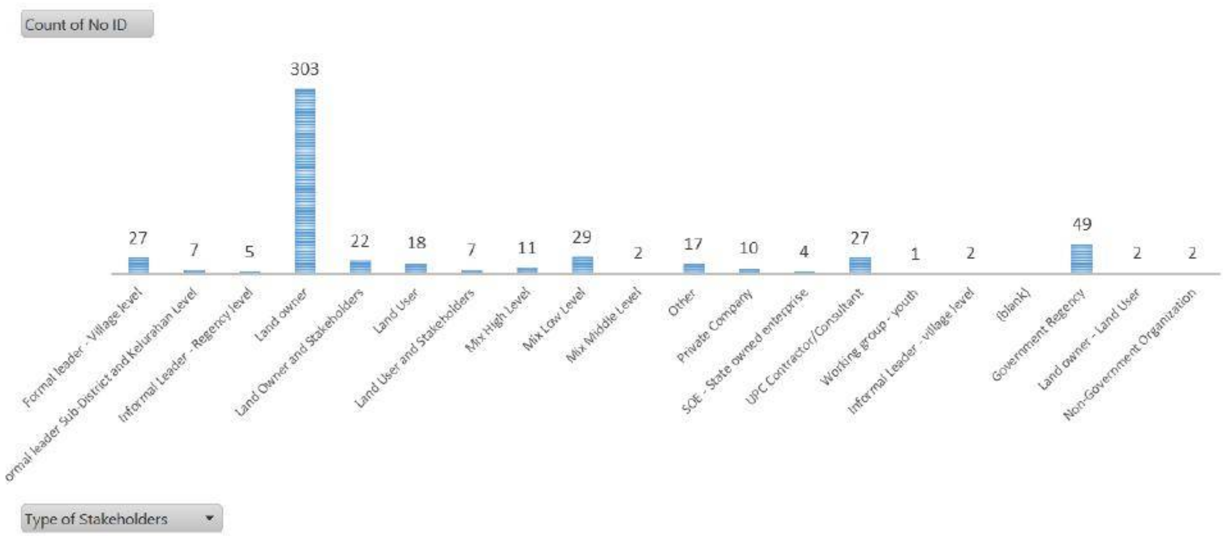


Figure 3-7 Trend of Type of Stakeholder

The trend of stakeholder's type depicted in the period of October 2013 to November 2015 illustrates the same trend as the activity and subject engagement, of which 56% of interaction occurs with the land owner (see Figure 3-7).

In general, the interactions that occur in all project activities of the UPC are represented at the middle level. This means that the role of people managers is significant in all activities. In addition, based on Figure 3-8 and Figure 3-9, it can be seen that in the context of land acquisition, middle level or people managers also have an important role.

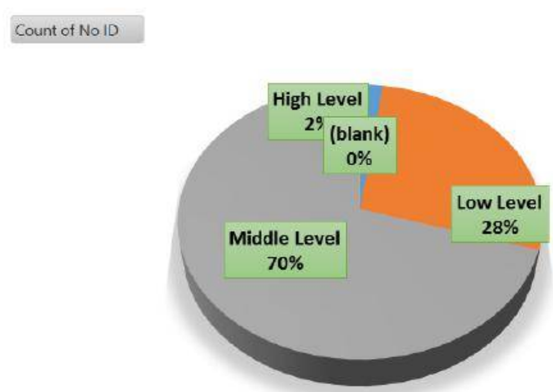


Figure 3-8 UPC Representatives

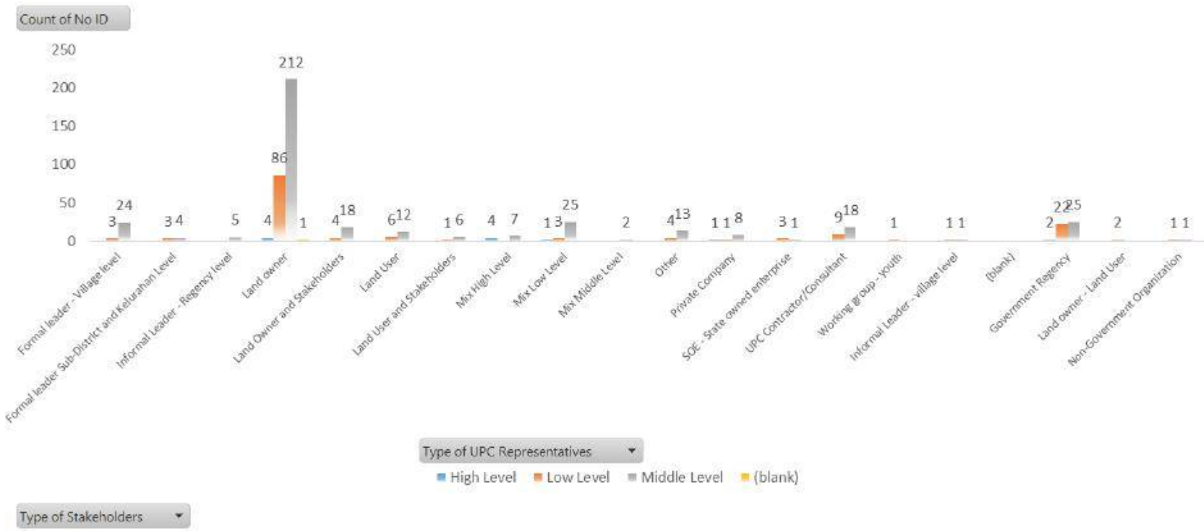


Figure 3-9 Trend of Interaction Among UPC and Stakeholders

3.3. Related Issues

The local community in Sidrap Regency generally provides support to the development of Sidrap wind farm project Phase 1, particularly the local community in Lainungan Mattirotasi villages. Wind farm project is considered to provide a change to the energy supply and can be an alternative renewables and clean energy. In particular, it raises further expectations towards socio-economic changes in the community, in which the planned project area is essentially not a productive area. Therefore, in the future, the wind farm project could trigger an economic alternative other than rain fed crops and development of cattle farm. Here are a number of issues related to the development of Sidrap wind farm project Phase 1:

- Concerns on domestic animals (cattle) as a result of wind farm operations, such as the adaptation process of cows to the presence of turbines;
- The public's safety during construction;
- Water quality and quantity, especially during drought periods, where a number of rivers will dry out;
- Prioritizing the involvement of local manpower in the wind farm project activities.

4. Project Stakeholders

In the context of SEP document, stakeholders are parties that can affect, be affected by or have an interest and legitimacy to the Sidrap Wind Farm Project development, both individually and in groups. Stakeholders may consist of: affected communities locally or individuals and formal and informal representatives; government authorities at regional and local levels, politicians, religious leaders, civil society organizations, academia, or other related business entities[1]. UPC-SBE identifies Key Stakeholders

[1] Stakeholder Engagement: A Good Practice Handbook for Companies Doing Business in Emerging Markets, IFC, 2007

with the above classification, and map key stakeholders with the focus on the local level and provide an important credit for the support from provincial and regional levels.

The types of stakeholders are classified as follow: Internal UPC (employee, contractor and consultant); government (National, Provincial and Regency levels); Third Parties (NGOs, academicians, etc.) and local community (Community Groups, Villagers, Elders, Community Leaders, Youth Groups, Women Groups, and Project Affected Peoples). Based on the type, the stakeholders' characteristics associated with the development of Sidrap Wind Farm Project can be seen in Figure 4-1. The assessment was conducted by UPC – SBE in order to understand the support pattern from stakeholder (influence and potential engagement) and to minimize the level of project risk.

Based on assessment results, the level of influence and potential degree of engagement of each type of stakeholders generally has a positive and high score. Therefore, each of these key stakeholders has an important and strategic role to provide support for the development of Sidrap Wind Farm Project. In further detail, the identification of key stakeholders is focused on two villages located in the project area, which are Lainungan and Mattirotasi Village (detailed keys stakeholders can be seen in Table 4-1).

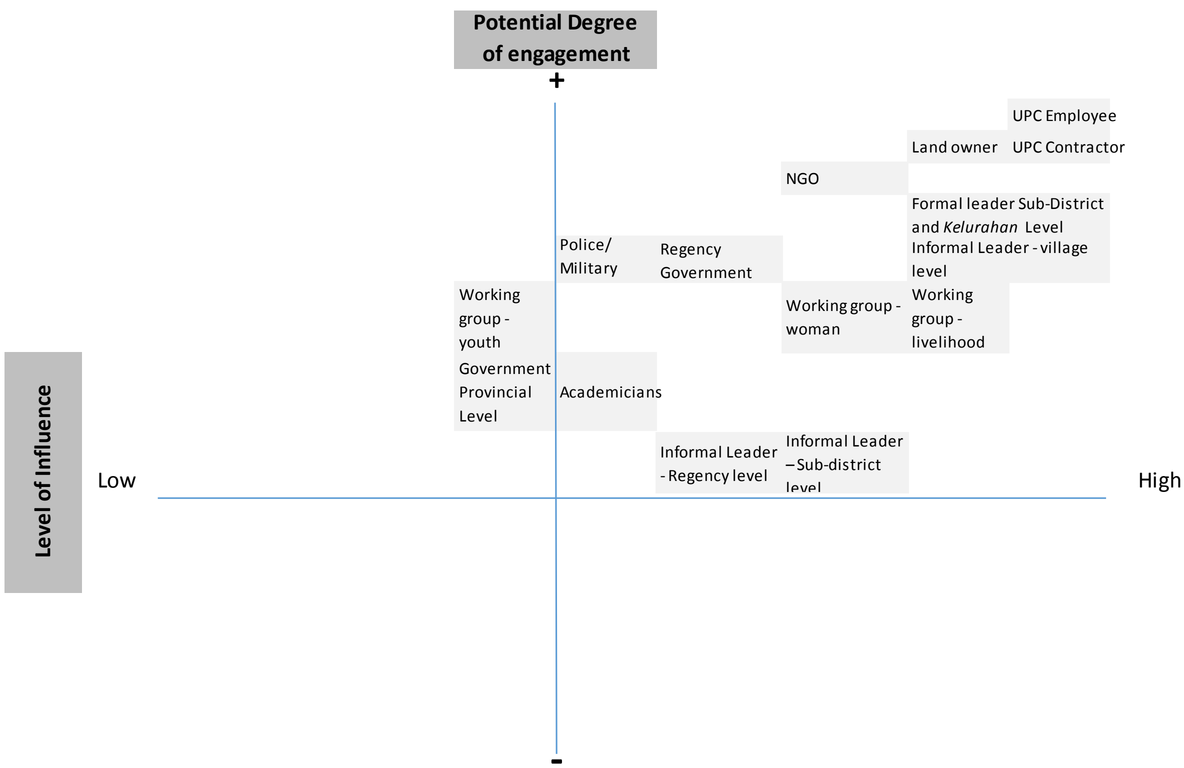


Figure 4-1 Type of Stakeholders, level influence and Potential Degree Engagement in Project Area

Table 4-1 Key Stakeholders of Sidrap Wind Farm Project

No	Stakeholder	Profile	Representative	Relation / Link to
	Lainungan			
1	Andi Haruna	Lainungan Village Head	Community member of Lainungan Village, A number of land owners	Kasman, Darwis, Samir, Nendre, Muhammad, Musa
2	Muhammad	Lainungan Village Secretary	Community member of Lainungan Village	Andi Haruna, Musa
3	Darwis	Sub-village Head of Kulua 1, Lainungan Village	Community member of Lainungan Village, A number of land owners	Andi Haruna, Lasari, Agustan, Nendre, Muhammad, Musa, Nawir
4	Nendre'	Head of BPD Lainungan, Tau Lotang community leader	A number of land owners, Tau' Lotang ethnic group	Andi Haruna, Tau Lotang ethnic group, Land owner
5	Nawir	Member of BPD Lainungan, Land owner	A number of land owners	Darwis, Hasan
6	Kasman	Land owner, Community leader of Tau Lotang ethnic group	A number of land owners, Tau' Lotang ethnic group	Andi Haruna, Tau Lotang ethnic group, Land owner
7	Ladile	Religious leader of Lainungan village, SARA officer	Muslim group Lainungan Village	Andi Haruna, Darwis, Imam of Lainungan Village, Imam of Lainungan Village
8	Santi K	PKK Group Head of Lainungan Village, Head of Ta'lim Assembly, wife of Lainungan Head village, leader of women group	PKK Group Lainungan Village, Ta'lim Assembly Group	Andi Haruna, PKK Group, Ta'lim Assembly group
9	H. Saleng	Land owners of Transmission Line Area	A number of land owners in Transmission Area	A number of land owners in Transmission Line area
10	Umar Abu Bakar	Member of SATPOL-PP, Land owner	A number of land owners in Lainungan Area	Andi Haruna, kasman, Usman

No	Stakeholder	Profile	Representative	Relation / Link to
11	Rabiah	BPN Kab. Sidrap staff	BPN Kab. Sidrap	Certified land owner/PRONA
12	Hamka	BPN Kab. Sidrap staff	BPN Kab. Sidrap	Certified land owner/PRONA
13	Sofyan	BPN Kab. Sidrap pensioner	Staff of BPN Kab. Sidrap, Certified land owner/PRONA	BPN Kab. Sidrap staff, Certified land owner
14	Samir	Former Village Head of Kulua 1, Lainungan Village	A number of land owners in Lainungan Area	Andi Haruna, a number of land owners in Lainungan area
15	Lasari	Sub-Village Head of Makkadae 2 , Lainungan Village	Community member of Lainungan Village, A number of land owners	Andi Haruna, Darwis, Agustan, Nendre, Muhammad, Musa, Nawir
16	Agustan	Sub-village Head of 3 Lainungan Village	Community member of Lainungan Village	Andi Haruna, Darwis, Lasari, Nendre, Muhammad, Musa, Nawir
17	Hasan	Land owner that has not yet agreed to land acquisition		Nawir
18	Rasidin Itimah	land owner	Land owners from Tau Lotang ethnic group	Tau Lotang Ethnic group in Lainungan Village
19	Muh. Yusuf	Lainungan Village staff	Community member of Lainungan Village	Andi Haruna, Darwis, Lasari, Agustan, Muhammad,
20	Yassir Canno	Land owner that has not yet agreed to land acquisition	Lainungan community	Nawir
21	Ramli	Land owner that has not yet agreed to land acquisition	Lainungan community	Nawir
22	Musa	Local employee, member of Lainungan Village Youth Group	Local employee of Lainungan Village area	Andi Haruna, Darwis, member of Lainungan Village Youth Group, Local employee from Lainungan Village
23	hamzah nessa	Land owner	Member of local employee, a number of land owners	Darwis, a number of land owners in Lainungan Village

No	Stakeholder	Profile	Representative	Relation / Link to
24	Burhanuddin	Member of Lainungan village Youth Group	A number of land owners, Tau' Lotang ethnic group, member of Lainungan Village Youth Group	Nendre, member of Lainungan Village youth group
	Mattirotasi			
1	Drs. Zainuddin M	Village Head of Mattirotasi	Community member of Mattirotasi Village, A number of land owners	Jumardi, Usman, H. Ara, Asi', Udin, Jamal, Muh. Amin
2	Usman	Land owner, Head of BPD Mattirotasi	H. Ara, community of Pabberesseng Sub-village	H. Ara , Drs. Zainuddin M, Asi, Amir (Helper area Dusun Pabbaresseng)
3	Asi	Sub-village Head of Pabberesseng	Community member of Pabberesseng Sub-village	Usman, Drs. Zainuddin M, Warga Dusun Pabberesseng
4	Jamal	Sekretaris Desa Mattirotasi	Community member of Mattirotasi Village, A number of land owners	Usman, Asi, Drs. Zainuddin M
5	Jumardi	Head of GAPOKTAN Rimba Harapan	Mattirotasi Village farmer group member, Mattirotasi Village Youth Group	Drs. Zainuddin M, M. Amin, Asi, Usman, Farmer group member in Mattirotasi Village
6	M. Amin	Instructor of GAPOKTAN Mattirotasi Village	Mattirotasi Village farmer group member, youth group	Drs. Zainuddin M, Jumardi, Mattirotasi Village Youth Group
7	H. Ara	Land owner	Community member of Pabberesseng Sub-village, land owner and Helper for Pabberesseng Sub-village area	Community member of Pabberesseng Sub-Village, land owners in Pabberesseng sub-village, Drs. Zainuddin M, Usman, Jamal
8	A. Ojeng	Land owner	A number of land owners for Lainungan Village project area	A small number of land owners in Lainungan Village, Helper from Lainungan Village
9	H. Ambo Dalle	Community leader Pabberesseng Sub-Village	Community member of Pabberesseng Sub-village	Drs. Zainuddin M, community member of Pabbersseng Sub-village

No	Stakeholder	Profile	Representative	Relation / Link to
10	Abdullah	Religious leader (Imam) Mattirotasi Village	Muslim Group Mattirotasi Village	Drs. Zainuddin m, Imam of Kamiri'e Sub-Village, Imam of Kampung Baru Sub-village
11	Hj. Riadah	Head of PKK Group Mattirotasi Village, Head Ta'lim Assembly Group, Wife of Mattirotasi Head Village	PKK Group Mattirotasi Village Majelis Ta'lim group	Drs. Zainuddin M, PKK Group, Ta'lim Assembly Group
12	H. Laube	Land owner in Transmission Line area	A number of land owners in Transmission Line area	A numbe rof landowners in Transmission Line area
13	Ambo Saibe	Head of Pada'idi, Samenre and Bunga Desa farmer groups in Mattirotasi area	A member of Pada'idi, samenre' and Bunga Desa farmer group	H. Zainuddin Jannah, Pada'idi, Samenre' and Bunga Desa farmer group member
14	Ambo Baharuddin	head of Makkaresso farmer group	Makkaresso farmer group member	H. Zainuddin Jannah, Makkaresso group member
15	Irwan	Former Head Village of Mattirotasi	Community of Mattirotasi Village,	Community member of Pabberesseng Sub-village, Ilham
16	Ilham	Former Head Sub-Village of Pabbersseng, Imam candidate in Pabberesseng Sub-village	Community member of Pabberesseng Sub-village	Irwan, Community of Pabberesseng Sub-Village
17	Udin	Head of Kampung Baru Head Sub-village Mattirotasi Village	Community member of kampung Baru Sub-Village Mattirotasi Village	Drs. Zainuddin m, Jamal, community member of Kampung Baru Sub-village Mattirotasi Village
18	Rusdiansyah	Mattirotasi farmer group instructor, Staff of agriculture and plantation department of kab. Sidrap	Rimba Harapan farmer group member in Mattirotasi Village area	Drs. Zainuddin M, H. Zainuddin Jannah, Muharram, Jumardi, M. Amin, Tani Rimba farmer group member in Mattirotasi Village
19	Muharram	Secretary of Agro Bina Taruna Mandiri (NGO)	Member of farmer group in HKM area Mattirotasi Village	H. Zainuddin Jannah, farmer group member in HKM area of Mattirotasi Village

No	Stakeholder	Profile	Representative	Relation / Link to
20	Andi Arman	Head Division Forestry Department of Sidrap Regency	Member of farmer group in HKM area Mattirotasi Village, Forestry Department Kab. Sidrap, NGO farmer group NGO of Farmer Group	Head of Forestry Department Kab. Sidrap, H. Zainuddin Jannah, Muharram, farmer group member in HKM area of Mattirotasi Village
21	Ambo Bulang	Land owner, cattle farmer, Cashew farmer	A number of land owners, Farmers in Mattirotasi Village Area	Zain Katu, Bahar
22	Bahar	TNI member, cattle farmer, Cashew farmer	A number of land owners, Farmers in Mattirotasi Village Area	Zain Katu, Ambo Bulang
23	Azis	Head of Kemiri'e Sub-village, Mattirotasi Village candidate	Community member of Kamiri'e Sub-village Mattirotasi Village	Drs. Zainuddin m, Asi, Udin, community member of Kamiri'e Sub-Village

5. Stakeholder Engagement Program

Purpose of the Stakeholders Engagement Program. The engagement process is an on-going activity conducted to establish and maintain a constructive relationship between UPC – SBE, community and stakeholders. The SEP objectives are as follows:

- Consolidation plan for community engagement, and to that ensures consistency communication amongst the UPC and external stakeholders and community.
- Minimize obstacles in the implementation of project activities.
- Maintain a relationship and communication among community and UPC - SBE.
- Ensure positive community perspective, throughout the construction and process as well as the lifetime of the project (operation).

Approach Strategy. The approach used in developing Stakeholders Engagement Program is basically non-standard, due to possible changes and modifications according to current conditions in the field. The initial planned strategy approach includes:

- Establishment of local committee, as part of communication between UPC - SBE and community. The local committee can be a new entity or an existing group that helps run the program. However, this entity would not become an obstacle for community members who want to deal directly with UPC - SBE.
- Consultation and Disclosure, such as conducting community meetings, group discussions, and/or Socialization.
- Collaboration and Empowerment, such as: community development programs, corporate social responsibility programs, training for local community.

Disclosed Strategy. By conducting public notification, including: in public areas (Information flyer, Banner, pamphlets, etc.), Local Newspaper, Local Radio, UPC Website.

Gender and Vulnerable Peoples Issues. UPC commits to take into consideration women groups, children, and vulnerable peoples in the Stakeholder Engagement Program. The Land Acquisition framework and planning clearly provide specific portion for vulnerable peoples. As a response and responsibility of UPC - SBE, women's groups and vulnerable people's will get an equal portion in the development of Community Development and CSR Programs.

Community Development and CSR Program. UPC - SBE will be preparing integrated Community Development and CSR programs and will be part of a Stakeholder Engagement Program. The development of general CSR programs will consist of the following: schools and/or educational programs; tourism and wind farm learning centre maintenance and promotion; health care programs that do not have a religious context; provision of potable water and annual maintenance of such; trash collection and safe disposal systems and annual operating budget of such; non-religious affiliated community meeting places; non-religious affiliated community market place; provision of electrical supplies and maintenance of such; community transportation services and the annual upkeep of such.

List of Stakeholder engagement program based on project activities can be seen in Table 5-1. This list is tentative and possible to change.

Table 5-1 Stakeholder Engagement Program of UPC Sidrap Bayu Energi

Project Activities	Engagement Program	Approach strategy	Stakeholders Involved	UPC Team
Pre-Construction and Construction • Land Acquisition - APL • Land Acquisition - Forestry • Pre-Construction Activities • Road Construction • Foundation Construction and Tower Erection • Overhead Distribution / Transmission Lines • Operations and Maintenance Building • Community Development and CSR on Pre-construction phase	• Land owner Identification • Land Measurement • Asset inventory • Engagement and negotiation with land owner	• Direct negotiation with willing seller willing buyer clausal • Socialization, consultation and disclosure	• Land Owners • Village and Sub district Level • Notary • Government Regency and Provincial Level (BPN)	• Land Acquisition Team
	• Land User identification • Asset inventory • Engagement and Compensation Negotiation with Land User (HKM Farmer groups) in production forestry area	• Socialization, consultation and disclosure • Negotiation – group meeting	• Government Regency (Forestry agency for land procurement in protected forestry area)	• Land Acquisition Team • Community Relation Team
	Project Pre-construction Socialization	• Socialization, consultation and disclosure • Public Notification	• Village and Sub district Level • Local Community, including local groups.	• Site Manager • Community Relation
	Identification of potential Local employee	• Socialization, consultation and disclosure • Public Notification • Engage local community as local employee • Training for potential local community employee	• Village and Sub district Level • Local Community, including local groups.	• Site Manager • Community Relation
	Project Status Disclosure	• Socialization, consultation and disclosure • Public Notification • Group discussion	• Village and Sub district Level • Local Community, including local groups.	• Site Manager • Community Relation
	Establish Community Development and CSR program	• Community meeting and group discussion	• Government Regency and Provincial Level	• Community Relation Team

Project Activities	Engagement Program	Approach strategy	Stakeholders Involved	UPC Team
		• Developing Community based Program • Community development • Training for local community	• Village and Sub district Level • Local Community, including local groups. • Woman Groups and potential vulnerable groups	
Project Operation • Operation of Wind Farm • Community Development and CSR	Project Operation Socialization	• Socialization, consultation and disclosure • Engagement Activity Report • Engagement Tracking Database	• Government Regency and Provincial Level • Village and Sub district Level • Local Community • UPC Employee • UPC Contractor • UPC Consultant	• Site Manager • Community Relation Team
	Project Status Disclosure	• Socialization, consultation and disclosure • Public Notification • Group discussion	• Village and Sub district Level • Local Community, including local groups.	• Site Manager • Community Relation
	Establish Community Development and CSR program	• Community meeting and group discussion • Developing Community based Program	• Government Regency and Provincial Level • Village and Sub district Level • Local Community, including local groups.	• Community Relation Team
Project Closure	Project Closure Socialization	Socialization, consultation and disclosure	• Government Regency and Provincial Level • Village and Sub district Level • UPC Employee • UPC Contractor • UPC Consultant	• Site Manager • Community Relation Team

6. Timeframe of Stakeholders Engagement Program

Following are initial timeframe of Stakeholders Engagement Program (see Table 6-1).

Table 6-1 Timeframe of Stakeholders Engagement Program

Task	Time Frame
Land Acquisition and land procurement in production forestry Program	Ongoing process
Project Pre-construction Socialization	Before the commencement of the construction phase of project (January 2016)
Developing Local Community Committee	Ongoing process – January 2016
Identification of potential Local employee	Before the commencement of the construction phase of project
Project Status Disclosure – Construction	Monthly event
Establish Community Development and CSR program	On-going – January 2016
Project Operation Socialization	Before the commencement of the operation phase of project (2017)
Project Status Disclosure – Operation	Monthly event
Establish Community Development and CSR program	January 2017
Project Closure Socialization	Before the end of the project
Reporting of Engagement activities	Daily
Engagement tracking and resume of engagement tracking	Weekly

7. Management and Resources

Existing UPC - SBE Framework of the organizational structure for stakeholder engagement program can be seen in Figure 7-1. In the stakeholder engagement program, community relations team will be managing and implementing the company's Stakeholder Engagement Program also integrating a community engagement program internally (between team developer, land team and construction and operation team) with stakeholders. The following are the roles and responsibilities of the Community Relations Team:

- Community relations team is a dedicated team assigned specifically to the UPC - SBE to conduct community relations programs, including stakeholder engagement program. The role of the community relations team in the daily activities is carried out by the Community Relations Officer, and under the supervision of the Community Relations Manager.

- Community relations team will work closely with development teams and land team, to facilitate all activities of community engagement, recording engagement activities, community consultation and disclosure and UPC – SBE CSR programs.
- Community Relations Officer acts as a liaison, facilitator and manager of community engagement program.

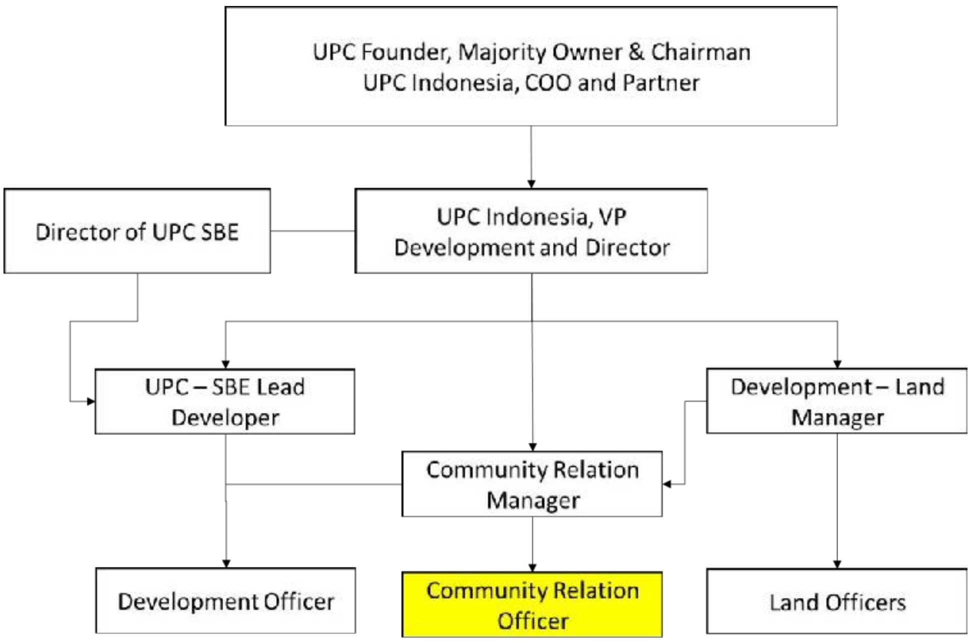


Figure 7-1 UPC – SBE Organizational Structure

8. Grievance Mechanism

8.1. UPC GM's Policy and Objective

Referring to UPC - Community grievances Handling Procedures Document, UPC complaint mechanism would refer to IFC, which will be effective complaint mechanisms that can facilitate early indication and mediate issues so it can be handled properly and quickly. IFC GN109 states that grievance mechanism should be scaled to the risks and adverse impacts of the project and have Affected Communities as its primary user. The principle will guide the policy-creation, planning, and execution of UPC's process to Ensure that all the guidance have been held to its highest degree. To this end, UPC will strive to express the guidance in the Table 8-1.

Table 8-1 UPC GM Policy

Guideline	UPC 's Plan
Proportionality	
Scaled to risk and adverse impact on affected	Utilize the result of the environmental and

Guideline	UPC 's Plan
communities	social assessment to map out and estimate the magnitude of impact the project can potentially create and consult with the local government and usual-practice and experience of other wind farm projects
Cultural Appropriateness	
Designed taking into account culturally appropriate ways of handling community concerns	Consult with the local leaders to the different traditions and habits of the community in the project area; encourage women's participation in rural areas.
Accessibility	
Clear and understandable mechanism that is accessible to all segments of the affected communities at no cost	Grievance mechanism will be informed in the local language. Coordinate with local leaders and village leaders to gather grievances and have regular weekly meetings with the local stakeholder
Transparency and Accountability	
To all stakeholders	Record of grievances will be copied to the grievant; commit to a response time of 7 working days from the time of that the grievant was reported.
Appropriateness Protection	
A mechanism that prevents retribution and does not impede access to other remedies	Commit to a no retribution policy for grievant filling grievances. Inform grievant of potential course of upscale remedy if they are not satisfied with the proposed solution;

The objective of UPC Grievance Mechanism, refer to UPC - Community Grievances Handling Procedures, including: Create a system where grievances are received, registered, understood, analyzed, and the appropriate action is taken; Consult, follow-up, and provide realistic solution to remedy the grieved party; Map out key issues that are prevalent to be used as feedback to improve the Project's way of conducting its work activity; monitor over the lifetime of the project; Create mitigation measures against policies, procedures, and behavior in the project that can cause grievance . In general, the complaints mechanism of UPC Indonesia can be seen in Figure 8-1, and the operationalization of the grievance mechanism for PT. UPC Sidrap Bayu Energi can be seen in the Standard Operation Procedure of Grievance Mechanisms (see Appendix H).

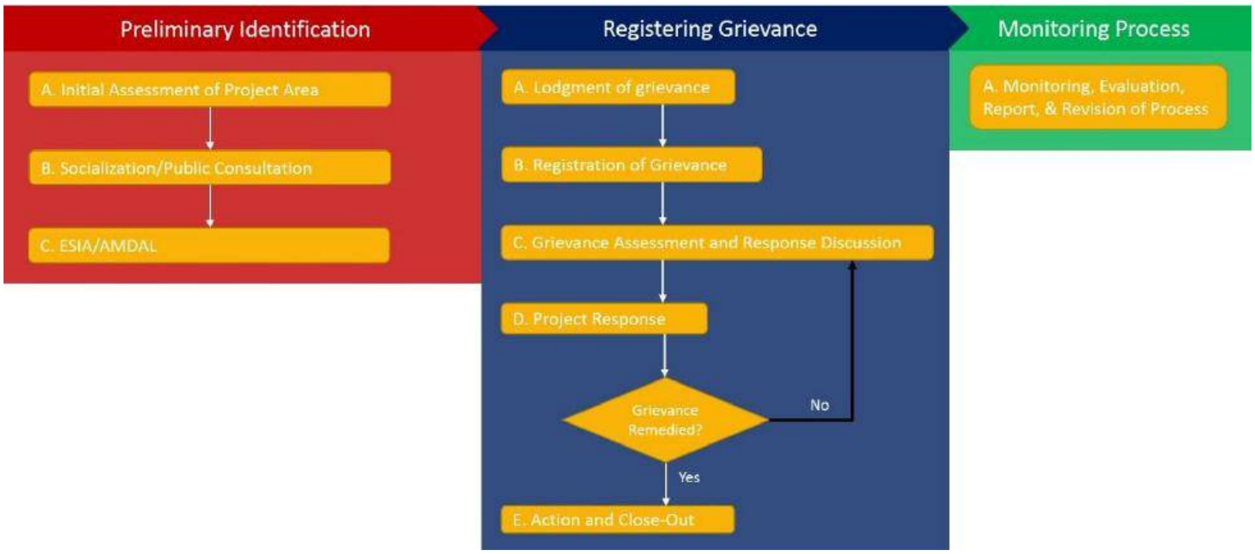


Figure 8-1 Flow of Grievance Mechanism

8.2. Disclosure of GM

The Grievance Mechanism would be clearly informed to the community in several ways, by taking into account local context and communication preferences and practices. Grievance is received by the community through one of several channels, including:

- During public consultation sessions, formal and informal meetings;
- Public notification, including: in public areas (Information flyer, Banner, Pamphlet, etc.), Local Newspaper, Local Radio, UPC Website.
- Direct communication from the grievant to the CRO, GO, or other UPC's employees
- Relayed to a trusted community member (the village head/community leader/land owner) who will then consult with the Community Relations Officer to file the grievant;
- Relayed or reported by contractors;
- Calling a publicized phone number for community concerns: +62 421 90705 or +62 81 1862 9198.

9. Monitoring and Reporting

UPC – SBE has developed and established procedures to monitor and measure the effectiveness of management program. The system of monitoring mitigation measures is operated to ensure engagement of representatives of affected community to participate in monitoring activities as an alternative measure in managing communication strategy with related parties. Management and people's managers provide assurance that monitoring and reporting can be carried out, and conduct studies and strict controls over reporting of community engagement activities. Reporting systems are done per engagement (see Appendix F) and database engagement tracking (see Appendix G) are development activities that have been carried out by UPC - SBE

In relation to monitoring, a number of components may include: progress monitoring, which refers to the engagement tracking database; outcome monitoring, information based on data of Weekly report of Engagement Tracking Resume and Monthly Engagement Tracking Resume; evaluation: assessing the goal and overall effectiveness of the program with a review of the activity report. Tools of monitoring of stakeholder engagement programs include:

- Reporting of engagement activity (see Appendix F)
- Weekly update of Engagement Tracking database (See Appendix G)
- Weekly report of Engagement Tracking Resume (see Appendix I)
- Monthly Engagement Tracking Resume
- Community Meeting, Socialization, Consultation and Disclosure report.
- Grievance Mechanism Reports and Status (GM database).

Appendix H

Gap Analysis Report

UPC-Sidrap - ESHIA

UPC Renewables

3rd September 2015

GAP ANALYSIS REPORT IFC ESHIA VERSUS AMDAL

GAP ANALYSIS REPORT IFC ESHIA VERSUS AMDAL

Prepared for

UPC Renewables

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3rd September 2015

JKTD14001

Quality Information

Document GAP ANALYSIS REPORT IFC ESHIA VERSUS AMDAL

Ref JKTD14001

Date 3rd September 2015

Prepared by Kevin Dobson

Reviewed by Andrew Sembel

Revision History

Revision	Revision Date	Details	Authorised	
			Name/Position	Signature
Rev 1	3-Sept 2015	Draft Final For Client Review	Kevin Dobson Director, Environment	

Table of Contents

1.0 INTRODUCTION

1.1 Gap Analysis Objectives

The Project needs to be designed to adhere to the local and national environmental regulations and international environmental standards as stipulated by the IFC Performance Standards. Indonesia regulation requires the project to develop an AMDAL if their activity is listed in Environment Minister Regulation No 5 year 2012, while the IFC guidelines require that an ESHIA is prepared. IFC guidelines are one of a number of environmental assessment frameworks which have been developed under the Equator Principles III (EPIII), a recognised international standard for environmental and social safeguards by financial institutions. UPC Renewables have requested the preparation of an IFC compliant ESHIA, to address the needs for international financing and meet their own standards of environmental and social performance.

An AMDAL has already been prepared and processed for the project and a letter of environmental feasibility has been issued that will enable securing an environmental permit. Due to the different purposes of the 2 documents there are often differences between the requirements of an AMDAL and those of an IFC compliant ESHIA. This document is intended to inform the preparation of a supplementary studies program that will be required to bridge the identified gaps and to prepare an integrated work program that will achieve the dual objectives.

1.2 Approach

An AMDAL is necessarily prepared to comply with Indonesian regulations as outlined in Section 2.1. For the analysis environmental parameters associated with baselines and environmental impacts the AMDAL process is often very specific about the Indonesian standards that will need to be applied.

The IFC EHS guidelines give a clear indication of what needs to be assessed, although they tend to be less prescriptive about the standards that need to be applied, indicating that equivalent internationally recognised standards can be adopted by a project. For the elements to be considered in the ESHIA, the default standards will be assumed. In cases where there is a discrepancy between the IFC ESHIA requirements and those of the local EIA process, is considered best practice and in fact required by IFC guidelines that the more stringent of the two shall apply.

This screening and scoping process will require the development of a consolidated project description that will serve the purpose of defining all of the potential impacts within the disciplines, for the purposes of this gap analysis only a summary project description is included here.. In terms of the gap analysis, only the relevant aspects of the project will be extracted; a fully comprehensive Project Description is required for a full ESHIA.

The gap analysis refers to the technical backgrounds for AMDAL and ESHIA (using IFC Guidelines). The two processes are similar in nature with respect to:

- the development of scopes;
- some of their community disclosure requirements;
- execution of the studies (baselines);
- development of impact assessments and mitigations; and
- disclosure and release.

Key differences include:

- the extent of background studies;
- the need under IFC to address all eight Performance Standards under the General Guidelines for preparation of an ESHIA and the IFC's EHS Guidelines.

1.3 Approach to the Gap Analysis

This report has been developed as a screening and scoping exercise to inform and specify the requirements of the preparation of an international ESHIA which incorporates as much is possible the AMDAL which is already been prepared. Scoping is a fundamental element in the development of a terms of reference for any ESHIA exercise, however in this case since an AMDAL has already been prepared the objective is to maximise the use of information which has been developed for the AMDAL and defined the additional studies which are required to address the needs of an IFC compliant ESHIA. In order to do so a systematic approach has been undertaken as follows:-

- Define the 2 processes (AMDAL and ESHIA) that will be followed;
- Provide a brief summary of the project description that has been used to evaluate the potential for the project to have environmental and social impacts;
- Undertake a scoping exercise that will identify any and all potential impacts of the project, regardless of site-specific or mitigation measures which will alter their significance;
- Provide an analysis of the extent to which these impacts have been dealt with in the AMDAL, and the additional measures which need to be undertaken in the form of baseline assessment and environmental social impact assessment to complete the requirements of an IFC ESHIA.

In order to support the information provided in this report two appendices have been included with this document:

- Appendix A provides details of the methodology that will be applied in the environmental and social impact assessment process to determine the significance of impacts and the requirements for management and monitoring plans associated with the mitigation strategies;
- Appendix B provides the details of a supplementary field studies program which will be undertaken in the near future to address any gaps in the available baseline data.

It should be stressed that this document will not address impact mitigation in any detail, although many mitigation strategies have been put in place, and the AMDAL contains an RKL/RPL. It is important to remember that the object of this exercise is to identify all potential impacts and their full assessment and mitigation strategies will be dealt with in the ESHIA document.

2.0 Comparison of the Two EIA Processes

2.1 Indonesian AMDAL Process

The AMDAL study/process is required for every activity/project that is listed in Decree of Environment State Minister No. 5 Year 2012 regarding the List of Businesses and/or Activities Type. This project falls under a category that requires an AMDAL to be prepared. According to Regulation of Environment State Minister No. 16 Year 2012 regarding Guidelines for Environmental Document Preparation, the approach for the impact assessment will include (as per Regulation):

- a description of the tasks that will be undertaken as part of the environmental impact assessment process, including any specialist reports or specialized processes, and the manner in which such tasks will be undertaken;
- an indication of the stages at which the competent authority will be consulted;
- a description of the proposed method of assessing the environmental issues and alternatives, including the option of not proceeding with the activity;
- particulars of the public participation process that will be conducted during the environmental impact assessment process; and
- any specific information required by the competent authority.

2.1.1 Authority Consultation

A consultation meeting will be arranged with the BLHD of Bontang City, in cases whereby there is a need to address and highlight issues that the competent authority or impact assessment team might be interested in or the process and/or approach that both parties might agree to follow in the AMDAL process.

2.1.2 Public Participation Process (Impact Assessment Phase)

The following public participation activities during the AMDAL process are conducted as per Regulation of Environment State Minister No. 17 Year 2012 regarding Public Involvement on AMDAL and Environmental Permit Processes:

a) Public Notification

Once the authorities have provided their comments on the submitted notification letter, the announcement of the impact assessment phase will be widely announced, with an invitation to the public and registered Impacted and Affected Peoples (I&APs) in the Public Participation Process. The methods of announcing the impact assessment phase to I&APs will be through newspaper advertisements (local, regional and/or national) and a letter informing or inviting all I&APs within the existing database.

b) Consultation with I&APs and Authorities

Public consultation is another form of public involvement which can be conducted before, at the same time or after public notification. This activity is intended to give an opportunity for I&APs to deliberate about the approach and issues raised during the impact assessment

Prior to public consultation, project initiator should identify all the stakeholders (community, NGOs, etc.) that will participate in the consultation process.

The community and other key stakeholders should be engaged to deliver their inputs, comments and responses which will be documented, managed and also incorporated into the KA document. In addition, this process could be used as a media to select and determine potential representatives of the impacted community who will be involved in the AMDAL documents (KA, ANDAL, RKL, and RPL) evaluation.

The AMDAL process is summarizing in Figure 2-1. AMDAL Document consists of four documents that are undertaken sequentially, these being:

- Terms of Reference Document (*Kerangka Acuan* - KA)
- Environmental Impact Analysis Document (*Analisis Dampak Lingkungan Hidup* - ANDAL)
- Environmental Management Plan Document (*Rencana Pengelolaan Lingkungan Hidup* - RKL) and Environmental Monitoring Plan Document (*Rencana Pengelolaan Lingkungan Hidup* - RPL)

2.1.3 KA Preparation

KA preparation is the first critical pathway in the AMDAL process that would lead the following processes. The main activities will be performed during KA preparations include:

- **Scoping (in concert with Impacts Matrix as discussed above but involving the public)**

  Scoping is a critical, early step in the preparation of an ANDAL (*Analisis Dampak Lingkungan Hidup* or Environmental Impact Assessment). During the scoping process, all issues that are likely to be of greatest importance during the Impact Assessment will be identified, while those are of little concern will be eliminated. Typically, this process concludes with the establishment of a Terms of Reference (ToR) for the preparation of an ANDAL. In this way, scoping ensures that proposed studies for ANDAL are focused on the significant effects and time and money are not wasted on unnecessary investigations.

  During the scoping, the involvement of the public as well as the competent authority and other responsible government agencies is an integral part of the scoping process. Public input helps to ensure that important issues are not overlooked when preparing the ToR and/or initiating the AMDAL study.

  The process of scoping includes a description of project activities and the potential impact on the environment that may occur. Project activities are divided into phases such as pre-construction, construction and operational phases. The potential impact scoping is conducted by experts, who base their preliminary assessments of the ToR phase on the description of project activities that will be carried out by the proponent.

  Scoping provides the foundations for an effective and efficient AMDAL process. When systematically carried out, scoping highlights the issues that matter and that provide clear direction to the proponent on what is required to manage potential impacts. This increases the likelihood of an adequately prepared AMDAL report. It helps to avoid the problem of unfocused, voluminous reports and the attendant delay while their deficiencies are addressed and corrected. Scoping thereby helps to make sure that resources are targeted on collecting the information necessary for decision-making and not wasted on undertaking excessive analysis.

  The scoping process itself can vary in scope, complexity and time taken. A comprehensive approach to scoping may be needed for a large-scale project, which has a range of impacts that are potentially significant. In other cases, scoping will be a more limited and restricted exercise. Depending on the circumstances, the scoping process can be tailored to include some or all of the aims listed below.

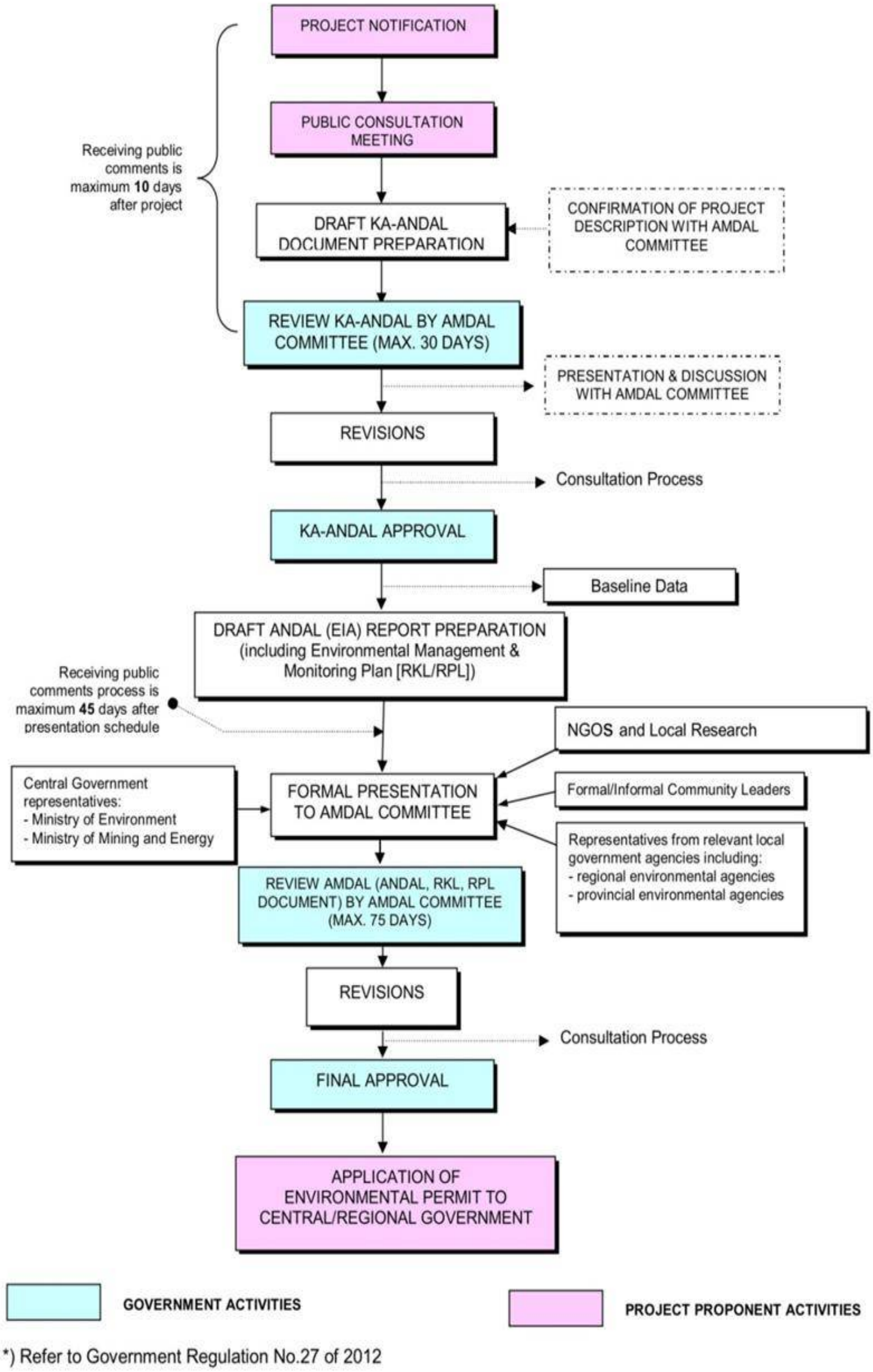

Figure 2-1 Main Steps of AMDAL Process (Based on Government Regulation No.27 of 2012)

- **Pre-Survey Site Visit**

  The pre-survey site visit will be performed before public consultation. This activity will be combined with courtesy visit to local environmental agency (i.e. BLHD) and other related stakeholders. Key objectives of this activity include:

  - Obtain a better understanding of the actual condition of the proposed project site;
  - Understanding the existing activities surrounding the proposed project site; and
  - Introducing the key personnel of the AMDAL study team to the local environmental agency (i.e. BLHD) and other related stakeholders.

- **Document Preparation and Approval Process**

  The guideline of KA document preparation is regulated in Environment Minister Regulation No. 16 Year 2012.

  The approval process of KA document is regulated in Government Regulation No. 27 Year 2012. The final of the draft KA document will be submitted by the AMDAL Evaluation Committee for their reviewing process for a maximum of 30 working days. The project initiator together with their AMDAL consultant will present the results of the public announcements, public consultation and KA content to the AMDAL Evaluation Committee. The revision of the KA document should include all inputs from the presentation and it shall be submitted to AMDAL Evaluation Committee to be approved by Bupati/Gubernur/Minister of Environment.

Scoping is completed when the detailed studies required in the ANDAL have been specified. The ToR sets out what the ANDAL is to cover, the type of information to be submitted and the depth of analysis that is required. It provides guidance to the AMDAL Study Team on how the study should be conducted and managed. Experience shows that the ToR should be a flexible document. The terms may need alteration as further information becomes available, as new issues emerge or as others are reduced in importance.

2.1.4 ANDAL, RKL, RPL Preparation

The ANDAL, RKL and RPL documents will be prepared according to the approved KA, baseline data and associated information gathered during secondary data collection and field survey.

- **Significant Impact Assessment**

  Baseline data parameters and project description will be used to conduct a significant impact assessment. The approved KA has already identified potential impacts including an evaluation of hypothetical impacts. In the ANDAL document, hypothetical impacts will be more fully analysed to get information regarding impact magnitude and importance level.

- **Hypothetical Impact Analysis**

  The Hypothetical Impact Analysis is aimed to carefully and partially study the alteration of environmental quality due to project activities. The quality alteration is determined as magnitude and impact importance. Essentially, impact magnitude is approached by comparing the actual conditions of environmental quality before the project activity begins with the projection of environmental conditions after project implementation. The impact magnitude could be positive or negative, depending on the impact character that will occur.

  The importance level of impacts and determinants of impacts are presented in the form of a matrix, and grouped based on two importance levels - not important (NI) and Important (I). The determination of significant impacts is conducted based on seven criteria of impact levels according to article 22 of Law No 32 Year 2009 regarding Protection and Management of Environmental and Government Regulation 27 Year 2012 regarding Environmental Permit.

In this section, hypothetical impacts will be evaluated and analysed in terms of the linkages and interactions of all potential significant impacts in order to determine the total impact characteristic of project activity. All impact evaluation results will lead to the determining scale of environmental and social issues that will be used as a basic recommendation for the impact mitigation and monitoring plan.

2.1.5 Impact Mitigation and Monitoring Plan

Based on significant impact evaluation results, the detailed measures and recommendations for the mitigation, management and monitoring of the environmental impacts that will be formulated in the Environmental Management Plan (RKL) and Environmental Monitoring Plan (RPL) will be developed. These recommendations can be used as input to enhance the project development plan, minimize negative impacts and enhance positive environmental and social impacts of the proposed development activities.

2.1.6 ANDAL, RKL and RPL Approval Process

Similar with the KA approval process, the final draft of the ANDAL, RKL and RPL documents will be submitted to the AMDAL Evaluation Committee to be reviewed for a maximum period of 75 working days. The AMDAL Consultant will represent the project proponent in presenting the ANDAL, RKL and RPL documents to the relevant AMDAL Committee and will coordinate with the relevant parties to obtain AMDAL Approval. The project proponent representative should attend all meetings to answer all technical questions related to the project description.

The final revision of the ANDAL, RKL and RPL document will be prepared based on all inputs from the formal presentation and AMDAL Evaluation Committee review results. The final revision of ANDAL, RKL and RPL documents will be submitted to the AMDAL Evaluation Committee to get their approval. The approved ANDAL, RKL and RPL document will be used to obtain the Environmental permit.

2.1.7 Environmental Permit

The Environmental Permit is required based on Government Regulation No. 27 Year 2012. The application for an environmental permit is submitted to relevant authorities simultaneously with submission of the AMDAL. The process for obtaining the environmental permit is described in Figure 2-2.

The application of environmental permit will be submitted to relevant stakeholders with the complete and approved ANDAL, RKL and RPL documents, the project permit, and project profile to be reviewed. A public announcement in the local newspaper and a poster posted on a local notice board or related local government office will be completed within a 5 day period, and the community can give their comments within 10 days after the public announcement. The environmental permit will be released by the Minister, governor or regency and will be announced in mass media within 5 days after the environmental permit is released.

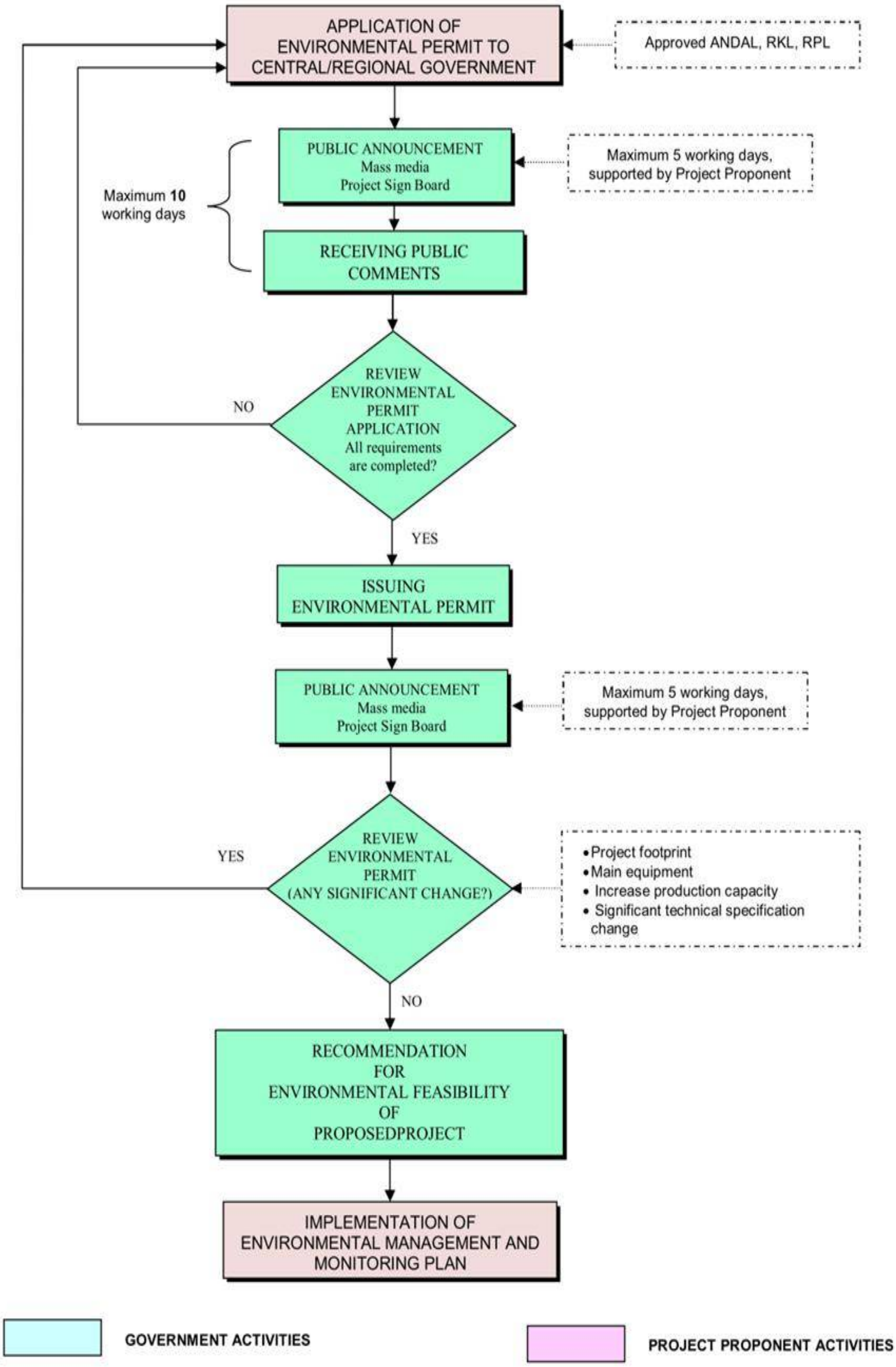

Figure 2-2. Main Steps in Obtaining Environmental Permit (Based on Government Regulation No.27 of 2012)

2.2 IFC Guidelines and Reference Framework

The common conundrum facing power projects in Indonesia is the combination of environmental and social compliance with the Laws of Indonesia, and with International Guidelines, either from corporate standards or those dictated by project financing bodies. Development of the project will comply with both frameworks.

The Equator Principles III, published in June 2013, are a risk management framework for assessing environmental and social risk, which is adopted by financial institutions, such as the IFC. Equator Principles III provides a minimum standard for due diligence. EPIII provide the overarching principles for environmental and social performance of projects undertaken by the signatory financial institutions, they do not provide methods of appraisal. The application of IFC Performance Standards is an example of Equator Principles III interpretation, and IFC Guidelines are referred to in EPIII as an appropriate interpretation. So references to IFC or EPIII are not directly interchangeable, but in this document, if either is mentioned, both can be inferred.

The IFC interpretation of Equator Principles is not the only international standard that is applied to projects; in fact, many projects and lenders require the application of other frameworks. However, for state of the art environmental and social assessment, most of the international standards are consistent with IFC's approach, even though they may vary in the way they articulate their requirements or lay out their documentation for their respective audiences. IFC guidelines are used here as they provide a comprehensive framework, and also satisfy the standards of most financing bodies. For the purposes of this report, IFC standards will suffice as a benchmark.

The IFC COMPLIANT ESHIA process is driven by its policy on environmental and social management of projects as published in January 2012. The policy is articulated through the definition of a series of eight performance standards, covering various aspects of project development. Those standards are:

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

It also defines a series of scales or categories under which the performance standards will need to be interpreted; essentially different levels of project will trigger a different response and level of analysis and reporting. The categories are:

- Category A: Business activities with potential significant adverse environmental or social risks and/or impacts those are diverse, irreversible, or unprecedented.
- Category B: Business activities with potential limited adverse environmental or social risks and/or impacts that are few in number, generally site-specific, largely reversible, and readily addressed through mitigation measures.
- Category C: Business activities with minimal or no adverse environmental or social risks and/or impacts.

Wind energy power stations are Category A projects, since they have the potential to generate impacts which are significant and irreversible, since they represent a significant change to existing environmental values albeit that mitigation strategies and methods reduce the risk of those impacts. This means that they are generally required to provide a full ESHIA with substantial rigor behind their analysis of baselines, potential impacts and mitigated outcomes, and a comprehensive Environmental and Social Action Plan to indicate how the outcomes will be managed, monitored and if necessary corrected.

IFC PS 1 is and key link of all eight IFC performance standards. It requires a project proponent to conduct an environmental and social assessment, and to establish and maintain an Environmental and Social Management System (ESMS) *'appropriate to the nature and scale of the project and commensurate with the level of its environmental and social risks and impacts'*. It follows, that the project has to:

- Produce an Environmental Impact Assessment; and
- Document its project-specific ESMS.

It is important to appreciate that only IFC PS 1 necessarily applies to all projects, assuming associated environmental and social risks and impacts do exist. The applicability of the remaining IFC PS have to be tested on a project by project basis through the ESHIA process with reference to the scale of the project and the significance of specific PS-related risks and impacts. This prompts the need for Screening / Assessment of the applicability of Performance Standards 2 to 8 and documentation of the screening process.

The framework under which an IFC COMPLIANT ESHIA is undertaken cascades down from the performance standards to a set of EHS guidelines – there is a general EHS Guideline and a series of industry specific guidelines. The guidelines are just that – guidelines; in as much as they often quote standards and concentrations that should be applied, but often give examples of other standards and approaches that can be used, but their use should be justified. As a general rule it is best to apply the standards that are quoted in the guidelines. Thus there is a trace from the IFC policy document, with its performance standards through to the methodologies that are used to determine parameters, assess impacts and determine environmental risks. For this project the following guidelines in addition to the performance standards need to be adhered to:

- Equator Principles III – June 2013
- IFC General EHS Guidelines, April 2007;
- IFC EHS Guidelines for Wind Energy August 2015;
- IFC EHS Guidelines for Electric Power Transmission and Distribution, April 2007;
- IFC EHS Guidelines for Toll Roads, April 2007;
- IFC EHS Guidelines for Ports Harbours and Terminals, April 2007;
- IFC Introduction to Health Impact Assessment; 2009; and
- IFC Good Practice Guide for Stakeholder Engagement May 2007;
- IFC Greenhouse Gas Reduction Accounting Guidance for Climate Related Projects; December 2013;
- Cumulative Impact Assessment and Management: Guidance for the Private Sector in Emerging Markets, IFC, August 2013.
- IFC Guidance Note 5, Concerning Land Acquisition and Involuntary Resettlement, January 2012

3.0 Summary Project Description

This section will provide a summary of the project description. It is not intended to be comprehensive, but will provide enough background to understand the considerations that informed this gap analysis. A more comprehensive project description is provided in the project AMDAL document (English-language translation available) (AECOM, 2015).

3.1 Project Location

The project will take place in Sidenreng Rappang (Sidrap) Regency of South Sulawesi province, and will span the villages of Mittiroasi, Laingungan, Lawaloi, and Uluale in Watang Pulu Sub-District. There will also be an 8 km 150 kV transmission corridor from the project substation to the PLN Sidrap substation.

The WTG field will occupy ridgelines with a predominantly North-Northeast to South-Southwest aspect, the prevailing winds across the Ridge from the East from the West south-west, depending on the time of year.

3.2 Project Components

UPC intends to develop the Site in phases, with the first phase being a 75 MW wind energy generation facility and the second phase being up to 75MW. This Phase 1 is the subject of this Gap analysis, and hereafter referred to as the "Project", although the outline concepts (in a Project Proposal Study format) for Phase II are discussed further as an Attachment to this document. The development of the Site will use modern 2.0 MW – 3.3MW wind turbine generators, however, the base case for this report will use a Gamesa 2.5MW WTG. The Site and Project are supported by a strong interconnection to a national transmission grid with good demand and the capacity to dispatch all the output from the Project. Economies of scale, commercially viable wind, a supportive community and good site constructability make this project feasible. Key features of the project are:

- Maximum Energy Generation Capacity – 75 MW;
- Size of individual turbines – 2.5 MW (assumed for this report);
- Internal transmission network – 35 kV;
- Number of Turbines – 28 (assumed for this report)
- Interconnection – 150 kV
- Land Owner – Government (Forestry Land) and Private Agricultural Land;
- Estimated Average Wind Speed (60 m agl) – 7.24 m/s ;
- Commercial Operation Date – 21 Months After PPA;
- Current Land Use – Forestry and Agricultural;

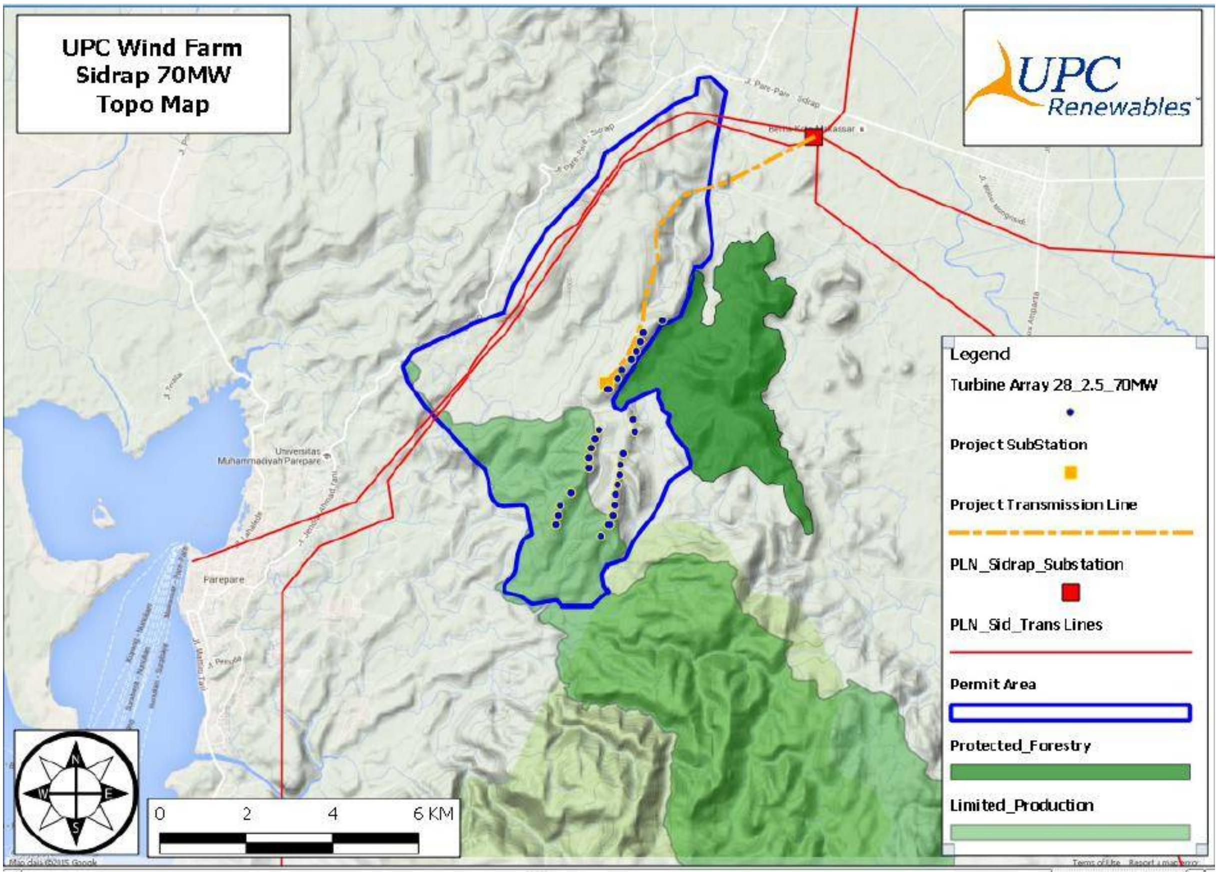

Figure 3-1 Proposed WTG Layout

3.3 Land Acquisition

A majority of the WTGs will be erected on a combination of production forestry area and private land located in Kecamatan Wattangpulu. The forestry land, which is under the limited production forest status, is composed mostly of grassy ridges with few and stunted trees and a small amount of forest and is used primarily for grazing of cattle and cashew nut tree cultivation. Most of the private land can be classified as open grassland, which is used for grazing cattle, with some other agricultural activities in the valleys that would not be impacted by the turbines. Very few settlements and places residence can be found near the Project area, there will be no physical displacement. The existing land uses will not interfere with the wind farm and can be considered to be compatible. Once construction is complete, normal use of the land can resume, with the exception of the physical footprint of the tower bases access roads and transmission infrastructure. The wind farm will install and upgrade roads to the area for the benefit of both the Project and the local residents.

Very few trees are found along the ridges, even in areas which have been designated for forestry purposes. Most of the observed plants in the project area are brush and undergrowth. Some incidents of community teakwood and cashew nut plantations are found in the project footprint. The local community also uses the area for grazing livestock. Nutmeg gathering activities in the forestry area by the community can also be found. Additionally, some parts of the hills are being quarried for gravel. This would appear to be the extent of the community economic activity in the area.

The project has prepared a working draft Land Acquisition Plan and a significant amount of land acquisition has already taken place following processes and procedures that are compatible with both IFC Performance Standard 5 and other associated performance standards and local Indonesian regulations.

Land ownership status in Indonesia is a complex issue, with often strained relationships between what is seen to be the national laws, and what is recognised that a local level. At a national level there are 2 broad definitions of land designation Forestry, and Freehold (literally translated-Land for Other Purposes). Freehold land is controlled nationally by the National land registry (BPN), however for varying reasons uptake of land certification is often inconsistent and record-keeping sometimes questionable. In theory, forestry land cannot be “owned” but may be used, in fact there are areas of Indonesia which have been designated as forestry where there are existing villages and people have been farming the land for many years. At a local level land ownership can be recognised at a village level as well is a sub District (Camatan) level, with various forms of recognition of ownership, usually some form of a letter. This is often complicated by the fact that a family may own an area of land and yet more than one member of the family may claim ownership. Often land boundaries have never been formally surveyed and part of the land acquisition process needs to include formal recognition of the boundaries and assessment of land areas.

Land acquisition activities extend beyond the wind farm itself, to access roads (both new and upgraded) and transmission corridor. The project has taken steps to ensure that it the land which is absolutely necessary, and that the balance of the site can be returned to the community and resume its usual use. To achieve this land negotiations include a purchase of the land and assets, more correctly described as compensation in the forestry areas associated with a leaseback arrangement to enable access and reuse as well as provision for return of the land at the end of the project life. In this way current land owners/users will be appropriately compensated for any potential land use by the project, and will be allowed to return back to the land once construction is completed.

The land acquisition and resettlement plan makes provision for:

- initial disclosure of project, its activities and potential footprint;
- a process through which land ownership and land use is recognized;
- an initial letter of no objection acknowledging willingness to negotiate;
- appropriate valuation of land types by an independent valuer;
- identification and recognition of precise land areas and assets;
- defining a package of purchase, compensation and future return to the land as appropriate;
- undertaking of an appropriate negotiation to all arrive at a willing buyer-willing seller agreement;
- an appropriate transaction duly notarised under Indonesian regulations;
- a grievance mechanism; and
- a monitoring and evaluation programme (yet to be defined).

3.4 Construction

3.4.1 Mobilisation

3.4.1.1 Shipments to Site

The movement of WTG components to site will be one of the most significant aspects of the construction phase with respect to potential impacts. Each WTG will comprise 7 major loads, that will need to be moved to site (3 blades, 3 tower sections, and 1 Nacelle). As well is the specific loads there will be a significant amount of material that will need to be shipped to site including:

- cabling and connections;
- transformer kiosks;
- transformers and switchyard;
- transmission poles and towers; and
- other hardware required that is not immediately available in Southern Sulawesi.

There will be other plant and equipment that will be required through the construction phase, some of which may be sourced from Southern Sulawesi, and others may also need to be shipped in. They include:

- Suitably sized cranes;
- Excavators;
- Concrete batching plants; and
- Other general plant and equipment for civil works.

These materials will be shipped to Southern Sulawesi offloaded and moved to site by road on a combination of existing roadways and purpose-built access roads. For existing roads it may be necessary to consider temporary arrangements to allow for appropriate turning circles and clearances for the long, wide and high loads. The engineering competence of the roads and structures will also need to be considered, and if possible permanent or temporary reinforcement may be necessary.

Land acquisition is an ongoing process and is the subject of a frequent internal reporting mechanism within the project organisation.

3.4.1.2 Shipping Logistics

Recent logistic studies have established that the most efficient option for mobilising equipment to site will be to land shipments at the Port of Pare Pare and move them to site by road. A recent logistic study has established that with the construction of a suitable Materials Offload Facility (MOF) the Pare Pare port area will be appropriate for landing the complex loads. Establishment of the new MOF will not require any dredging, and it is likely to be a simple rock wall and fill structure. Transport of the materials to site will require some structural modification to the existing road system to widen bands and ensure structural competence.

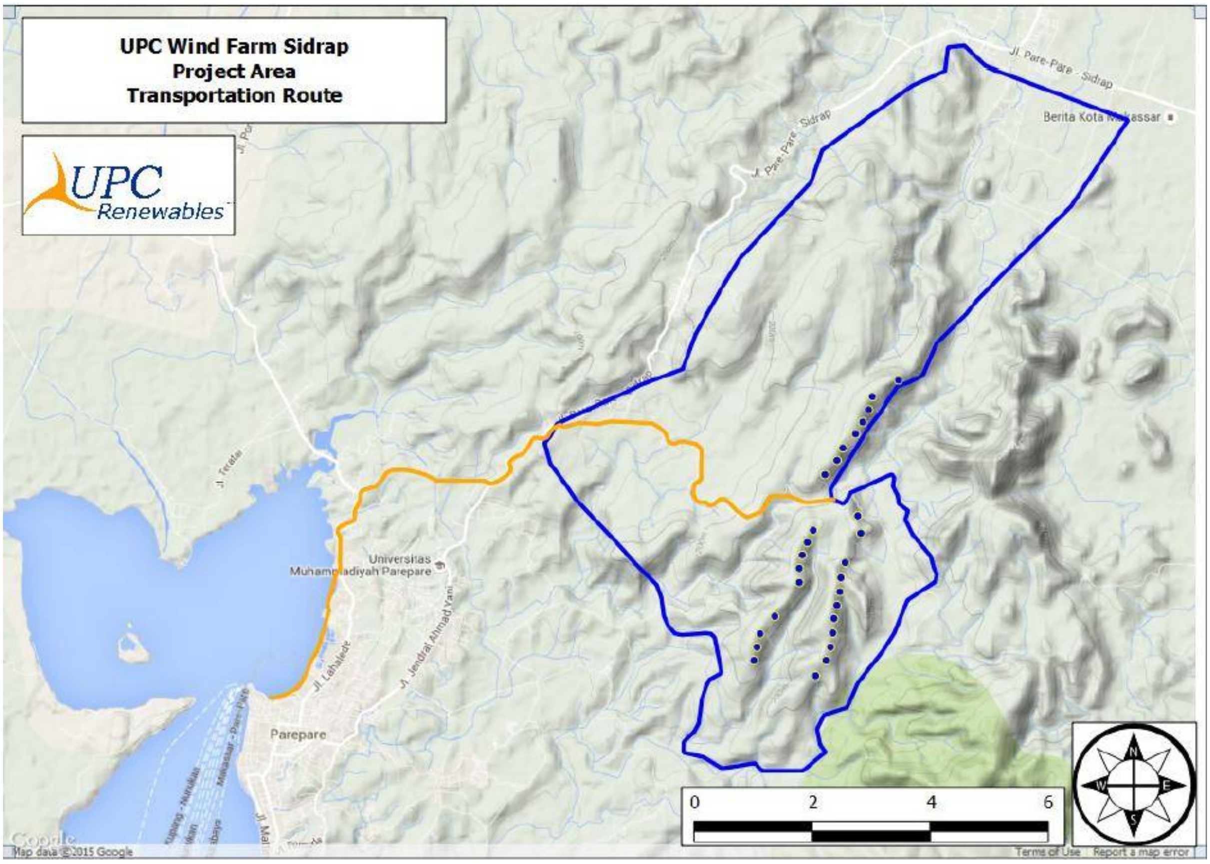

Figure 3-2 Proposed Transportation Route

3.4.2 Land Preparation

Prior to the start of construction, UPC will review and document the general condition of the site, including type and abundance of vegetation and areas of existing disturbance. As previously mentioned, a licensed surveyor will survey and stake all road and turbine locations before construction begins.

Clearing and grading will typically occur in the following order: access road, lay-down area, turbine and other facility locations, interconnect routes, and transmission line. Clearing of trash, debris and scrub/shrub on those portions of the site where construction will occur will be performed by bulldozers and loaders in the initial stages of construction. Generally the grading will be limited to small amounts of filling in areas where local dips and gullies have formed and those small areas of uneven terrain. Prior to completion of construction, all remaining trash and debris will be removed from the site to an approved disposal facility, or piled in a separate pile near the area of removal and saved for later reclamation activities.

During the operation phase of the Project, public access to the turbines will be monitored to provide for the safety of the public in and around the operating equipment. Clean-up from activities during routine daily maintenance will be performed at the time maintenance is performed by the O&M provider's personnel. Disposal of cutting and debris will be in an approved facility designed to handle such waste.

3.4.3 Construction of Access Roads

In order for construction equipment and personnel to reach the wind turbine locations, transportation routes will need to be determined. These routes will be determined based on goals to minimize disturbance, avoid sensitive resources and maximize transportation efficiency. The transportation plan will also discuss the design criteria for existing roads that may need to be modified and any new roads that may be required and will also discuss the involvement of regional government and other staff familiar with potentially problematic areas for road construction and/or maintenance. The exact length of new and modified access roads will be determined upon finalization of the plan. A traffic management plan is also being developed that will incorporate measures to decrease impacts of increased truck traffic.

Construction of the Project will require constructing new roads to provide access for construction vehicles. Use of the new roads will continue during operation of the project. Improvements for construction vehicles generally will involve providing an all-weather surface for roads with a gravel surface that is 15 to 30 cm of crushed gravel of varying size or concrete surface. Existing intersections will be widened as needed to allow trucks to manoeuvre into and out of the construction area. A turning radius of 40 to 50 m is needed. All road improvements and new road routes will be marked by flagging or survey stakes, as required.

In areas where there are no roads near proposed wind turbine strings, new access roads will be constructed. Temporary turnaround areas will be situated at the end of each turbine strings that will provide the ability for the vehicles to turnaround.

Upon completion of wind turbine construction, the construction road width may be reduced after consultation with the local government. As required the reclamation of the road will involve the removal and transportation of the aggregate materials offsite for separating the salvageable material. Once aggregate base is removed, the ground shall be de-compacted and restored to pre-existing conditions and contours. The on-site service roads will be re-graded smooth with low spots and ruts filled in with the reusable gravel base material.

During site operations, roads will be inspected quarterly. Periodic grading and placement of gravel may be required to maintain road quality.

3.4.4 Erecting WTG's

3.4.4.1 Tower Foundations

The wind turbine foundation anchors the wind turbine structure securely to the ground. Typical foundation designs commonly used for wind turbine installations within the industry are the "mat" foundation, the “pile” foundation and the “Rock Anchor” foundation. The wind turbine foundation type and design will be determined based on the load information provided by the wind turbine manufacturer and the load bearing soil characteristics that are measured by the geotechnical test at the location of the wind turbines. Each foundation location will be surveyed, staked, and investigated for soil conditions prior to the construction of that foundation. The “mat” foundation design is the more common of the types named above and consists of a reinforced cement concrete spread foot foundation directly resting on the soil at a depth of approximately 3 meters below ground level. The mat foundation is generally an octagon shape having dimensions ranging from 15 to 20 m and a concrete pier on the top of the mat extending to the ground level. Typically, the amount of soil material excavated for a “mat” foundation ranges between 1500 to 2000 m^3 that is then replaced after completion of the foundation setup. The amount of concrete material needed to construct a typical foundation is approximately 500 to 650 m^3. Wherever possible, elements shall be incorporated into the foundation design that will facilitate demolition of the structure at the end of the project life. Alternatively, the Rock Anchor foundation may be possible to use depending on the strength of the underlying rock. This type of foundation requires drilling into the bed rock underneath the turbine and securing steel rods within the drill holes. These are then connected to a pedestal which the turbine then sits on. This type of foundation is lower impact but is more dependent on appropriate geotechnical conditions. However, it is considered, based on preliminary geotechnical investigation that the mat type foundation is the more appropriate for this site.

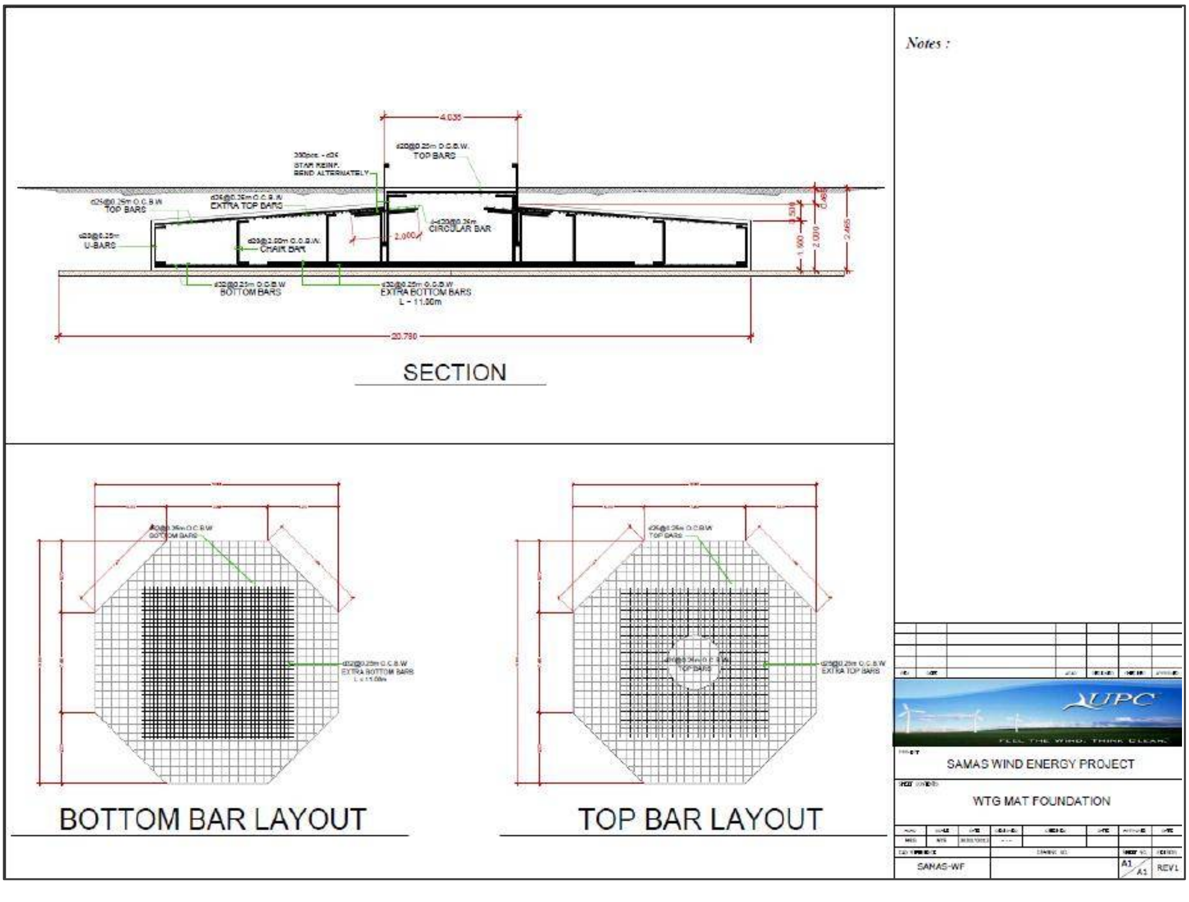

Figure 3-3 Typical WTG Mat Foundation

3.4.4.2 WTG Erection and assembly

Most of the major components will arrive in sections completely assembled and will be lifted in place. The rotor (consisting of the hubs and blades) will need to be assembled on the ground prior to lifting. The rotor will be placed with the nose up, and the assist crane will be used to lift blades so they can be attached to the rotor. Once these blades are attached, and the necessary hydraulic or electric connections are made between the hub and the blades, the complete rotor assembly will be ready for lift.

- Lift 1-4: Assembly of the tower – the base assembly section is bolted to the foundation using a pneumatic wrench followed by a specific torque wrench, and then other sections are progressively bolted together.

- Lift 5: Installation of the nacelle – the nacelle is lifted and placed on top of the completed tower.

- Lift 6: Installation of the rotor – the assembled rotor is lifted, stabilized with assistance from the secondary crane and tag lines extending from the upper rotor assembly to personnel guiding them, and attached to the main shaft protruding from the nacelle.

Once the crane and all wind turbine components have arrived at the site, the assembly of the major components takes 2-3 days. The lifting of large turbine components can only be done during periods of high visibility and low winds. Weather delays could occur at some sites. Two large cranes may be simultaneously installing turbines for a total of 4 to 5 turbines to be erected per week

3.4.5 Internal and External Transmission

The Gathering System 34.5KV lines will consist of 3 or 4 34.5 KV “strings”. Each string connects 9 or more turbines by a common electrical connection and then routes this 34.5KV line back to the Project substation. This is done by way of poles, typically of a distribution type, single pole or where necessary double pole type. The strings are designed to ensure minimum environmental disturbance and visual impact, whilst optimizing the route line and electrical losses.

An above-ground 150 kV overhead transmission line will be routed from the Project sub-station to connect with PLN’s 150 kV lines to Sidrap Sub-station, which is located north of the Project area. The Project overhead transmission line to the sub-station will be approximately 8 km in length.

The structures suggested to be used for the majority of the transmission line are lattice towers. Materials and tower components will be transported to the site via tractor trailer and will be staged and assembled (if necessary) at the location of installation. At the commencement of construction, material and components will be transported, as needed, from the staging area to the construction site.

Transmission line tower foundations are dependent on the type of terrain encountered, as well as the underlying geotechnical conditions. The actual size and type of foundation to be installed will depend on the soil bearing capacity.

The construction steps of the transmission line are listed below.

- Survey/Stake Site
- Clear/Grub Site
- Perform Site Grading
- Drill/Auger holes for bolt cage and cement foundation
- Install transmission poles
- Wire stringing, tensioning, and clipping
- Terminate wires at sub-stations

3.4.6 Control and Maintenance Facility

The O&M building will be building of approximately 20 m long by 10 m wide and built on two levels. The lower floor will contain the switchgear room, battery room and AC/DC converters. The upper floor will contain house the SCADA and Protection Equipment as well as the control room.

The Admin Building will be approximately 30m long by 10m wide and will have office facilities for management and staff a locker room, toilet facilities, kitchen facilities and a meeting room

The Warehouse Building will be approximately 26m long by 10m wide and will contain a workshop, and storage area.

All of the buildings will be located within a fenced area of approximately 2 ha. Telecommunications and electrical lines will also be connected to the building. A summary of activities are listed below. Additional details on the construction of the O&M building will be provided as they are developed during the detailed engineering process.

The construction of the O&M building(s) will require the following activities:

- Survey/Stake Site
- Clear/Grub Site
- Perform Site Grading
- Install Perimeter Fence
- Install Foundations and Slab
- Install a Gravel Parking Area
- Install Building
- Install Communication and Electrical Lines

3.5 Operation

Power from the turbines would be fed through a breaker panel at the turbine base inside the tower. In the base case Gamesa turbine the 690V generator voltage will be increased to 34.5kV via a transformer mounted inside the turbine nacelle.

The Phase I Project's wind turbines will be connected via an overhead gathering system which will collect the energy generated by each wind turbine and deliver to the Phase I Project sub-station, where it will be transformed to further increase the voltage so that it can be transmitted via a high-voltage transmission line to PLN. In order to connect the high voltage line from the Phase I Project to the utility line, a switching station will also be necessary at the point of interconnection.

Power will be transmitted via 34.5 kV electric cables (referred to as the Gathering System or MV system). The cables will be constructed aboveground, on pole or tower structures. Above ground structures allow the collector cables to span more rugged terrain and can span such formations as canyons, native grasslands, wetlands, and intermittent streams. The ground conditions at Sidrap have been assessed as being too complex and difficult to bury the Gathering System. Overhead 34.5 kV structures will generally be about 14 m tall. The turbines will be connected in several loops to the substation optimized to balance the power on each circuit, reduce the length of each line and minimize the electrical losses.

3.6 Decommissioning

To be advised in the Final ESHIA.

3.7 Project Justification and Alternatives

3.7.1 Project Justification

There is a power deficit in Indonesia that leaves approximately 30% of the country without a dependable electricity source, primarily in rural areas. In South Sulawesi there is only around 366MW of available electricity with a reported peak load of 867MW and a deficit of 501MW. To meet the user demand, expansion of power plant installed capacity and further reaching transmission corridors are required. The power sector is quickly growing in order to meet these demands, primarily through the use of traditional energy sources. Indonesia's power generation capacity grew from 21.5GW in 2004 to

29.3GW in 2011, increasing to 33.0 GW in 2012 . The make-up of energy sources is shown in Figure 3-4 (Source: PLN Statistics 2012). As shown, approximately half of electricity is generated from coal, with around 11% generated from geothermal and hydropower.

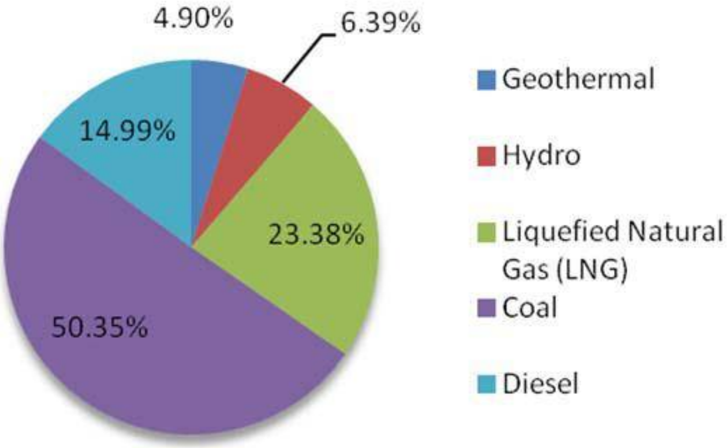

Figure 3-4 Indonesia Electrical Energy Sources (2012)

The 2012 PLN statistics report that only a small amount of energy - 0.34MW - is being generated from wind power. This is likely to be due to the fact that the windy areas of Indonesia do not generally experience long term high wind patterns when compared to other parts of the world, and so the viability of wind power generation has been marginal. Recent technological advancements in wind turbine design have resulted in turbines that are viable in areas with lower wind capacity.

There is a growing global concern about the impacts of climate change and the anthropogenic contributing factors that have caused atmospheric warming. The burning of fossil fuels and the conversion of land use from forests to agricultural or grazing land are the two most significant factors that have increased global concentrations of CO_2, which is the main anthropogenic GHG contributing to global warming, resulting in unprecedented levels of GHGs in the atmosphere. Primarily due to agriculture, global atmospheric concentrations of methane and nitrous oxide have also increased. Indonesia's contribution to global emissions is currently ranked number nine worldwide, in a three-way tie with the United Kingdom and Mexico. As Indonesia is the world's fourth most populous country, its per capita emissions are comparatively low. Eighty-one percent of Indonesia's emissions come from three primary sources: land use change (deforestation) (48%), the energy sector (20%), and peatland fires (13%).

In order to address the threat of climate change and Indonesia's contributions to global emissions, the government has issued the National Action Plan to Reduce GHG Emissions (RAN-GRK). The Government of Indonesia has made a strong commitment to reduce GHG emissions by 26% by 2020, with an additional 15% reduction contingent upon international support. The plan focuses on several areas where reductions in emissions can be made including agriculture, forestry and peat lands, energy and transportation, industry, and waste handling. RAN-GRK provides guidance for the local government and other related institutions on GHG emission reduction planning. RAN-GRK includes a target for renewable energy of 4.4 million tons of CO_{2e} by 2020.

Taking into account the need to balance the energy needs of the country with the goal of reducing total emissions, the annual increase in power generation capacity is occurring against the backdrop of a commitment by the Government of Indonesia to increase the proportion of renewable energy in the country's energy mix from 7% in 2006 to 15% in 2025 via Presidential Decree No 5 of 2006. In 2014, this law was updated in Government Regulation Number 79 Year 2014 on National Energy Policy to increase the proportion of renewables to at least 23% by 2025:

- New and Renewable: ≥ 23% (2025), ≥ 31% (2050)
- Oil: < 25% (2025), < 20% (2050)
- Coal: ≥ 30% (2025), ≥ 25% (2050)
- Gas: ≥ 22% (2025), ≥ 24% (2050)

This new law clearly shows greater commitment by the government to support the development of renewable energy sources throughout Indonesia.

The South Sulawesi Province electricity power system is currently being supplied by power plants interconnected to the 150 kV and 70 kV transmission systems in South and West Sulawesi (Sulselbar). There are 28 existing sub-station with a total capacity of 1,568 kVA, including an Interbus Transformer (IBT) with 150/70 kV ratio. Total power generation capacity is nearly 900 MW, while total peak load reaches 764 MW. The current electrification ratio in South Sulawesi Province is 78%, which is significantly higher than its neighboring provinces, West Sulawesi (55%) and Southeast Sulawesi (57.9%).

PLN has estimated the growth of the South Sulawesi Province's electricity demand from the period of 2010 – 2020 and this projection shows that sales will increase at a rate of 11.1% per annum, electricity production increasing at a rate of 11.1% per annum, peak load increasing at a rate of 11.0% per annum and the number of customers will increase at a rate of 5% per annum.

The regional electricity market also indicates consistent growth and a need for new generation in the near future.

3.7.2 Project Alternatives

Alternatives to the Project include alternative generation sources, alternative sites, alternative turbines, alternative landing location and the no project alternative.

3.7.2.1 The No Project Alternative

Sulawesi Island is one of the more power-deficient major islands in Indonesia, with an existing power deficit of more than 500MW in the south, west and southwest. In 2012 the power plant installed capacity was only 592MW. In the project region, electricity is sourced primarily from coal. As previously noted, 2012 PLN statistics report only a small amount of energy - .34MW - being generated from wind power, yet the government has implemented regulations to increase the amount of renewable energy across the power sector. With 50% of Indonesia's power being sourced from coal fired power plants, there is a need for increasing the percentage of renewable energy contribution, wind energy being one of these replacement forms of energy.

In Sulawesi, the obvious alternative to a wind farm project is increased production of power generated from the burning of coal, a traditional fossil fuel that provides half of the country's energy supply. A coal fired power plant generates electricity through heat energy, resulting in emissions from waste heat energy and flue gas. Flue gas emissions generally contain nitrogen, CO_2, water vapor, nitrous oxide (NOx), sulfur dioxide (SO_2), fly ash and particulate matter (PM_{10}). CO_2 emissions from coal, as the most carbon-intensive fossil fuel, are approximately double that of natural gas. [(6)] Coal is the number one energy-based source of CO_2 emissions globally, and has had an increasing role in global emissions since 1990.

3.7.2.2 Project Location

Project locations in Indonesia which would be suitable for wind power generation are fairly few. Most of the locations which are available have relatively low wind velocities compared to when farms located in other parts of the world. The ridges to be utilised for the Sidrap wind farm offer an excellent combination of topography and available resource, there are other locations in Southern Sulawesi which may be suitable, however it is expected that eventually most of the available wind resource will be exploited. The project location for the Sidrap wind farm is considered to be optimal because of its:-

- Wind profile;
- Favourable topography;
- Ability to be located around local communities with a minimum of intrusion;
- Proximity to potential points of landing the equipment and transporting to site; and
- Proximity to existing grid connections.

The current planned layout for the WTG array has been optimised around the available technology options, geography, and accessibility. UPC is constantly reviewing best application of technology and optimisation of project design. There may be some small changes as all avenues of optimisation are explored however there should not be a significant departure from the current planned layout.

3.7.2.3 Turbine Design

UPC has significant experience in the construction of wind power generation facilities, and an excellent working knowledge of best available technology (BAT). A number of potential equipment suppliers were considered for the project based on a variety of criteria, most important of which was availability of technology which will suit the wind profile of the project location. The Gamesa G114 turbine is currently considered the most suitable technology to handle the wind conditions at the site, and optimise the harvesting of energy.

3.7.2.4 Point of landing the equipment

The use of Pare Pare port is considered to be the best of a number of options, which included landing the goods at Makassar and shipping north by road. Construction of the materials offload (MOF) facility at Pare Pare port is clearly the better option, a small solid jetty will be constructed and it will be a matter of further engineering optimisation to decide if a moor and unload, or a beaching facility will be used. The proximity of Pare Pare means that only approximately 30 km of road transportation is required which will minimise the need for alteration of bends and curves and temporary displacement of services.

4.0 Scoping for International ESHIA and Comparative Impacts Matrix

4.1 Scoping Checklist for an IFC Compliant ESHIA

The gap analysis will analyse the specialised studies for what is needed to meet IFC requirements versus what is currently being done to meet local requirements and propose a plan for gap closure.

The primary task of this study will be to assess the Project with respect to the eight performance standards in the five environmental elements (i.e. specialised studies) and develop a study scope for each element. This scope will then be used as a reference against which each of the current AMDAL studies will be compared. Based on IFC requirement, the topics that will be investigated are:

- Land Use and Planning
- Surface Water Quality
- Hydrology and Hydraulics
- Groundwater
- Geology, Pedology and Topography
- Air Quality
- Noise
- Terrestrial Biota
- Aquatic Ecology/Marine Ecology
- Ecosystem Services
- Traffic and Transport
- Occupational Health and Safety
- Waste Management
- GHG and Climate Change
- Visual Impact
- Land Acquisition and Community Displacement
- Socio-Economic
- Community Amenity
- Cultural Heritage
- Socio-Cultural
- Indigenous Peoples
- Public Health
- Cumulative Impacts
- Labour and working conditions

4.2 Potential Impact Significance

Full details of the assessment of potential impacts for significance are provided in Appendix A. A risk assessment framework has been applied which considers a combination of the severity of the potential impact and the likelihood that it will occur. For the purposes of this scoping exercise and gap analysis only raw impacts have been considered, the final ESHIA document will consider mitigation strategies and represent a residual significance as well is the raw significance. For many environmental elements, the determination of severity can only be a semi-quantitative evaluation, whereas for some such as air or water quality there are measurable parameters which can be used to define severity. The severity of an impact is then combined with its potential likelihood to determine its significance as represented in Table 4-1.

Table 4-1 Risk Assessment Framework for Determining Impact Significance

	Impact Likelihood				
	Extremely Unlikely	**Unlikely**	**Low Likelihood**	**Medium Likelihood**	**Inevitable**

Impact Severity	**Positive**	Positive	Positive	Positive	Positive	Positive
	Slight	Negligible	Negligible	Negligible	Negligible	Negligible
	Low	Negligible	Negligible	Negligible	Minor	Minor
	Medium	Negligible	Minor	Minor	Moderate	Moderate
	High	Minor	Moderate	Major	Major	Critical
	Critical	Moderate	Major	Major	Critical	Critical

4.3 Potential Impacts Matrix

Scoping considers the potential impacts of the project in order to represent the mitigation strategies and management plans that will be put in place to eliminate or reduce the potential for an impact to occur. By definition at this scoping phase every potential impact needs to be considered, even if there are circumstances specific to either the project or the location which may render them to be insignificant. It is expected that through the impact assessment process some of the potential impacts which have been recognised here will be eliminated because they are not relevant to this particular project in this particular location. However for impacts whose significance will be reduced by mitigation, they will remain in the impacts register and the mitigation and monitoring strategies associated with their management will be reported in both the impact assessment and Environmental and Social Management Plan (ESMP).

An impacts matrix has been developed for the Project which considers each of the activities of the project, and associated activities of the project and their potential to cause an environmental impact under one of the categories defined in Section 4.1. A more detailed analysis of each potential impact is provided in Section 5.0 which will also provide the activity with which the impact has been associated and an analysis of its current status in the AMDAL which has been completed versus that which is likely to be required for an IFC compliant ESHIA. To enable comparison between the 2 sections each of the impacts presented in the impacts register have been given an impact code that will enable comparison with the gap analysis (

Table 4-2). The raw significance which has been calculated represents a desktop assessment based on information available and may be refined based on site observations. In cases where there is not enough information available to make an assessment significance has not been assigned.

Table 4-2 Impacts Register for the Project

	Impact Code	Potential Impact	Raw Significance
Land Use and Planning			
	LUP01	Loss of viable agricultural land due to project footprint	Minor
	LUP02	Project Compatibility with the regency 5 year plan?	Negligible
Surface Water Quality			
	WQ01	Sediment build-up in streams due to displaced soils	Negligible
	WQ02	Inflow of contaminants due to spills and losses	Moderate
	WQ03	Creation of stagnant, standing water by surface works	Negligible
	WQ04	Sewerage and domestic effluents from workers camps	Moderate
	WQ05	Sewerage and domestic wastewater from plant facilities	Minor
Surface Hydrology and Hydraulics			
	HDRL01	Alteration of drainage flows on and from the site due to road cut and fill	Minor
	HDRL02	Project Water Usage During Construction	Minor
	HDRL03	Site drainage alters drainage patterns in the study area	Minor
Groundwater			
	GW01	Potential Groundwater Contamination from Fuel Spills and Transport to Aquifers	Minor
	GW02	Dewatering of deep excavations for turbine masts may cause groundwater depletion	Negligible
	GW03	Deep excavations for turbine masts may expose aquifers to direct contamination	Negligible
Geology, Pedology and Topography			
	GEO01	Ground Contamination Due To fuel Spills on Refuelling and Lost Vehicle Fluids	Minor
	GEO02	Erosion of Soils in Exposed areas after clearing	Minor
	GEO03	Probability of landslips due to Road excavations	Negligible
	GEO04	Stability of Soils and Spoil Heaps	Minor
Air Quality			
	AQ01	Generation of TSP by Dust Generation	Moderate
	AQ02	Vehicle Emissions During Construction	Negligible
Noise and Vibration			
	NOI01	Construction Noise	Moderate
	NOI02	Wind Turbine Noise	Moderate
	NOI03	Traffic noise during operation	Negligible

	Impact Code	Potential Impact	Raw Significance
	NOI04	Vibration impact during earthworks and foundations works	Negligible
Terrestrial Ecology Fauna			
	FAUN01	Bird and Bat Strikes	Minor
	FAUN02	Species displacement due to lost habitats during land clearing	Moderate
	FAUN03	Interruption to fauna movements by roads and corridors	Negligible
Terrestrial Ecology Flora			
	FLRA01	Introduction and Spread of Weeds	Minor
	FLRA02	Lost ecosystems due to land clearing	Minor
Aquatic Ecology			
	AQUA01	Damage to riparian stream ecosystems and riparian habitats during construction	Negligible
Biodiversity Services			
	BSRV01	Potential Loss or alteration of biodiversity services to the local communities	Negligible
Waste Management			
	WAST01	Possibility of excess fills and spoils	Negligible
	WAST02	Management of topsoil, green waste and timber after clearing	Negligible
	WAST03	Management of waste materials from vehicle, plant and equipment operation and maintenance	Minor
	WAST04	Domestic waste from Workers Camps and site activities	Minor
	WAST05	Maintenance waste during operations	Minor
	WAST06	Management of Domestic waste during operations	Negligible
	WAST07	Disposal of spent materials on Project Closure	Moderate
Sustainability and Climate Change			
	SUS01	GHG emissions through construction phase	Negligible
	SUS02	Lifecycle analysis will need to be incorporated in the projected carbon footprint and integrated with the conceptual closure plans	Positive
	SUS03	Project carbon footprint	Positive
Traffic and Transport			
	TT01	Cartage of construction materials to site using public roads	Moderate
	TT02	Mobilisation of Civil Works Plant and Equipment to site	Negligible
	TT03	Construction traffic entering and leaving the site	Moderate
	TT05	Additional marine traffic importing project plant and equipment	Negligible

	Impact Code	Potential Impact	Raw Significance
Visual Impact			
	VIS01	Light Spill from Night Lighting of Secured Areas	Negligible
	VIS02	Visual impact on the surrounding area	Negligible
	VIS03	Light Flicker	Minor
Cultural Heritage			
	CH01	Potential loss of sites of cultural significance	Minor
Indigenous Peoples			
	IP01	Impacts or loss of home for indigenous peoples	Minor
Cumulative Impacts			
	CUM01	Cumulative impacts with other anthropogenic activities in the area	Moderate
Socio-Economic			
	ECON01	Employment of local labour during construction	Positive
	ECON02	Employment of Local Personnel During operation	Positive
	ECON03	Economic flow-ons from project activity in the area	Positive
	SOC01	Influx of workers during construction	Minor
Community Displacement			
	DISP01	Economic Displacement of Land Owners	Moderate
	DISP03	Economic Displacement of Third Parties	Minor
	DISP04	Temporary Use of land for construction activities	Minor
Commnity Ammenity			
	AMEN01	Restricted egress through the site due to perimeter fencing	Moderate
	AMEN02	Loss of facilities in communities to be acquired	Negligible
	AMEN03	Loss of the space used by the exclusion area	Negligible
Labour and working conditions			
	WORK001	This impact has been included as a general placeholder to acknowledge the need to deal with working conditions as part of the ESHIA	Unassigned
Public Health			
	PH01	Exposure of public to danger in civil works areas	Major
	PH02	Possible exposure of human sensitive receptors to elevated dust level during construction	Moderate
	PH03	Possible elevation of odour levels due to fuel handling and exhaust fumes	Negligible

5.0 Studies Requirements and Gap Analysis

In any scoping exercise it is appropriate to define the requirements of studies that will be needed to provide an appropriate assessment under each of the environmental elements that are being considered. In the case of this project and scoping exercise a local Indonesian AMDAL has already been prepared and a degree of assessment has been made and therefore scoping in this instance takes the form of the gap analysis defining the requirements to use the AMDAL study in an IFC compliant ESHIA. As noted in Section 2.0, current best practice requires that if there is a discrepancy between the IFC requirements and those of the local EIA process, then the more stringent of the 2 shall apply, in order to ensure that both requirements are met.

Thus in the sections below each of the environmental elements mentioned In Section 4.1 have been analysed at the level of each of the potential impacts which have been identified in Section 4.3 with respect to the level of analysis that has been applied in the AMDAL compared to what will be required for an IFC compliant ESHIA.

For each of the potential impacts the following are presented:

- Impact code and identity;
- A description of the project activity expected to generate the potential impact;
- An assessment of potential raw significance;
- A gap assessment of the impact versus what is currently in the AMDAL which includes:
  - Whether or not the impact is actually considered in the AMDAL,
  - A comment on the manner in which the impact is treated in the AMDAL;
  - A reference to the section of the AMDAL where the impact has been included;
  - A brief comment concerning what will be needed to further address the impact in an IFC compliant ESHIA.

Then for each environmental element, an assessment has been made of:

- The level of baseline study required for an ESHIA;
- The level of baseline study available from the AMDAL;
- A description of the need for supplementary baseline study; and
- An outline of the impacts analysis requirements for an ESHIA and the extent to which the AMDAL can provide that information.

A detailed field studies plan has been generated based on the requirements that have been identified in this section and is presented in Appendix B.

5.1 Land Use and Planning

ESHIA - Yes AMDAL - Yes

5.1.1 Potential Impacts and Gap Assessment

LUP01 **Loss of viable agricultural land due to project footprint**

Activity: Whole Of Project - Land Acquisition

Potential Raw Significance: Minor

Gap Assessment Included in the AMDAL - No

AMDAL Comment: No viable agricultural, but cashew plantations belong to residents, it is not considered as significant impact

AMDAL Reference:

Gap Comment: This issue will need to be addressed in more detail in the ESHIA.

LUP02 **Project Compatibility with the regency 5 year plan?**

Activity: Whole Of Project - Overall Construction Management

Potential Raw Significance: Negligible

Gap Assessment Included in the AMDAL - Yes

AMDAL Comment: Location allotment refers to Regional Regulation of the Sidenreng Rappang Regency No. 5 of 2012 on the General Spatial Plan Sidenreng Rappang Year 2012-2032. (20 years)

AMDAL Reference: Table 4-2 point 1

Gap Comment: Adapt from AMDAL

5.1.2 Supplementary Study Requirements - Land Use and Planning

ESHIA Baseline Requirements

Need to describe current land use for the project area, and relevant statutory planning.

AMDAL Baseline Requirements

AMDAL contains required information.

Supplementary Field Study Requirements

No supplementary study required

Impacts Analysis Requirements

AMDAL assessment appears adequate.

5.2 Surface Water Quality

ESHIA - Yes AMDAL - Yes

5.2.1 Potential Impacts and Gap Assessment

WQ01 Sediment build-up in streams due to displaced soils

Activity: Whole Of Project - Overall Construction Management

Potential Raw Significance: Negligible

Gap Assessment Included in the AMDAL - No

AMDAL Comment Affected streams are listed in Table 2-10, mostly ephemeral and periodic streams. No impact described

AMDAL Reference: 2.1.1.9.1

Gap Comment Will need to crosscheck this on the ESHIA site visit, the ESHIA will need to describe the possible fate of displaced sediments during rain events

WQ02 Inflow of contaminants due to spills and losses

Activity: Whole Of Project - Overall Construction Management

Potential Raw Significance: Moderate

Gap Assessment Included in the AMDAL - No

AMDAL Comment: Not covered

AMDAL Reference:

Gap Comment: The potential for this impact will need to be addressed in the ESHIA

WQ03 Creation of stagnant, standing water by surface works

Activity: Whole Of Project - Overall Construction Management

Potential Raw Significance: Negligible

Gap Assessment Included in the AMDAL - No

AMDAL Comment: Not covered

AMDAL Reference:

Gap Comment: There will be a need to describe the potential for this issue in the ESHIA, which will refer to an EMP for the management of civil works to avoid the creation of standing water.

WQ04 Sewerage and domestic effluents from workers camps

Activity: Whole Of Project - Overall Construction Management

Potential Raw Significance: Moderate

Gap Assessment Included in the AMDAL - No

AMDAL Comment: All domestic effluents will be collected in permanent septic system

AMDAL Reference: 2.1.3.6 TOR

Gap Comment: It is understood that 2nd season water quality sampling will cover what is needed will need to be written up. It is understood at the moment that the project will be a avoiding the use of workers camp's this needs to be resolved.

WQ05 Sewerage and domestic wastewater from plant facilities

Activity: Whole Of Project - Overall Construction Management

Potential Raw Significance: Minor

Gap Assessment Included in the AMDAL - No

AMDAL Comment: All domestic effluents will be collected in permanent septic system

AMDAL Reference:

Gap Comment: Probably can transfer from AMDAL

5.2.2 Supplementary Study Requirements - Surface Water Quality

ESHIA Baseline Requirements

An ESHIA study will require the establishment of water quality monitoring locations for potential receiving waters of project impacts. It is normal for such a study to include a full range of typical water quality parameters commensurate with a recognised guideline in most cases Indonesian standards for the collection and analysis of water quality are compatible.

AMDAL Baseline Requirements

There is no discussion at all of water quality in the AMDAL. Impacts on water quality were eliminated from the scope at the KA-ANDAL stage. There is in fact not even a description of downstream receiving waters or drainage from the site.A baseline study was undertaken by AECOM in the rainy season of 2013/2014 nine water quality sampling points were established, noting that most streams in the area were either ephemeral, or have periodic flow.

Supplementary Field Study Requirements

It will be necessary to undertake a dry season assessment of each of the nine recognised sampling points to determine flow characteristics, and if water is there to take samples. It is probably not relevant to take samples of standing water, but photographic record of the sampling locations should

Impacts Analysis Requirements

Water quality issues are likely to be limited to the migration of settlements, mostly during construction phase, with the possible consideration of wash from the service roads and facilities during operation. Consideration for the potential of sediment migration will need to assess the drainage characteristics from the site, and the potential intervention of vegetation and grassland to provide natural attenuation. (it should be noted that the AMDAL committee did not consider migration of settlements and water quality to be an issue that required reporting baselines or any ongoing monitoring). It is likely that, subject to establishing flow regimes relative to rainfall events, that monthly water quality sampling be recommended during construction if it occurs in the rainy season, and that ongoing biannual sampling in both wet and dry season be recommended for operational phase. Both baseline and impact analysis will need to be included in the ESHIA, they are not present in the

5.3 Surface Hydrology and Hydraulics

ESHIA - Yes AMDAL - Yes

5.3.1 Potential Impacts and Gap Assessment

HDRL01 **Alteration of drainage flows on and from the site due to road cut and fill**

Activity: Connecting Roads - Construction of connecting roads

Potential Raw Significance: Minor

Gap Assessment Included in the AMDAL - No

AMDAL Comment: Drainage will be constructed, along with access road, probably need a little bit more analysis of the potential impact.

AMDAL Reference:

Gap Comment: The ESHIA will need to discuss plans for linear and cross drainage of the access roads. It is understood that at the moment only tracks exist in many places with casual drainage.

HDRL02 **Project Water Usage During Construction**

Activity: Whole Of Project - Overall Construction Management

Potential Raw Significance: Minor

Gap Assessment Included in the AMDAL - No

AMDAL Comment Using ground water (well) as water source, not sure if the volumes required for construction are included.

AMDAL Reference:

Gap Comment: Will need to estimate volume of water required and drawdown from the well for the ESHIA

HDRL03 **Site drainage alters drainage patterns in the study area**

Activity: Whole Of Project - Overall Construction Management

Potential Raw Significance: Minor

Gap Assessment Included in the AMDAL - No

AMDAL Comment: Not covered

AMDAL Reference:

Gap Comment: Need to check site drainage patterns on the ESHIA site visit will need to write up in the ESHIA document.

5.3.2 Supplementary Study Requirements - Surface Hydrology and Hydraulics

ESHIA Baseline Requirements

Given the project is located on the ridge lines from which water will drain, it is not necessary to undertake flood modelling or analysis of rain events. It will be appropriate to provide an assessment of drainage patterns from the project area and from any service roads which are established, describing their interaction with the watershed and receiving waters.

AMDAL Baseline Requirements

Not considered in the AMDAL. Some watershed assessment was undertaken to inform the KA ANDAL, however the AMDAL committee did not consider surface hydrology to be of significance that warranted reporting in the AMDAL.

Supplementary Field Study Requirements

Further observational review of the site based on the new wind turbine configuration to describe potential receiving waters. As the next sampling exercise will be a dry season event, it is not expected to encounter any flow coming from the Ridge.

Impacts Analysis Requirements

It will be necessary to describe flow characteristics from the project site to advise potential fate and receiving waters for storm flows from the site. It is understood that there may be some construction of a service road, if possible that alignment should be reviewed for the possibility of cross drainage requirements, and if necessary to describe potential linear drainage impacts. It is understood that the area is quite dry in the dry season, and that soil can become friable and prone to erosion, in particular during first flow events that the commencement of rainy season. The erodibility of soils should be evident during dry season, as should the potential for natural attenuation from grasslands and vegetation.

5.4 Groundwater

ESHIA - Yes AMDAL - Yes

5.4.1 Potential Impacts and Gap Assessment

GW01 Potential Groundwater Contamination from Fuel Spills and Transport to Aquifers

Activity: Whole Of Project - Fuel Management

Potential Raw Significance: Minor

<u>Gap Assessment</u> Included in the AMDAL - No

AMDAL Comment: Baseline ground water quality available.

AMDAL Reference: Table 2-14

Gap Comment: The potential for this impact needs to be discussed in the ESHIA along with potential management plans such a spill response plans.

GW02 Dewatering of deep excavations for turbine masts may cause groundwater depletion

Activity: Wind Turbines - Construction and Installation of the turbines

Potential Raw Significance: Negligible

<u>Gap Assessment</u> Included in the AMDAL - No

AMDAL Comment: Excavation 3 m depth, no info about ground water depth. Only stating that it varies among geology features.

AMDAL Reference: 1.1.2.5.1

Gap Comment: Not likely to be an issue since most construction occurs along ridgelines. Geotechnical investigation has suggested that shallow foundations will only be required not likely to affect aquifers.

GW03 **Deep excavations for turbine masts may expose aquifers to direct contamination**

Activity: Wind Turbines - Construction and Installation of the turbines

Potential Raw Significance: Negligible

Gap Assessment Included in the AMDAL - No

AMDAL Comment: Excavation 3 m depth, no info about ground water table, and related impact

AMDAL Reference:

Gap Comment: As discussed in the issue concerning drawdown, it is not likely that aquifers will be affected.

5.4.2 Supplementary Study Requirements - Groundwater

ESHIA Baseline Requirements

An ESHIA study would be expected to describe groundwater quality and quantity. As the project takes place on ridge lines, and that the only project impacts are expected to be potential drawdown of water resource for construction water, and the possible dewatering of foundations mapping of water table is not necessary.

AMDAL Baseline Requirements

Issues of groundwater quality and quantity were not considered to be significant at the KA-ANDAL stage and not required to be included in the AMDAL. In a baseline study undertaken in the rainy season of 2013/2014 samples were taken from 2 natural springs, it was not possible to get to the source of those springs and samples were taken from the community reservoirs that they service.

Supplementary Field Study Requirements

Dry condition sampling should observe the flow characteristics of the two springs during dry season, and water quality sample should be taken from the same two reservoirs. Need to double check that there are no other potentially impacted community wells in the area.

Impacts Analysis Requirements

Potential impacts are likely to be limited. Analysis of water resources must consider what sources will be used for construction, particularly if it occurs in the dry season. Not dealt with in the AMDAL, ESHIA will need to provide a more complete assessment.

5.5 Geology, Pedology and Topography

ESHIA - Yes AMDAL - Yes

5.5.1 Potential Impacts and Gap Assessment

GEO01 **Ground Contamination Due To fuel Spills on Refuelling and Lost Vehicle Fluids**

Activity: Whole Of Project - Fuel Management

Potential Raw Significance: Minor

Gap Assessment Included in the AMDAL - No

AMDAL Comment: Bunded areas will be constructed in compliance with Indonesian environmental requirements.

AMDAL Reference: 2.1.3.7 TOR

Gap Comment: Likely that the AMDAL section can be transferred.

GEO02 Erosion of Soils in Exposed areas after clearing

Activity: Whole Of Project - Overall Construction Management

Potential Raw Significance: Minor

Gap Assessment Included in the AMDAL - No

AMDAL Comment: Prevented through culvert and drainage design. Baseline info only regarding type of soil which is sensitive to erosion.

AMDAL Reference: 1.1.1.1 and 2.1.1.6

Gap Comment: The ESHIA will need to address the issue,and will need to refer to the need for an erosion and sediment control plan.

GEO03 Probability of landslips due to Road excavations

Activity: Connecting Roads - Construction of connecting roads

Potential Raw Significance: Negligible

Gap Assessment Included in the AMDAL - No

AMDAL Comment: No assessed impact related to road excavation, but landslides is a potential natural disaster in the area.

AMDAL Reference: 2.1.1.7

Gap Comment: The ESHIA will need to address this issue specifically and appropriate responses in civil design and civil project management need to be described in the EMP.

GEO04 Stability of Soils and Spoil Heaps

Activity: Whole Of Project - Overall Construction Management

Potential Raw Significance: Minor

Gap Assessment Included in the AMDAL - No

AMDAL Comment: Not addressed in the AMDAL.

AMDAL Reference:

Gap Comment: The ESHIA will need to deal with plans for civil work management

5.5.2 Supplementary Study Requirements - Geology, Pedology and Topography

ESHIA Baseline Requirements

Key issues to be considered for the existing soil conditions are the status of the site with respect to viable topsoil of agricultural value, the erodibility of soils and whether or not the site has any pre- existing potential land contamination.

AMDAL Baseline Requirements

The AMDAL report provides information concerning soil types and some secondary information concerning potential for natural disasters. It doesn't include any specific assessment of slope stability of the specific site, nor does it deal explicitly with the issue of potential prior contamination of the land. The AMDAL assessment of the geology is poorly supported by reference to field methodologies and sampling.

As part of the site assessment it is normal for an AECOM team to undertake a rudimentary phase I

Supplementary Field Study Requirements

Phase 1 site observations were not explicitly reported in the first baseline study, as none were observed it will be necessary for the supplementary site visit to make a more formal review of potential contamination conditions. It is not understood if or when geotechnical investigation will take place for the siteif a formal geotechnical report has been prepared, then elements of it should be included in the ESHIA.

Impacts Analysis Requirements

It will be necessary to consider site topography and the potential for slippage of loose soils and spoils. It is normal that an erosion and sediment control plan be put in place. Assessment of the road alignment and construction activities for the potential of soil contamination from spillage of fuels and oils needs to be included.

AMDAL does appear to cover erosion issues suitably, but is not dealt with contaminated land issues explicitly.

5.6 Air Quality

ESHIA - Yes AMDAL - Yes

5.6.1 Potential Impacts and Gap Assessment

AQ01 **Generation of TSP by Dust Generation**

Activity: Whole Of Project - Overall Construction Management

Potential Raw Significance: Moderate

Gap Assessment Included in the AMDAL - Yes

AMDAL Comment: Covers modelling - but probably does not deal with this issue

AMDAL Reference: 3.1.2.1

Gap Comment: Modelling that has been undertaken will need to be reviewed, not sure if it covers the carriage of TSP, in fact not sure if prediction of the fate 4 generated dust is possible. Site visit will need to consider the possibilities of this issue and interaction with potential sensitive receptors, may be necessary to do some dustfall measurement at

AQ02 **Vehicle Emissions During Construction**

Activity: Whole Of Project - Overall Construction Management

Potential Raw Significance: Negligible

Gap Assessment Included in the AMDAL - Yes

AMDAL Comment: Covers modelling of CO, NO2, TSP.

AMDAL Reference: 3.1.2.1, 3.1.3.1, 3.1.4.1

Gap Comment: AMDAL covers this adequately.

5.6.2 Supplementary Study Requirements - Air Quality

ESHIA Baseline Requirements

An ESHIA study will require the description of the air-quality for a number of parameters that are likely to be impacted by the project. It is normal that Indonesian air-quality parameters and measurements for AMDAL baselines will be acceptable , although it will be necessary to justify why less modern

AMDAL Baseline Requirements

A single sampling event has taken place for air quality sampling and establishment of baseline levels, the sample was taken in rainy season and a dry season sample is required. The sampling event involved Indonesian standard methods, which although not fully in alignment with modern methods, can be justified given the availability of such methods in Indonesia. Samples were taken at four locations which can be averaged to give a baseline level. The sampling event did not include analysis

Supplementary Field Study Requirements

A second (dry season) sampling run is required, using the same points that we use for the AMDAL. It is suggested that if possible PM10 and PM2.5 also be measured with the TSP, and that a factorisation be developed for the relationship in the area.

Impacts Analysis Requirements

Consideration of vehicles during mobilisation and transportation of equipment as well is plant operation will need to be considered. Wind erosion of exposed soils, spoils and other dust generating activities will need to be considered during construction. Given the high wind of the area and the topography it is a challenge to define where dust will fall so modelling will not be necessary. AMDAL analysis will need to be expanded for the ESHIA.

5.7 Noise and Vibration

ESHIA - Yes AMDAL - Yes

5.7.1 Potential Impacts and Gap Assessment

NOI01 Construction Noise

Activity: Whole Of Project - Overall Construction Management

Potential Raw Significance: Moderate

Gap Assessment Included in the AMDAL - Yes

AMDAL Comment: Covers noise modelling from mobilization and road construction, not main building and power plant construction.

AMDAL Reference: 3.1.2.2, 3.1.3.2

Gap Comment: It is probably not warranted that Plant construction needs to be modelled for noise, but it will need to be dealt with in the noise section of the ESHIA. ESHIA Field Trip will need to have a closer look at potential sensitive receptors.

NOI03 Traffic noise during operation

Activity: Whole Of Project - Overall Construction Management

Potential Raw Significance: Negligible

Gap Assessment Included in the AMDAL - No

AMDAL Comment: Not usually dealt with in an AMDAL

AMDAL Reference:

Gap Comment: Will need some reference once we understand the transport routes and plans, it does not require modelling.

NOI04 **Vibration impact during earthworks and foundations works**

Activity: Whole Of Project - Overall Construction Management

Potential Raw Significance: Negligible

Gap Assessment Included in the AMDAL - No

AMDAL Comment: Vibration is not covered in AMDAL and considered as not significant impact (in KA) since project location is far from settlement

AMDAL Reference: 2.5.2.2.5 KA ANDAL

Gap Comment: Not likely to be an issue given the distance of the construction from the nearest residential receptors. ESHIA will need to address the

NOI02 **Wind Turbine Noise**

Activity: Wind Turbines - Operation of the Wind Turbines

Potential Raw Significance: Moderate

Gap Assessment Included in the AMDAL - Yes

AMDAL Comment: Covers noise modelling

AMDAL Reference: 3.2.1.1

Gap Comment: Will need to use the windpro model that we have. AMDAL does not usually take a receptor-by receptor approach to analysis and only uses reference to standard points. Field study will need to have a closer look at locations of receptors and probably do some mapping of individual residential receptors.

5.7.2 Supplementary Study Requirements - Noise and Vibration

ESHIA Baseline Requirements

Noise baselines will need to be determined that represent identified residential sensitive receptors, these measurements will need to be taken in accordance with WHO standards requiring 48-hour monitoring and 24 hour averaging. Noise will need to consider seasonality, and variability of wind conditions and may be necessary to undertake baseline sampling at representative times that correlate with variable wind conditions. Baseline will need to consider actual sensitive receptors,

AMDAL Baseline Requirements

Indonesian standard methods for determining noise on one occasion have been applied in the AMDAL. Noise measurements were taken at four locations which are the same as the air quality stations. There has been no mapping of actual sensitive receptors.

Supplementary Field Study Requirements

Appropriate WHO noise baseline data will need to be collected at points which are truly representative of impacted residential receptors, not the generic points which have been used in the AMDAL. It will be necessary to map actual residential receptors that may be impacted by the noise fields generated from the windpro model.

Impacts Analysis Requirements

It will be necessary to undertake modelling of the noise using appropriate software and applying it to the known turbine arrays. If options are being considered for turbine arrays they should also be modelled as proximity to residential receptors can have significant influence on noise impacts. Mitigation strategies will need to be described for any sensitive receptors for whom noise levels are expected to exceed WHO guidelines, or if baselines are greater than those guidelines; 3dB larger than the baseline.

Vibration assessment should consider the manner in which major earthworks are undertaken in particular piling or rock breaking activities. Detailed vibration modelling is probably not required given the distance to the nearest sensitive receptors, although slope gradients and the ability to stabilise soil and spoil heaps will need to be considered.

AMDAL analysis is not adequate for the ESHIA, it will be necessary to deal with considerations of

5.8 Terrestrial Ecology Fauna

ESHIA - Yes AMDAL - Yes

5.8.1 Potential Impacts and Gap Assessment

FAUN02 Species displacement due to lost habitats during land clearing

Activity: Whole Of Project - Overall Construction Management

Potential Raw Significance: Moderate

Gap Assessment Included in the AMDAL - No

AMDAL Comment: No protected fauna, Prevented by initial survey to make construction will not be done at sensitive area

AMDAL Reference: 2.5.2.2.3 KA ANDAL

Gap Comment: This issue was not covered in the AMDAL because it was discounted as an impact at the KA ANDAL stage which often happens, the ESHIA will need to revisit this issue in a little bit more detail.

FAUN03 Interruption to fauna movements by roads and corridors

Activity: Whole Of Project - Overall Construction Management

Potential Raw Significance: Negligible

Gap Assessment Included in the AMDAL - No

AMDAL Comment: No info, baseline is sufficient

AMDAL Reference:

Gap Comment: An ESHIA needs to mention that the issue has been considered, not expected to be any sort of an impact of significance

5.8.2 Potential Impacts and Gap Assessment

FAUN01 Bird and Bat Strikes

Activity: Wind Turbines - Operation of the Wind Turbines

Potential Raw Significance: Minor

Gap Assessment Included in the AMDAL - Yes

AMDAL Comment: Potential impact to 4 target species.

AMDAL Reference: 3.2.1.3

Gap Comment: 2nd season required for ESHIA work. 2nd season sampling will need to undertake assessment of avian species in accordance with the new IFC guidelines. Potential for migratory pathways and the presence of transitory species needs to be considered.

5.8.3 Supplementary Study Requirements - Terrestrial Ecology Fauna

ESHIA Baseline Requirements

For land bound fauna it will be necessary to define biodiversity values for the study area and identify any species of ecological significance, endangered status and correlation with ICUN red list. It will be necessary to undertake a complete study of avian species present in the project area including estimates are species density, flight and migration patterns and location of perching and nesting sites. It will also be necessary to describe whether or not such activities have potential to interact with wind turbines of the dimension proposed for the project. Will be necessary also to describe predatory habits, and reference to conservation listings and the ICUN red list. Seasonality will need to be considered, especially with respect to migratory species.

AMDAL Baseline Requirements

The AMDAL has included a single wet season sampling event which complies with IFC guidelines.

Supplementary Field Study Requirements

A full second (dry) season sampling event will need to be undertaken, with special consideration to migratory species which may be present at that time of year.

Impacts Analysis Requirements

AMDAL analysis appears suitable, but baseline is will need to be expanded for seasonal variations.

5.9 Terrestrial Ecology Flora

ESHIA - Yes AMDAL - Yes

5.9.1 Potential Impacts and Gap Assessment

FLRA01 **Introduction and Spread of Weeds**

Activity: Whole Of Project - Overall Construction Management

Potential Raw Significance: Minor

Gap Assessment Included in the AMDAL - No

AMDAL Comment: Not considered in the AMDAL.

AMDAL Reference:

Gap Comment: It is understood that most of the weed species that are possible to have been transferred, will already have done so given the lack of attention to this issue in general movements around Sulawesi.will need to be discussed in the ESHIA, will discuss with botany specialists with respect to current distribution of weeds. Should be noted that the land is not a particular agricultural importance that will suffer from the introduction of pest species.

FLRA02 **Lost ecosystems due to land clearing**

Activity: Whole Of Project - Overall Construction Management

Potential Raw Significance: Minor

Gap Assessment Included in the AMDAL - No

AMDAL Comment: No protected terrestrial flora, only concern is local cashew plantation. Baseline data is sufficient (has diversity index, etc)

AMDAL Reference: 2.5.2.2.3 TOR

Gap Comment: An issue that was dropped at the KA ANDAL stage and will need to be considered in more detail in the ESHIA, will need to be considered on the ESHIA site visit.

5.9.2 Supplementary Study Requirements - Terrestrial Ecology Flora

ESHIA Baseline Requirements

It will be necessary to describe a complete understanding of the current ecological value of any impact areas of the project footprint and associated infrastructure such as roadways and transmission lines. This will need to include a description of the nature of habitats, availability of biodiversity services and an overall assessment of the biodiversity present in the habitats that have been identified. Except in cases where highly modified habitats have obviously reduced biodiversity

AMDAL Baseline Requirements

The AMDAL did not consider terrestrial flora is a significant enough impact to warrant a detailed assessment. Most of the site is highly disturbed and cleared there are no remnant ecosystems of environmental value on the site.

Supplementary Field Study Requirements

A dry season sampling will need to be undertaken for each of the habitats that have been identified including a transect analysis of each location.

Impacts Analysis Requirements

AMDAL analysis appears adequate, but baseline considerations will need to be expanded for IFC COMPLIANT ESHIA.

5.10 Aquatic Ecology

ESHIA - Yes AMDAL - Yes

5.10.1 Potential Impacts and Gap Assessment

AQUA01 Damage to riparian stream ecosystems and riparian habitats during construction

Activity: Whole Of Project - Overall Construction Management

Potential Raw Significance: Negligible

<u>Gap Assessment</u> Included in the AMDAL - No

AMDAL Comment: Construction is not done in riparian area

AMDAL Reference: Figure 2-27

Gap Comment: This issue was dropped at KA ANDAL Stagegiven the distance from streams. Given the current understanding with respect to attenuation of sediment transport by local grasslands, it is likely that this potential impact can be dropped from the ESHIA, with a discussion that there is no potential for impact.

5.10.2 Supplementary Study Requirements - Aquatic Ecology

ESHIA Baseline Requirements

Although it is expected that will be limited impact on the aquatic ecology and water quality in the surrounding streams, that will differ from the existing environmental conditions; it will be necessary to describe existing aquatic ecosystems.

AMDAL Baseline Requirements

The AMDAL did not consider aquatic ecology to be an environmental value that required assessment.

Supplementary Field Study Requirements

A dry season sampling will need to be undertaken for all streams. This should include sampling for fish.

Impacts Analysis Requirements

This will align with the water quality work, it is anticipated that given the distance to many of the streams sedimentation impacts are not likely to change from existing environmental conditions. This of course assumes that appropriate methods of erosion and sediment control are put in place as part of the civil works. AMDAL do not consider any potential impacts on aquatic ecology this will need to be dealt with in the ESHIA.

5.11 Marine Ecology

ESHIA - Yes AMDAL - Yes

5.11.1 Supplementary Study Requirements - Marine Ecology

ESHIA Baseline Requirements

Not thought to apply to this project unless beach landing of equipment is used, or a MOF

AMDAL Baseline Requirements

Does not apply.

Supplementary Field Study Requirements

Need to discuss possible landing of equipment for the alternate transportation route.

Impacts Analysis Requirements

Depends on whether or not new landing facilities need to be considered. ESHIA may need to consider landing of the equipment if new facilities all beach landing are used. Likely to only require desktop assessment.

5.12 Biodiversity Services

ESHIA - Yes AMDAL - No

5.12.1 Potential Impacts and Gap Assessment

BSRV01 Potential Loss or alteration of biodiversity services to the local communities

Activity: Whole Of Project - Overall Construction Management

Potential Raw Significance: Negligible

<u>Gap Assessment</u> Included in the AMDAL - No

AMDAL Comment: Not an AMDAL requirement.

AMDAL Reference:

Gap Comment: Need to interact with the social survey to better understand land use, might need some supplementary consideration for the ESHIA site visit. It is understood that any use of the area is actually a formal agricultural activity rather than biodiversity services, although it is understood that nutmeg gathering does take place and not clear if that is a commercial activity or an opportune use of biodiversity services.

5.12.2 Supplementary Study Requirements - Biodiversity Services

ESHIA Baseline Requirements

An assessment of the project using the IFC Health Impact Guideline (see below) suggest that only a desktop appraisal using available secondary data is necessary.

AMDAL Baseline Requirements

AMDAL baseline contains adequate secondary data plus some data obtained from the community

Supplementary Field Study Requirements

No further information required

Impacts Analysis Requirements

5.13 Waste Management

ESHIA - Yes AMDAL - Yes

5.13.1 Potential Impacts and Gap Assessment

WAST01 **Possibility of excess fills and spoils**

Activity: Whole Of Project - Overall Construction Management

Potential Raw Significance: Negligible

Gap Assessment Included in the AMDAL - No

AMDAL Comment: Not covered

AMDAL Reference:

Gap Comment: The ESHIA will need to mention the need for the management of soils in spoils as part of civil Works planning and have a plan in place to develop a top soil and vegetation waste management plan. Probably warrants the talk through this issue with UPC.

WAST02 **Management of topsoil, green waste and timber after clearing**

Activity: Whole Of Project - Overall Construction Management

Potential Raw Significance: Negligible

Gap Assessment Included in the AMDAL - No

AMDAL Comment: Waste, debris, etc will be excavated and transported to dumping facilities or piled near work area for pengurugan.

AMDAL Reference: 1.1.2.8 and 2.1.5.3 TOR

Gap Comment: This was droppedat the KA-ANDAL Stage, ESHIA will need to deal with vegetation waste management.

WAST03 **Management of waste materials from vehicle, plant and equipment operation and maintenance**

Activity: Whole Of Project - Overall Construction Management

Potential Raw Significance: Minor

Gap Assessment Included in the AMDAL - No

AMDAL Comment: Will be transported to dedicated infrastructure

AMDAL Reference:

Gap Comment: Complete inventory of estimated waste, and management strategies need to be included in the ESHIA.

WAST04 **Domestic waste from Workers Camps and site activities**

Activity: Whole Of Project - Overall Construction Management

Potential Raw Significance: Minor

Gap Assessment Included in the AMDAL - Yes

AMDAL Comment: Baseline data from residential.

AMDAL Reference: 2.1.4.5

Gap Comment: Estimates of waste generation and a waste Management plan for construction and operational phase need to be included in ESHIA. It is not anticipated that workers camp will be in place, but there will be a Canteen site that will be generating domestic waste.

WAST05 **Maintenance waste during operations**

Activity: Whole Of Project - Overall Construction Management

Potential Raw Significance: Minor

Gap Assessment Included in the AMDAL - Yes

AMDAL Comment: Debris will be carried out in a provided particular disposal facilities.

AMDAL Reference: 1.1.3.3

Gap Comment: See earlier notes concerning need to outline waste management plans for the ESHIA.

WAST06 **Management of Domestic waste during operations**

Activity: Whole Of Project - Overall Construction Management

Potential Raw Significance: Negligible

Gap Assessment Included in the AMDAL - Yes

AMDAL Comment: Transported and collected in permanent septic system.

AMDAL Reference: 2.1.3.6 TOR

Gap Comment:AMDAL Reference: will probably suffice.

WAST07 **Disposal of spent materials on Project Closure**

Activity: Whole Of Project - Project Closure and Decommissioning

Potential Raw Significance: Moderate

Gap Assessment Included in the AMDAL - No

AMDAL Comment: Not dealt with in the AMDAL.

AMDAL Reference:

Gap Comment: Need to have a discussion with the client about life cycle and project closure.

5.13.2 Supplementary Study Requirements - Waste Management

ESHIA Baseline Requirements

Will need to describe the availability of facilities in the area for the management of waste including landfills and hazardous waste Management facilities.

AMDAL Baseline Requirements

The AMDAL doesn't provide a general description of the manner in which waste is disposed but doesn't describe the locations of landfills and facilities.

Supplementary Field Study Requirements

Will need more focused assessment of the fate of waste in the project area are present. It is suspected that there will be no formal landfill facilities or managed waste management facilities but this will need to be established.

Impacts Analysis Requirements

A detailed waste management plan for the project will need to be presented including the management of all classes of waste, this will need to include "cradle to grave" assessment of the fate of all wastes generated by the project through both construction and operation. The AMDAL will provide adequate assessment of waste management for any phase of the project this will need to be developed for the ESHIA.

5.14 Sustainability and Climate Change

ESHIA - Yes AMDAL - No

5.14.1 Potential Impacts and Gap Assessment

SUS01 **GHG emissions through construction phase**

Activity: Whole Of Project - Overall Construction Management

Potential Raw Significance: Negligible

Gap Assessment Included in the AMDAL - No

AMDAL Comment: Need further calculation

AMDAL Reference:

Gap Comment: Will need to undertake a calculation in accordance with the IFC guidelines.

SUS03 **Project carbon footprint**

Activity: Whole Of Project - Overall Construction Management

Potential Raw Significance: Positive

Gap Assessment Included in the AMDAL - No

AMDAL Comment: Need further calculation.

AMDAL Reference:

Gap Comment: Full GHG assessment for the project needs to be undertaken in accordance with IFC guidelines.

SUS02 **Lifecycle analysis will need to be incorporated in the projected carbon footprint and integrated with the conceptual closure plans**

Activity: Secuity and Enclosures - Vegetation Control

Potential Raw Significance: Positive

Gap Assessment Included in the AMDAL - No

AMDAL Comment: Need further calculation.

AMDAL Reference:

Gap Comment: Needs to be incorporated in an operational phase GHG assessment, in accordance with IFC guidelines.

5.14.2 Supplementary Study Requirements - Sustainability and Climate Change

ESHIA Baseline Requirements

No specific baseline required as there are no project related activities ongoing in the area are present.

AMDAL Baseline Requirements

Not an AMDAL requirement.

Supplementary Field Study Requirements

No additional baseline information required.

Impacts Analysis Requirements

A greenhouse gas assessment will need to be undertaken for a project in accordance with IFC guidelines.

5.15 Traffic and Transport

ESHIA - Yes AMDAL - Yes

5.15.1 Potential Impacts and Gap Assessment

TT01 **Cartage of construction materials to site using public roads**

Activity: Whole Of Project - Overall Construction Management

Potential Raw Significance: Moderate

Gap Assessment Included in the AMDAL - Yes

AMDAL Comment: Public road will be used during haul road construction.

AMDAL Reference: 1.1.2.4

Gap Comment: An indicative traffic and transport plan will need to be incorporated in the ESHIA, is a detailed plan is not yet available. There will need to be a description of any estimates changes to existing traffic patterns and flows.

TT02 **Mobilisation of Civil Works Plant and Equipment to site**

Activity: Whole Of Project - Overall Construction Management

Potential Raw Significance: Negligible

Gap Assessment Included in the AMDAL - Yes

AMDAL Comment: Includes modelling of traffic condition.

AMDAL Reference: 3.1.2.4

Gap Comment: AMDAL coverages probably adequate, needs to be reviewed in a little bit more detail. The route that has been considered needs to be revisited given the revised transport plan.

TT03 **Construction traffic entering and leaving the site**

Activity: Whole Of Project - Overall Construction Management

Potential Raw Significance: Moderate

Gap Assessment Included in the AMDAL - Yes

AMDAL Comment: Doesn't appear to have been addressed specifically but traffic and transport has been dealt with in some detail.

AMDAL Reference: 3.1.2.4

Gap Comment: Needs to be part of a traffic and transport plan, not necessarily developed in the ESHIA, but the needs defined.

TT05 Additional marine traffic importing project plant and equipment

Activity: Wind Turbines - Construction and Installation of the turbines

Potential Raw Significance: Negligible

Gap Assessment Included in the AMDAL - Yes

AMDAL Comment: Towers component will be transported to the nearest port, no impact assessed in the AMDAL.

AMDAL Reference: 1.1.2.2

Gap Comment: It doesn't appear that Marine traffic will be a major issue, but the issue will need to be visited in the ESHIA.

5.15.2 Supplementary Study Requirements - Traffic and Transport

ESHIA Baseline Requirements

It will be necessary to define the current condition of roads that will be used by the project and project personnel through all phases of the project. This will need to include an assessment of engineering competence, suitability for purpose (issues such as overhead lines et cetera) and current traffic

AMDAL Baseline Requirements

ANDAL provides extensive baseline information concerning the transportation route from Makassar.

Supplementary Field Study Requirements

Client has advised that an alternate transportation route has been identified including a landing of the project components to the north of Parepare and a Road transport route to site including the construction of some new roads. The revised transport planwill need to be reviewed and it may be necessary to undertake further traffic studies for the new route.

Impacts Analysis Requirements

The AMDAL analysis appears adequate, however it does not consider the potential new route. It is understood that the AMDAL will need to be revised for the new transport plan and expected that the AMDAL analysis can be directly applied to the ESHIA.

5.16 Visual Impact

ESHIA - Yes AMDAL - No

5.16.1 Potential Impacts and Gap Assessment

VIS01 Light Spill from Night Lighting of Secured Areas

Activity: Secuity and Enclosures - Isolation of the site and management of Security

Potential Raw Significance: Negligible

Gap Assessment Included in the AMDAL - No

AMDAL Comment: Not covered

AMDAL Reference:

Gap Comment: It is understood that the project area will be some distance from the nearest residential receptors in that light spill is not likely to be an issue during construction phase, this needs to be confirmed.

VIS02 **Visual impact on the surrounding area**

Activity: Whole Of Project - Overall Construction Management

Potential Raw Significance: Negligible

Gap Assessment Included in the AMDAL - No

AMDAL Comment: Not an AMDAL issue

AMDAL Reference:

Gap Comment: LVIA will be undertaken as part of the ESHIA study.

VIS03 **Light Flicker**

Activity: Whole Of Project - Overall Construction Management

Potential Raw Significance: Minor

Gap Assessment Included in the AMDAL - Yes

AMDAL Comment: Covers modelling of flicker, but do not differ flicker and glint

AMDAL Reference: 3.2.1.2

Gap Comment: A little bit more of a detailed analysis of this issue needs to be covered in accordance with IFC guidelines, in typical AMDAL visual impact of any sort is not usually considered. Of course a wind farm is a very unique project activity, and will probably get more attention in AMDAL in the future. Visual impacts are of course very topical at an

5.16.2 Supplementary Study Requirements - Visual Impact

ESHIA Baseline Requirements

It will be necessary to define existing visual values for the project area. This is usually achieved by field observation and the preparation of photography which has been collected using settings that are identified as being "neutral" for the representation of near and far Field visual impacts. Given the nature of a wind farm Project and international sensitivities with respect to visual impact it is appropriate that every conceivable viewpoint be considered.

AMDAL Baseline Requirements

Not an AMDAL requirement.

Supplementary Field Study Requirements

Targeted visual impact assessment will need to take place at site on the next field visit including assessment of any locations which are considered to have an aspect to the project. The development of specific sensitive receptor locations will need to be mapped and overlaid with modelling.

Impacts Analysis Requirements

Light flicker and glint will need to be modelled and shown in the ESHIA for specific receptor fields. An appropriate VIA needs to be undertaken to recognised international standards; this is expected to be limited to a desk top review, with the preparation of some photo montages. Since visual impact values are not considered to be of high significance in Indonesia it is considered that receptor sensitivity to visual impact is quite low. Not included in the AMDAL as this is not an AMDAL requirement. However the issues of light flicker and glint were dealt with.

5.17 Cultural Heritage

ESHIA - Yes AMDAL - Yes

5.17.1 Potential Impacts and Gap Assessment

CH01 **Potential loss of sites of cultural significance**

Activity: Whole Of Project - Overall Construction Management

Potential Raw Significance: Minor

Gap Assessment Included in the AMDAL - No

AMDAL Comment: No information regarding heritage sites

AMDAL Reference:

Gap Comment: The ESHIA site visit will need to pay a little bit more attention to this issue, as it is considered to be an important one for most financial institutions. There does not appear to be enough rigour in the conclusionsthat had been reached in the AMDAL process. There will be a need to mention chance find procedures in the ESHIA.

5.17.2 Supplementary Study Requirements - Cultural Heritage

ESHIA Baseline Requirements

Will be necessary to report all items of cultural heritage significance in the area. It is understood that this is only likely to apply to the possible presence of gravesites. An appropriate archaeological survey of the area needs to be undertaken.

AMDAL Baseline Requirements

No cultural Heritage issues reported.

Supplementary Field Study Requirements

A targeted cultural Heritage survey needs to be conducted.

Impacts Analysis Requirements

Anecdotal information suggests that the team to visit the site did not observe any items of particular cultural significance that would warrant consideration. This needs to be confirmed and if so then assessment of cultural heritage will only need to consider the possibility of chance finds during land clearing and excavation. Not dealt with in the AMDAL, will need to be included in the ESHIA.

5.18 Indigenous Peoples

ESHIA - Yes AMDAL - Yes

5.18.1 Potential Impacts and Gap Assessment

IP01 **Impacts or loss of home for indigenous peoples**

Activity: Whole Of Project - Land Acqusition

Potential Raw Significance: Minor

Gap Assessment Included in the AMDAL - No

AMDAL Comment: IP is not considered in the AMDAL.

AMDAL Reference:

Gap Comment: It is understood this hasn't been dealt with in the AMDAL at all, there will be a need to look into definitions and presence of indigenous peoples in the area and demonstrated in the ESHIA.

5.18.2 Supplementary Study Requirements - Indigenous Peoples

ESHIA Baseline Requirements

Project will need to demonstrate an appropriate assessment for the presence of indigenous peoples in the project area.

AMDAL Baseline Requirements

Not mentioned in the AMDAL.

Supplementary Field Study Requirements

It will be necessary to confirm that there are no indigenous peoples groups or communities in the project area, this extends beyond the simple analysis of Indonesia register. The following tests should be applied: Self-identification as members of a distinct indigenous cultural group and recognition of this identity by others; Collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories; Customary cultural, economic, social, or political institutions that are separate from those of the mainstream society or culture; or

Impacts Analysis Requirements

It is currently not thought that there are any IP's in the project area; if this is found to be incorrect then the considerations of performance standard seven will need to be applied. Not considered to be significant enough to warrant reporting in the AMDAL, however it is important that the ESHIA addresses the issue of analysis of the project area for IP's.

5.19 Environmental Risk

ESHIA - Yes AMDAL - No

5.19.1 Supplementary Study Requirements - Environmental Risk

ESHIA Baseline Requirements

Need to demonstrate a clear understanding of the project location and its exposure to extreme events such as seismic or weather-related incidents and its vulnerability to natural or unnatural events such as landslides or flooding.

AMDAL Baseline Requirements

Not an AMDAL requirement. However consideration of geology and weather in baselines will provide the data that is required.

Supplementary Field Study Requirements

No additional field data required.

Impacts Analysis Requirements

The ESHIA will need to consider all nonroutine events that may occur during the life of the project, their impact on the project, and the potential for the project to compound impacts, or alter the existing environmental values. Issues such as emergency response procedures and procedures for responding to extreme weather conditions will need to be presented as mitigation strategies. There are elements of ERA in various parts of the AMDAL, but the issue has not been dealt with explicitly and will need to be compiled for the ESHIA.

5.20 Cumulative Impacts

ESHIA - Yes AMDAL - No

5.20.1 Potential Impacts and Gap Assessment

CUM01 **Cumulative impacts with other anthropogenic activities in the area**

Activity: Whole Of Project - Overall Construction Management

Potential Raw Significance: Moderate

Gap Assessment Included in the AMDAL - No

AMDAL Comment: Activities around project area are cashew plantation and livestock.

AMDAL Reference: 2.2

Gap Comment: A more systematic cumulative impact assessment in accordance with IFC guidelines will need to be undertaken. It is not thought there are any other anthropogenic activities in the area that will contribute to cumulative impacts with this project. There may be some short-term cumulative impacts associated with transportation of the equipment to site.

5.20.2 Supplementary Study Requirements - Cumulative Impacts

ESHIA Baseline Requirements

Need to understand all other anthropogenic activities in the area which may contribute to cumulative impacts, or may themselves be impacted by this project.

AMDAL Baseline Requirements

Not AMDAL requirement.

Supplementary Field Study Requirements

Need to undertake a review of all other activities in the area which may contribute to cumulative impacts with this project. In particular aspects such as road use, visual impact and community development may need to be considered.

Impacts Analysis Requirements

Cumulative impacts analysis needs to be undertaken in accordance with IFC guidelines as per good practice Handbook August 2013. No cumulative impact assessment included in the AMDAL.

5.21 Socio-Economic

ESHIA - Yes AMDAL - Yes

5.21.1 Potential Impacts and Gap Assessment

ECON01 **Employment of local labour during construction**

Activity: Whole Of Project - Overall Construction Management

Potential Raw Significance: Positive

Gap Assessment Included in the AMDAL - Yes

AMDAL Comment: Work opportunity and income improvement

AMDAL Reference: 3.1.1.1 and 3.1.1.3

Gap Comment: There have been some calculations made in the AMDAL, the ESHIA will need to visit those and test their basis and rigour.

ECON02 **Employment of Local Personnel During operation**

Activity: Whole Of Project - Overall Construction Management

Potential Raw Significance: Positive

Gap Assessment Included in the AMDAL - Yes

AMDAL Comment: Not considered as significant impact -but has been addressed in the AMDAL.

AMDAL Reference:

Gap Comment: There will be a need to outline the potential for the employment of local personnel during the construction and operation phase in the international ESHIA. AMDAL information is likely to be sufficient.

ECON03 Economic flow-ons from project activity in the area

Activity: Whole Of Project - Overall Construction Management

Potential Raw Significance: Positive

Gap Assessment Included in the AMDAL - Yes

AMDAL Comment: Increased income for construction worker, multiplier effect is

considered as significant impact .

AMDAL Reference: 3.1.1.3, 3.2.1.4

Gap Comment: There has been analysis in the AMDAL which can probably be transferred, but there will need to be a review of the calculations and the rigour under which they been undertaken, sometimes assumptions in the AMDAL process are a little loose.

5.21.2 Supplementary Study Requirements - Socio-Economic

ESHIA Baseline Requirements

It is usual that the Land Census information that is collected as part of the LARAP can be used to underpinned secondary data concerning social economic circumstances in the area. Some projects also include a cost benefit analysis of the project, however that is not essential and probably not necessary for this project. As an extension of the economic displacement issues an understanding of issues such as local employment rates, availability of skilled and unskilled labour in the local area, availability of local enterprise they can service project needs and availability of services for the workforce and project should be considered. Information concerning all of these aspects of the local

AMDAL Baseline Requirements

The AMDAL contains significant significant analysis of secondary data.

Supplementary Field Study Requirements

AECOM to liaise with UPC on whether there is any information available on project cost benefit analysis that may be developed for other purposes. AECOM to review land Census information collected as part of the land acquisition process to bolster the secondary data which is available from local government statistics.

Impacts Analysis Requirements

It will be necessary to describe all aspects of the interaction of the project, and its personnel with local enterprise and economy. This will include availability of employment for local people, assessment of opportunities for the project and its personnel to avail themselves of local businesses and suppliers and the manner in which the project is likely to interact with local service providers. It is not uncommon although not absolutely necessary that a cost benefit is often provided to demonstrate broader benefits of the project to the general community, this could include improvement in the availability of power to meet the future needs of the province or in fact the local area.

5.22 Socio-Cultural

ESHIA - Yes AMDAL - Yes

5.22.1 Potential Impacts and Gap Assessment

SOC01 **Influx of workers during construction**

Activity: Whole Of Project - Overall Construction Management

Potential Raw Significance: Minor

Gap Assessment Included in the AMDAL - Yes

AMDAL Comment: AMDAL coverage is probably adequate.

AMDAL Reference: 3.1.4.3

Gap Comment: Can be adapted for use in the ESHIA.

5.22.2 Supplementary Study Requirements - Socio-Cultural

ESHIA Baseline Requirements

It will be necessary to describe the sociocultural setting of the local communities and broader areas that may be interacting with the project including any areas and facilities which may be utilised by personnel during construction or operational phases of the project. It is not anticipated that the wind farm project will challenge local cultural values in its construction or operation, but the presence of imported personnel in an area which may be fairly remote may have an impact on existing cultural aspects. Matters such as the availability of places of worship, capacity of local facilities interaction

AMDAL Baseline Requirements

AMDAL baseline provides significant information (mostly secondary data). A primary survey of hundred and seventeen random residents in the area representing the four villages has been undertaken and is presented.

Supplementary Field Study Requirements

No further study required.

Impacts Analysis Requirements

It will be necessary to make an assessment of all aspects in which the project will interact with the distinct cultural and traditional values of this remote community. Issues will need to be considered such as where project personnel will be accommodated, where they will worship, what community facilities they will avail themselves of and how they will interact with the local community. The assessment should also consider the possible presence in the community of marginalised groups based on gender, religion, race or origin, and perhaps identify opportunities for the project to interact in a positive way.

5.23 Community Displacement

ESHIA - Yes AMDAL - Yes

5.23.1 Potential Impacts and Gap Assessment

DISP01 **Economic Displacement of Land Owners**

Activity: Whole Of Project - Land Acquisition

Potential Raw Significance: Moderate

Gap Assessment Included in the AMDAL - No

AMDAL Comment: Not described impact to economic displacement, therefore LA is set according to national regulation and IFC

AMDAL Reference: 3

Gap Comment: An IFC compliant LARAP will need to be developed

DISP03 **Economic Displacement of Third Parties**

Activity: Whole Of Project - Land Acqusition

Potential Raw Significance: Minor

Gap Assessment Included in the AMDAL - No

AMDAL Comment: No described impact to economic displacement of 3rd parties, LA is set according to national regulation and IFC

AMDAL Reference: 3

Gap Comment: LARAP will need to consider economic displacement to 3rd parties

DISP04 **Temporary Use of land for construction activities**

Activity: Whole Of Project - Overall Construction Management

Potential Raw Significance: Minor

Gap Assessment Included in the AMDAL - No

AMDAL Comment: ANDAL only covers social dynamics, how worker influx will affect social, religion, racial issue that may lead to conflict

AMDAL Reference: 3.1.1.4

Gap Comment: ESHIA needs to discuss the possible use of lay down areas and temporary access during construction with UPC

5.23.2 Supplementary Study Requirements - Community Displacement

ESHIA Baseline Requirements

There will be a need for a separate LARAP providing full details of all Potentially Affected Parties (PAP's) the LARAP should detail the names of all individuals and their social and economic circumstances as well as the planned nature of compensation for their loss.

AMDAL Baseline Requirements

The AMDAL does not deal with land acquisition issues.

Supplementary Field Study Requirements

It is understood that UPC are preparing a LARA of the project, it will need to include all land acquisition and consideration of economic displacement. It is also understood that UPC have been interacting with the local communities to ensure they capture all of these issues. Suggest that AECOM interacts with the UPC personnel handling this exercise to ensure that our needs are aligned.

Impacts Analysis Requirements

Impact analysis will need to demonstrate that all displacement issues are dealt with in accordance with performance standard 5. That is that appropriate surveys of loss are undertaken and agreed with the PAP's and that the rates for compensation can be demonstrated to be fair and reasonable against market rates. Further that the project has considered vulnerability issues for the circumstances of those displaced and the nature of their displacement. Not adequately covered in the AMDAL will need full assessment in the ESHIA derived from the LARAP

5.24 Community Amenity

ESHIA - Yes AMDAL - Yes

5.24.1 Potential Impacts and Gap Assessment

AMEN01 Restricted egress through the site due to perimeter fencing

Activity: Security and Enclosures - Isolation of the site and management of Security

Potential Raw Significance: Moderate

Gap Assessment Included in the AMDAL - No

AMDAL Comment: Not dealt with as an AMDAL issue

AMDAL Reference:

Gap Comment: Will need to discuss with the client prior to the ESHIAField Trip in terms of what access they will be allowing through the site, given that it is a multiple footprint site during construction, and how the project will deal with trespass/encroachment.

AMEN02 Loss of facilities in communities to be acquired

Activity: Whole Of Project - Overall Construction Management

Potential Raw Significance: Negligible

Gap Assessment Included in the AMDAL - No

AMDAL Comment: No impact identified.

AMDAL Reference:

Gap Comment: this impact can probably be shut down, as there are no nearby communities that are likely to lose any facilities, the ESHIA will need to address this issue to indicate that has been included but there is no impact.

AMEN03 Loss of the space used by the exclusion area

Activity: Whole Of Project - Project Staffing and Management

Potential Raw Significance: Negligible

Gap Assessment Included in the AMDAL - No

AMDAL Comment: Not really considered an issue.

AMDAL Reference:

Gap Comment: ESHIA will need to demonstrate that this aspect has been considered.

5.24.2 Supplementary Study Requirements - Community Amenity

ESHIA Baseline Requirements

Will be necessary to understand whether or not the establishment of the project will have any impact on community amenity. These aspects are generally mostly spatial and can refer to the manner in which the community members travel from place to place, and where they may undertake aspects of functional, recreational, spiritual aspects of their day-to-day lives.

AMDAL Baseline Requirements

The AMDAL has undertaken extensive public consultation and given the community opportunity to respond on these issues.

Supplementary Field Study Requirements

No specific aspects of community amenity have been raised in the AMDAL, is not believe that further community consultation will be necessary this will be confirmed by the team who undertook the public consultation.

Impacts Analysis Requirements

It will be necessary to describe if the project will change any aspects of community amenity. This can mean the loss of places of significance used by the local community for functional, recreational or spiritual purposes and needs to consider all levels of the local community and society (for instance local swimming hole for the children). Consideration of alterations of community amenity should also include whether or not the physical location of the project will alter egress or travel through the site or the site area either temporarily or permanently. Mitigation strategies should consider whether or not temporary or permanent restorationor preservation of community amenity can be achieved, and if not if loss of amenity can be offset by replacing or upgrading existing facilities. May need further development from the AMDAL.

5.25 Labour and Working Conditions

ESHIA - Yes AMDAL - No

5.25.1 Potential Impacts and Gap Assessment

WORK001 This impact has been included as a general placeholder to acknowledge the need to deal with working conditions as part of the ESHIA

Activity: Whole Of Project - Project Staffing and Management

Potential Raw Significance:

Gap Assessment Included in the AMDAL - No

AMDAL Comment: Not an AMDAL issue.

AMDAL Reference:

Gap Comment: Not AMDAL issue at all, but there needs to be a section in the issue which deals with the requirements of IFC performance standard 2.

5.25.2 Supplementary Study Requirements - Labour and Working Conditions

ESHIA Baseline Requirements

No baseline required.

AMDAL Baseline Requirements

Not AMDAL requirement.

Supplementary Field Study Requirements

No supplementary field studies required at site.

Impacts Analysis Requirements

There will need to be a full review of the project and its approach to working conditions and OHS via its policy documentation and the mechanisms by which that will be transferred through to downstream contracting and the engagement and employment of the workforces. Issue not addressed in the AMDAL this is not an AMDAL requirement.

5.26 Public Health

ESHIA - Yes AMDAL - Yes

5.26.1 Potential Impacts and Gap Assessment

PH01 Exposure of public to danger in civil works areas

Activity: Whole Of Project - Overall Construction Management

Potential Raw Significance: Major

Gap Assessment Included in the AMDAL - Yes

AMDAL Comment: Other than health issue, mobilization by heavy vehicle may lead to accidents.

AMDAL Reference: 3.1.2.5

Gap Comment: There will be a need to deal with issues of public safety in and international ESHIA.

PH02 Possible exposure of human sensitive receptors to elevated dust level during construction

Activity: Whole Of Project - Overall Construction Management

Potential Raw Significance: Moderate

<u>Gap Assessment</u> Included in the AMDAL - Yes

AMDAL Comment: Baseline condition states that ARI is prevalence disease, and mobilization activity will increase disease pattern.

AMDAL Reference: 3.1.3.3

Gap Comment: The terminology will need to be softened for the international ESHIA, as there is no real pathway to receptor demonstrated. This will need to be revisited. This may be somewhat overstated in the AMDAL.

PH03 Possible elevation of odour levels due to fuel handling and exhaust fumes

Activity: Whole Of Project - Overall Construction Management

Potential Raw Significance: Negligible

<u>Gap Assessment</u> Included in the AMDAL - No

AMDAL Comment: No section covers odour issue

AMDAL Reference:

Gap Comment: Not likely to be an issue, this impact can probably be shut down and some reference made to its consideration in the ESHIA document.

5.26.2 Supplementary Study Requirements - Public Health

ESHIA Baseline Requirements

An assessment of the project using the IFC Health Impact Guideline (see below) suggest that only a desktop appraisal using available secondary data is necessary.

AMDAL Baseline Requirements

AMDAL baseline contains adequate secondary data plus some data obtained from the community

Supplementary Field Study Requirements

No further information required

Impacts Analysis Requirements

The IFC Health Impact Guidelines require impact assessment for public health which is commensurate with a number of parameters that need to be considered for the project relating to potential health impacts from the project, aspects of the project footprint and social sensitivity. The parameters that need to be considered specifically are:

Public health:

Hazardous materials exposure-minimal;

Resettlement/relocation-there is none;

Endemic disease profile-nothing out of the ordinary;

Health systems/infrastructure status-reasonable, to Indonesian standards;

Stakeholder concerns-none identified.

Overall Public Health sensitivity - Low

Project footprint:

Knowledge-well-known only small changes the layout being considered;

Physical area, number of people impacted-the areas remote from communities, it will not remove access to food and livelihood;

Timescale of impact-construction may have greater impact and will last for approximately eighteen months;

Precedence - there have been no previous projects of this nature in this area this is the first of its type; Complexity-most of the workforce will come from Indonesia and will not involve the import of a significant number of foreign workers, operational phase will have a very low staff member.

Overall project footprint sensitivity-low.

Social sensitivity:

Socio-economic situation-relatively low income remote community;

Conflict-none known;

Human rights-nothing out of the ordinary for Indonesia, the project intends to respect international conventions for human rights;

Resettlement-none;

Indigenous people - none known in the area;

Vulnerable communities-although not wealthy communities, there are no aspects of this project that would exploit or threaten vulnerabilities;

Appendix A – Impact Assessment Methodology

Appendix A

The Environmental and Social Impact Assessment Process

Contents

List of Figures

List of Tables

1.0 The Environmental Impact Assessment Process

The ESHIA process will be undertaken in accordance with IFC guidelines and can be represented as shown in **Figure 3-1**.

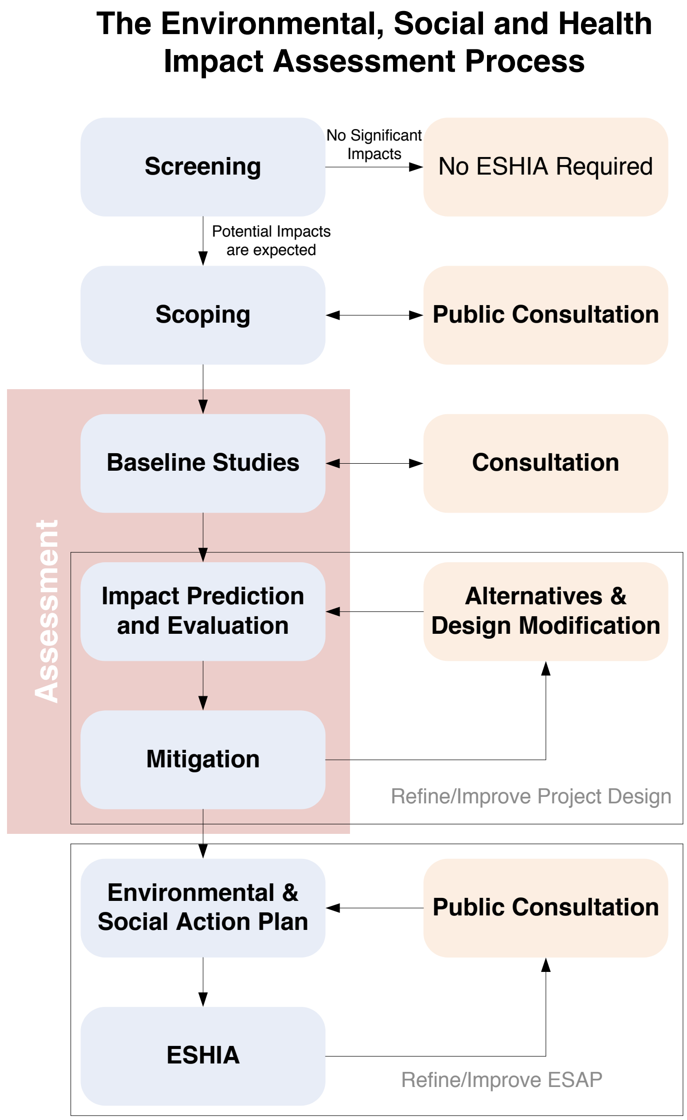

Figure 3-1 The ESHIA Process

here represents the product of consideration of potential impacts, and optimal mitigation strategies as represented in **Figure 3-1**.

1.1 Screening

Screening represents a preliminary assessment of the likely project impacts upon the environment its objective is mostly to determine if an ESHIA is required. .....in the context of IFC evaluation projects can be categorised as follows:

CATEGORY A

Projects expected to have significant adverse social and/or environmental impacts that are diverse, irreversible, or unprecedented.

CATEGORY B
Projects expected to have limited adverse social and/or environmental impacts that can be readily addressed through mitigation measures.

CATEGORY C
Projects expected to have minimal or no adverse impacts, including certain financial intermediary projects.

Although Wind farm projects have much lower environmental impact they will general fall into either Category A or B since they often represent a major change to the existing environment, hence the need for an ESHIA. Although potential impacts will be significantly reduced by the mitigation strategies that will be applied for the project, it represents the commencement of a major undertaking in the area.

1.2 Scoping

The scoping exercise of any environmental impact assessment process, determines the extent to which a project will interact with environmental or social elements. Through the scoping exercise the priorities, and extents of baseline studies and assessments are determined. The Project seeks to treat it as part of the Category A project.

IFC requires that the scoping stage stage is the start of interaction with local communities, to determine the key issues that need to be developed, in order to be sure that impacts on the community and any sensitive receptors will be defined as part of the environmental impact assessment process. It is important to understand the values, but the local community places upon environment that may be impacted by the project.

This report will provide a gap analysis and scoping assessment. The additional data which might be required were:

- Further baseline data collection and analysis of the data obtained includes update of sampling location for water monitoring ;
- Review and update impact assessment and evaluation of significant potential impact using robust criteria (sensitivity, magnitude and significance) for all assessment topics of the national EIA;
- Review and updated mitigation measures to produce Environmental and Social Mitigation Plan;
- Updated social impact assessment including added social baseline data collection; and
- Consideration of potential significant cumulative impact.

1.3 Impact Prediction and Evaluation

The definition of impacts needs to be an objective exercise, it predicts the potential for the project and its associated activities to change the existing environmental values as a consequence of its implementation. The cornerstone of impact prediction is the project description, which needs to define all the elements of the project and dissociated activities. Often, given the timing of the need for ESHIA, detailed design of the project and project elements may not be available, if that is the case that it is necessary to provide as much definition as possible as to the parameters that will be employed in a detailed design. As suggested in Figure 3-1 the prediction and evaluation of impacts, is often an iterative process, involving the project design team in the optimisation of project design to mitigate against the potential impacts of the project. In the case of environmental impacts, this may be something such as the relocation, or alteration of fo? ? ? rints in the alignments to avoid loss of ecosystems, and in the case of social elements it could include aspects of timing, use of local resources or other aspects of interaction with the community that may enhance potential benefits, or reduce potential negative effects.

The impact assessment process does not only consider planned project elements, but must include consideration of the interaction of the project with unplanned or abnormal conditions that may exist through life of the project. These unplanned interactions may be project arrive, such as accidents, spills or changes necessitated by external circumstances, or they may be related to abnormal or extreme environmental conditions that could possibly occur through life of the project.

The environmental and social impacts defined in this ESHIA are confined to those that have been identified to be associated with the exploration activities that will take place in 2012. In the case of the environmental impacts, is generally a fairly self-contained set of outcomes that will be a direct result of the exploration activities. For many of the social elements however, a significant number of the impacts will be the precursors of what will occur as the project proper proceeds

1.3.1 The definition of impacts

Environmental and social impacts can be both positive and negative, it may even be possible through mitigation strategies to turn potentially adverse impacts into positive outcomes, hence the cyclic nature of the development of impacts and mitigation strategies, in which the potential for these improvements can be explored. **Table 3-2** provides a description of the terminologies that are used throughout ESHIA to define and describe impacts.

Table 3-1 Impact Assessment Terminology

Term	Definition
Impact Magnitude	
Magnitude	Estimate of the size of the impact (e.g. the size of the area damaged or impacted, the % of a resource that is lost or affected etc.)
Impact Nature	
Negative Impact	An impact that is considered to represent an adverse change from the baseline, or introduces a new undesirable factor
Positive Impact	An impact that is considered to represent an improvement on the baseline, or introduces a new desirable factor
Neutral Impact	An Impact that is considered to represent neither an improvement nor deterioration in baseline conditions
Impact Duration	
Temporary	Impacts are predicted to be of short duration and intermittent/occasional in nature
Short-term	Impacts that are predicted to last only for a limited period (e.g. during construction) but will cease on completion of the activity, or as a result of mitigation/reinstatement measures and natural recovery
Long-term	Impacts that will continue over an extended period (e.g. operational noise) but cease when the Project stop operating. These will include impacts that may be intermittent or repeated rather than continuous if they occur over an extended time period
Permanent	Impacts that occur once on development of the Project and cause a permanent change in the affected receptor or resource (e.g. the destruction of a cultural artifact of loss of a sensitive habitat) that endures substantially beyond the Project lifetime

Term	Definition
Impact Extent	
Local	Impacts are on a local scale (e.g. restricted to the vicinity of the plant, i.e. restricted to within the ? ? ? Sorik Marapi area
Regional	Impacts are on a broader scale (effects extend well beyond the immediate vicinity of the facilities and affect the Mandailing Natal region)
International	Impacts are on a global scale (e.g. could extend beyond national boundaries/ affect existence of species)

It is important that the ESHIA process defines both the potential for a project to have an impact environmentally or socially, but also what the net outcome of that impact will be after mitigation measures are applied. The ESHIA is not only describe the direct impacts of the project itself, but also the way in which the project will interact with other influences that may derive a social or environmental impact. Thus there are a number of different types of impact that need to be considered as described in **Table 3-3**.

Table 3-2 Definition of Impact Type

Impact Type	Definition
Direct Impact	Impacts that result from a direct interaction between a planned project activity and the receiving environment (e.g. between occupation of a plot of land and the habitats which are lost)
Secondary Impact	Impact that follow on from the primary interactions between the project and its environment as a result of subsequent interactions within the environment (e.g. loss of part of a habitat affects the viability of a species population over a wider area)
Indirect Impact	Impact that result from other activities that are encouraged to happen as a consequence of the Project (e.g. presence of project promotes service industries in the region)
Cumulative Impact	Impacts that act together with other impacts to affect the same environmental resource or receptor
Residual Impact	Impacts that remain after mitigation measures have been designed into the intended activity

1.3.2 Evaluation of Impacts

In evaluating the significance or importance of impacts, several factors are taken into consideration. These include an assessment of the project component and its affect on the existing environment as a baseline and the potentially affected sensitive receptors. The impact is then assessed based on its potential severity and magnitude. The steps involved in the evaluation of impacts and level of impact are shown in **Figure 3-2**.

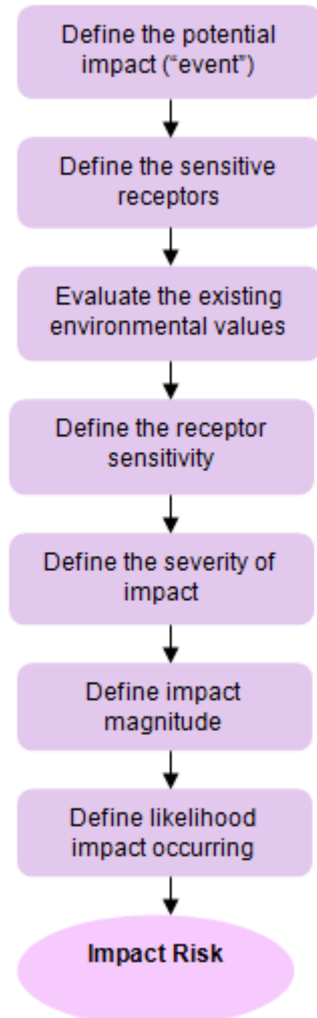

Figure 3-2 Impact Assessment Process

- **Impact Severity:** the severity of an impact is a function of a range of considerations including impact magnitude, impact duration, impact extent, and legal and guideline compliance;
- **Nature and sensitivity of the receiving environment:** the characteristics of the environmental or social receptor will be taken into consideration with respect to its vulnerability or sensitivity to an impact,
- **Likelihood of occurrence:** how likely or probable is it that this impact will occur.

The criteria described above are used to determine impact severity are further defined as follows:

- **impact magnitude:** the magnitude of the change that is induced, such as the percentage of resource that might be lost, the predicted change in the level of a pollutant, or a quantitative measure of losses or benefits to the community;
- **impact duration:** time period over which the impact is expected to last;
- **impact extent:** the geographical extent of environmental change, or the or the degree to which social impact may reach into the immediate, surrounding, or even general community;

- **regulations standards and guidelines:** the status of the impact in relation to regulations or prevailing legislation, comparison of the predicted outcome with recognised standards and guidelines the relevant to the project, its location and context.

Impact severity

Wherever possible severity of an impact should be described in quantitative terms, based on numerical values, representing regulatory limits, project standards or guidelines, or the number of people that have the potential to be impacted. However in some instances it is necessary to take a more qualitative approach in the definition of some outcomes, either because qualitative estimates are simply not possible, or because numerical evaluations are just not relevant (this is particularly true of some of the social elements, such as community perception).

Nature and sensitivity of the receiving environment

The criteria under which the sensitivity of the receiving environment is assessed can be described as:

- abundance
  - rarity: *is the impacted receptor a rare occurrence of that environmental state, or social parameter (such as an endangered species or habitat);*
  - size or extent: *necessary to define the amount of loss that may apply to the impact on a particular environmental or social element;*
- adaptability
  - resilience: *what is the ability of the particular environmental or social element to withstand the change (for instance social/health impacts may have different outcomes of a very old or very young members of the community)*;
  - ability to recover: *what is the potential to recover from the impact, how complete will recovery be and how long will it take*;
- state
  - degree of disturbance: *is the state of the environmental or social element in its natural condition, or has it been disturbed by other activities in the past*;
  - uniqueness: *is the particular environmental condition a unique situation, or is it a fairly common occurrence, what is the potential to replicate the situation by way of offset or compensation*;
  - establishment: *how well-established is this particular environmental/social condition, is its future tenuous or is it likely to persist.*
- value
  - implicit value: *how important is it to retain particular environmental/social condition, in the context of its interrelationship with the broader environment. With the loss of this particular environmental/social condition lead to further breakdown of the existing environment*;
  - recognised value: *has the environmental condition been recognised in some formal sense, such as a declaration of a conservation area or National Park.*

Likelihood of occurrence

For unplanned events, or extreme situations the likelihood that the particular environmental condition will exist can be ascribed a qualitative probability, as per the categories defined in **Table 3-4**.

Table 3-3 Likelihood Categories

Likelihood	Definition
Extremely unlikely	The event is very unlikely to occur under normal operating conditions but may occur in exceptional circumstances, ie the event is generally never heard of in industry
Unlikely	The event is unlikely but may occur at some time during normal operating conditions, ie the event is heard of in industry
Low Likelihood	The event is likely to occur at some time during normal operating conditions, ie incident has occurred in the company before
Medium Likelihood	The event is very likely to occur during normal operating conditions, ie the event occurs several times per year in the company
High Likelihood / Inevitable	The event will occur during normal operating conditions (is inevitable), ie the event happens several times per year at a location

Likelihood is estimated on the basis of experience and available evidence that such an outcome has previously occurred. Impacts resulting from routine or planned events (normal operations) are classified as having a high likelihood of occurrence.

Evaluation of significance

For the purposes of ascribing significance to the impacts in ? ? ? Sorik Marapi environmental impact assessments, the terminology that has been adopted is described in **Table 3-5**.

Table 3-4 Terminology for Impact Significance

Significance	Definition
Positive Impact	An impact that is considered to represent an improvement on the baseline or introduces a new desirable factor
Negligible Impact	Magnitude of change is comparable to natural variation
Minor Impact	Detectable but is not significant - should be further mitigated if possible but is an acceptable risk
Moderate Impact	Significant, amenable to mitigation, should be further mitigated if possible borderline acceptability.
Major Impact	Significant; amenable to mitigation; must be mitigated - not acceptable
Critical Impact	Intolerable; not amenable to mitigation; alternatives must be identified – Project Stopper

It must be noted that critical impacts, are not acceptable for planned operations, and can only be tolerated in the instance of unplanned or incidental events, and only then when the likelihood of occurrence has been reduced through project planning to least low or unlikely.

Impact magnitude

High

Major alteration of existing environment that is likely to be irreversible or will result in the loss of that environmental for a period of time.

Medium

An alteration to the existing environment that will modify its current status, but will not stop its role in the environment or is easily reversed.

Low

An alteration to the existing environment but few sensitive receptor or a change that will be transient

Slight

Measurable but no real change to environmental

No Change

Usually for mitigated outcome.

The magnitude of each impact is determined by comparing the impact severity against the sensitivity of the receptor in the impact significance matrix provided in**Table 3-6**.

Table 3-5 Determining the Severity of Impacts

		Sensitivity of Receptor				
		Low	**Low-Medium**	**Medium**	**Medium-High**	**High**
Impact Magnitude	**No Change**	Slight	Slight	Slight	Slight	Slight
	Slight	Slight	Slight	Low	Low	Low
	Low	Slight	Low	Medium	Medium	Medium
	Medium	Low	Medium	High	High	High

	High	Medium	High	High	Critical	Critical

For unplanned events or impacts to which probability of occurrence may be ascribed, severity of the impact needs to be considered in conjunction with the likelihood of its occurrence as described in **Table 3-7**.

Table 3-6 Determining the Significance of Impacts

		Impact Likelihood				
		Extremely Unlikely	**Unlikely**	**Low Likelihood**	**Medium Likelihood**	**Inevitable**
Impact Severity	**Positive**	Positive	Positive	Positive	Positive	Positive
	Slight	Negligible	Negligible	Negligible	Negligible	Negligible
	Low	Negligible	Negligible	Negligible	Minor	Minor
	Medium	Negligible	Minor	Minor	Moderate	Moderate
	High	Minor	Moderate	Major	Major	Critical
	Critical	Moderate	Major	Major	Critical	Critical

Impacts assessed as Negligible or Minor will require no additional management or mitigation that, because either the magnitude of the impact is sufficiently small for the receptor sensitivity is sufficiently low, and adequate controls or included in the project design. Negligible and minor impacts of therefore deemed to be insignificant, and do not require any further remedial action.

Impacts that are evaluated to be moderate or major require the implementation of further management or mitigation measures. Moderate to major impacts of therefore considered to be significant. For potentially major impacts the object of mitigation is to reduce the residual risk to a moderate level.

In the development of mitigation measures to reduce moderate impact, the emphasis is on demonstrating that the impact has been reduced to a level that is as low as reasonably practicable. It will not always be practical to reduce moderate impact of minor ones in consideration of the cost effectiveness of project.

Impacts evaluated as critical cannot be managed mitigated, and therefore demand selection of alternatives to eliminate the potential sources in. They cannot be contemplated as part of the normal operation of the project, and can only be considered if project design has taken every possible step to reduce the probability of occurrence to as low as possible.

1.4 Evaluation of Community and Social Impacts

For the assessment of social impacts the same approach has been undertaken as for the environmental impacts; however the terminologies have been altered slightly to consider community interpretation. So rather than refer to potential impacts of having a graded scale of significance (any social issue is of major significance to some or many parties), the term urgency is used to indicate the prioritization process that is necessary in dealing with community and social issues.

Impact Severity for various social concerns has been evaluated as per **Table 3-8**.

Table 3-7 Assessment of the Severity of Community and Social Impacts

Impact Severity	Community Displacement	Social And Public Amenity	Community Health
High	Will require the Physical Displacement or relocation of any Individuals. Will induce major economic displacement (greater than 25% of effective income) for any family or household.	Likely to impact on a large number of people (greater than 25% of the community) and will impair current lifestyles or customs. Will change daily function or remove resources for more than one family or household.	That any member of the community will be injured or suffer health impacts if an impact were to occur. That any member of the community may be in harm's way due to a project activity.
Medium	For Physical Displacement – only applies to mitigated outcomes where relocation will not preserve lifestyles and values. Will induce some economic Displacement (less than 25% of Household income) for more than 10% of a community.	Likely to impact on group of people (less than 25% of the community) and will impair current lifestyles or customs. Will challenge the perceptions and may cause unease that will need to be clarified amongst a large proportion of the community (>25%) Will change daily function or remove resources for one family or household.	That there may be health impacts on sensitive groups in the community that can be avoided.
Low	For Physical Displacement – only applies to mitigated outcomes where relocation will preserve lifestyles but may not satisfy cultural needs. Will induce some economic Displacement (less than 25% of Household income) for more than 10% of a community. Mitigated Economic outcomes that can only be resolved by one-off compensatory actions that may not be sustainable.	Likely to impact one or a few individuals and will impair current lifestyles or customs. Will challenge the perceptions and may cause unease that will need to be clarified amongst a group within the community (>25% of the community) Will change daily function or remove resources for one family or household.	Does not apply

Impact Severity	Community Displacement	Social And Public Amenity	Community Health
Slight	For Physical Displacement – only applies to mitigated outcomes where relocation will preserve lifestyles but may not satisfy cultural needs. Will induce some economic Displacement (less than 25% of Household income) for more than 10% of a community. Mitigated Economic Outcomes where long term solutions may be found by some effort by either party.	Will challenge the perceptions and may cause unease that will need to be clarified amongst a group within the community (>25% of the community)	Does not apply
Positive Impact	An outcome that will derive an economic benefit to the community.	The provision of community amenity or amenities that have previously been unavailable	An outcome that can be expected to improve community health

Then the urgency can be determined in the same way as environmental impacts **Table 3-9**.

Table 3-8 Determining the urgency of Community and Social Impacts

		Impact Likelihood				
		Extremely Unlikely	**Unlikely**	**Low Likelihood**	**Medium-Likelihood**	**High Likelihood / Inevitable (Planned Event)**
Impact Severity	**Slight**	Negligible	Negligible	Negligible	Negligible	Minor
	Low	Negligible	Negligible	Minor	Minor	Minor
	Medium	Negligible	Minor	Moderate	Moderate	Major
	High	Minor	Moderate	Major	Major	Critical

1.5 Mitigation

The issue process is intended to identify impact and benefits associated with project activities and ways of dealing with them during the planning and design stage of the project. The ultimate goal of the issue process is to reduce the negative impacts and enhance the benefits or positive impact of any intended activity. Planned mitigation measures will be described, and additional measures or controls will be recommended we impacts are still considered to be unacceptable.

Many mitigation or control measures will require a degree of management to ensure their success in reducing potential impacts to the residual level that is expected through the ESHIA process. Most of these residual outcomes are likely to require a degree of monitoring through project implementation to ensure that the mitigation management process is effective. It is these management and monitoring efforts that report to the environmental and social action plan (ESAP) as part of the ESHIA.

In deciding appropriate mitigation strategies there is a hierarchy of response as indicated in **Figure 3-3**.

Avoid at Source/Reduce at source: Avoiding or reducing at sources is essentially 'designing' the project so that a feature causing an impact is designed out or altered

Abate on Site: This involves adding something to the basic design to abate the impact – pollution controls fall within this category

Abate at Receptor: If an impact cannot be abated on-site then measures can be implemented off-site

Repair or Remedy: Some impacts involve unavoidable damage to a resource. Repair involves restoration and reinstatement type measures

Compensate in Kind/Compensate Through Other Means: Where other mitigation approaches are not possible or fully effective, then compensation for loss or damage might be appropriate

Figure 3-3 Mitigation Hierarchy

It is the nature of the industry that some impacts are just not reversible, the positive outcomes of the project outweigh the residual impact, hence the need for the ESHIA process to develop the best possible outcomes from the implementation of a project.

There are a also the possibilities of an unplanned events, and extreme and unusual environmental conditions that may lead to the possibility of major or even critical impacts. It is incumbent on the project proponent to reduce the probability of such events to as low as reasonably practical, and even after this is a necessary part of the mitigation process to define a response should the event occur. There is again a hierarchy of response to such occurrences:

- Control: this is a response to deal with potential negative impacts at the time and an emergency situation may be occurring, it can include such things as bushfire fighting capacity, or even stop work plans for extreme weather events;
- Recovery: in the event that the emergency situation has occurred it is important to identify how project proponents will respond to the potentially negative impacts such recovery plans could include response plans for containing or neutralising spills, or compensation packages were affected parties.

The Project seeks to establish environmental and social mitigation strategies that are robust and will continue to be applied as the main project progresses.

Appendix B – Draft Field Study Plan

ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT

PT UPC Sidrap Bayu Energi

28 August 2015

Field Study Plan

Field Survey and Sampling Program

DRAFT

Field Study Plan

Field Survey and Sampling Program

Prepared for

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28 August 2015

JKTD14001

D R A F T

Quality Information

Document	Field Study Plan
Ref	JKTD14001 c:\users\sembela\documents\projects\sidrap\field study plan_upc rev1.docx
Date	28 August 2015
Prepared by	Rahayu Komalasari and Andrew Sembel
Reviewed by	Kevin Dobson

Revision History

Revision	Revision Date	Details	Authorised	
			Name/Position	Signature
00	28 August 2015	Draft Plan	Andrew Sembel Manager	

DRAFT

Table of Contents

D R A F T

1.0 Introduction

1.1 Background

PT UPC Sidrap Bayu Energi (UPC) appointed PT Aecom Indonesia (AECOM) to undertake a Field Study and assist UPC on ESIA preparation(Environmental Impact Assessment) for the development of a 75 MW Sidrap Wind Farm Project (the Project), located in Sindenreng Rappang (Sidrap) Regency, South Sulawesi Province.

The objective of the AECOM's work is to provide a comprehensive ESIA (Environmental Impact Assessment) that comply with International Finance Corporation (IFC) standards. This field study is a part of ESIA preparation aims to fill the gap between UPS's AMDAL study and IFC requirements.

1.2 Description of Project Site

Proposed Project site is located in Mattirotasi Village, Lainungan Village, Lawawoi Village, Watang Pulu Sub District, Sidrap Regency, South Sulawesi Province.

1.3 Objectives

The main objectives of the proposed Field Study are as follow:

- Assist the Company meeting the requirements of international lenders.
- Identify present and potential areas of environmental impacts within the project site resulting from the proposed Project.
- Evaluate possible areas adjacent to the project site and their possible adverse environmental impact on the project site.
- Recommend follow-up actions addressing concerns that come up during the ESIA study.

1.4 Work Plan Organization

Following **Section 1.0**, this present Field Study Plan is organized as follow:

- Section 2.0 describes the scope of work associated with the field survey
- Section 3.0 describes the field sampling and analysis plan (SAP)
- Section 4.0 describes the deliverable and reporting activities
- Section 5.0 outlines the project team's organization and responsibilities.
- Section 6.0 outlines the project schedule.
- Section 7.0 lists the references cited in the main text of this Work Plan.

In addition to the main text of this Field Study Plan, Appendices addressing the following specific components of the site-specific ESIA project are provided:

- Appendix A, Project-Specific Health and Safety Plan (HSP)
- Appendix B, Standard Operating Procedures (SOPs)

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2.0 Scope of Work

Referring to the AECOM's AMDAL Gap Analysis, this section presents the details of the proposed Field Survey and Sampling activities with regard to sensitive receptors identification and ecological survey in order to meet IFC requirements.

2.1 Work Site

This 75 MW wind energy project is located in Mattirotasi Village, Lainungan Village, Lawawoi Village and Uluale Village, Watang Pulu Sub District, Sidrap Regency, South Sulawesi Province. 35 of wind turbines with capacity of 2.0 MW each will be installed in the Project area.

2.2 Site Access Permissions and Meetings

Authorization from all necessary stakeholders for field survey and sampling program will be managed by Company's local representatives. AECOM will obtain the respective authorization prior to the field survey and sampling activity.

AECOM Project Manager and Team Leader will inform and discuss all matters related to the field survey and sampling program as required to UPC's Point of Contact (PoC) for this Project.

2.3 Health and Safety

Safety precautions and awareness will be the top priority for all team members and assistants during each phase of the fieldwork, starting with travel to and from the site, equipment preparation, on-site activities on land and on, in, and near water, and demobilisation. Daily safety meetings will be held to highlight concerns before the day's work begins, including slipping/tripping hazards, lifting precautions, use of life vests and other PPE, observations and precautions related to snakes, fatigue, sun exposure and hydration, and emergency response and evacuation procedures. Any concerns regarding safety or health will be immediately addressed. All personnel are responsible for following safe work procedures, and the team leader is responsible for ensuring they are followed.

Team member must ensure that they have read, understood, and are implementing all safety requirement as described in the Job Safety Analysis (JSA) prepared for the field survey.

2.4 Field Studies Program

Referring the Amendment of Work Agreement, the following surveys are AECOM's scope of work:

- Surface water sampling, the water courses surrounding the Ridge of the project are ephemeral with no permanent flow. Even in the previous rainy season sampling there was no flow. It is expected that these streams in the sampling location will be even more dry in a dry season sampling campaign. Under IFC guidelines it may be necessary to expand the study area and establish a baseline sampling point at the nearest permanent receiving water.
- Groundwater sampling, there are not any permanent expected groundwater quality impacts from the project, other than those that potentially could result from accidental spills. It is not expected that the digging foundations on the ridge will have significant drawdown effects on local aquifers. There were 2 community wells sampled in the 1st program and 3 samples were taken from tanks supplied by Springs. Unfortunately it was not possible to determine the flow from the springs or get a direct sample due to the construction of the drawdown and the tanks. These will be sampled again.
- Air Quality, a full set of dry season air-quality results will be obtained that mirror the 1st sampling campaign.
- Noise, AMDAL noise requirements for baselines are different to those required by WHO/IFC guidelines. It will be necessary to undertake an appropriate baseline noise survey for potentially impacted communities that will comply with the International guidelines.

D R A F T

- Ecology: it will be necessary to take a 2nd season of detailed data for avian species (birds and bats) which will include observational and netting techniques. For terrestrial fauna and flora full transect analysis is not warranted due to the highly disturbed nature of the ecosystems, observational and anecdotal data will be collected.
- Cultural Heritage and Indigenous Peoples: an AECOM anthropologist will attend and undertake an assessment of cultural heritage values, involving local community figures as required. It is not believe there are any identifiable indigenous peoples in the area however DINAS offices keep a register of recognised IP's - enquiries will be made to confirm.
- Visual Impact Assessment: VIA is not an environmental element which is included in Indonesian AMDAL guidelines. Panoramic photography from various vantage points will be taken to inform a study that will be prepared by AECOM's Australian office, and for the preparation of photomontage to international guidelines.

D R A F T

3.0 Detailed Work Plan

The following section presents the details of the proposed Field Study.

3.1 Preparation of the Base Map

A base map of the Project area is provided by UPC. The respective base map will inform spatial location of settlements, road classification, contour lines, and several other existing infrastructures that would be used easily by field survey team.

3.2 Team Mobilization and Organization

AECOM's team from Jakarta will be deployed in Parepare a city located 10 km from the Project site. Parepare has been selected as a main base of field survey team. Shortly after the arrival of the team in Parepare, the following activities will be carried out:

- HSE and Security Induction;
- Technical briefing of field survey and sampling; and
- Preparation of field survey and sampling equipment

AECOM Team Leader will be responsible to organize such activities while AECOM HSE Officer will be responsible to ensure the availability of paramedic on site and personal protective equipment. Detailed HSE Plan and Emergency Plan are provided in separate documents.

As per communication protocol and HSE Plan/ ERP, all group leaders will coordinate with the AECOM Team Leader and AECOM HSE Officer during the field survey and sampling.

3.3 Field Survey Plan

3.3.1 Surface Water

Baseline study of surface water in the wet season has been undertaken by AECOM in 2013/2014. Nine sampling points were established, indicating that most stream in the study area were ephemeral or having periodic flow.

An ESHIA study requires the establishment of water quality monitoring location for potential receiving water of Project impact in the both dry and wet season.

Dry season assessment of each nine sampling points need to be undertaken in order to determine the flow characteristics. In the event that water is available, water sampling need to be undertaken as well. AECOM Team will provide photographic record and if possible to take samples of standing water. Sampling location map for surface water is presented in the Attachment 1.

Surface water parameter be monitored in accordance with local regulation of Governor Regulation of South Sulawesi No. 69 Year 2010 on Quality Standard and Criteria of Environmental Damage and Government Regulation No. 82 Year 2001 on Water Quality and Water Pollution Control. List of parameters to be monitored, the respective threshold value, sampling method and sampling period are given in the Attachment 2.

Given that project location on the ridge line from which water will drain, flood modelling or rain event analysis are not necessary. Instead, provision of drainage pattern assessment, describing interaction of Project area and service road with the water shed and receiving water, is recommended.

AECOM Team will provide observational review of the site based on the new wind turbine configuration to describe potential receiving waters.

3.3.2 Groundwater

AECOM team will identify flow characteristics of the two springs during dry season and water quality of the two reservoirs in dry season. Furthermore, re observation of community well in the study area will be undertaken in order to convince no other potentially impacted community well available in the area.

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List of parameter to be monitored will be complied with local regulation of Governor Regulation of South Sulawesi No. 69 Year 2010 on Quality Standard and Criteria of Environmental Damage and Regulation of Ministry of Health No. 416 Year 1990 on Clean Water Quality Standard. Monitored parameters, the respective threshold value, sampling method and duration are given in the Attachment 2. Sampling will be undertaken at two sampling points, map for groundwater survey location is presented in the Attachment 1.

3.3.3 Air Quality

The ESIA study will require the description of the air quality for a number of parameters that are likely to be impacted by the project. A single sampling event was taken during the wet season for air quality sampling and establishment of baseline levels. The sampling event did not include analysis of PM10 or PM2.5. A dry season sampling will be carried out at the same four locations used for the AMDAL study. PM10 and PM2.5 will also be measured with TSP, and that a factorisation will be developed for the relationship in the area.

Air quality sampling will cover all parameter listed in the local regulation of Governor Regulation of South Sulawesi No. 69 Year 2010 on Quality Standard and Criteria of Environmental Damage and Regulation, Government Regulation No. 41 Year 1999 as well as IFC General EHS Guideline. List of air quality parameters to be monitored, the respective threshold value, sampling method and sampling period are given in the Attachment 2.

Air Quality sampling will be undertaken at 4 different sampling points as presented in the Attachment 1.

3.3.4 Noise

ESHIA study requires representative noise baseline study considering recognized international standard method. Noise measurement will be undertaken in accordance with WHO standard requiring 48 hour monitoring and 24 hour averaging taking into consideration of seasonality and variability of wind condition, actual sensitive receptor and their exact location relative to the wind turbine layout. Noise sampling at representative time correlating with variable wind conditions might be necessary to be taken. Noise measurements were taken at four locations which are the same as the air quality stations. Location map for noise sampling is presented in Attachment 1.

Appropriate WHO noise baseline data at the point of impacted residential receptors will be collected. Detailed sensitive receptor mapping will be undertaken, coordinates of noise monitoring point at every household within 1km of the boundary will recorded using a handheld GPS. Detail of the sampling method and duration as well as the respective threshold value are given in the Attachment 2.

3.3.5 Ecology (Birds and Bats)

It will be necessary to take a 2nd season of detailed data for avian species (birds and bats) which will include observational and netting techniques. For terrestrial fauna and flora full transect analysis is not warranted due to the highly disturbed nature of the ecosystems, observational and anecdotal data will be collected.

Vantage Point Surveys

In order to identify flights at potential collision risk height and to inform collision risk modeling, Vantage Point (VP) surveys will be conducted to observe the flight patterns and behavior of target species within the survey envelope. The list of target species will be compiled from protected species or those of conservation concern thought likely to be subject to impact from a wind turbine development. Target species will be chosen carefully, as too many target species may dilute the survey effort concentrated on the species most at risk.

Each VP survey will last no longer than 2 hours, although more than one survey may be undertaken on the same day. The number of VP locations needed to cover the site adequately will be established during the initial scoping survey and will depend on the topography of the land, the presence of obstructions to views into and around the site and the visual envelope from the selected VP location(s).

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Freshwater Aquatic Biota Survey

Limited impact on the aquatic ecology and water quality in the surrounding streams are expected, that will differ from the existing environmental conditions. Existing aquatic ecosystems will be carried out including sampling for plankton and benthos.

3.3.6 Cultural Heritage and Indigenous Peoples

All items of cultural heritage significance in the area will be surveyed. It is understood that this is only likely apply to the possible presence of gravesites.

A survey will be carried out to confirm that there are no indigenous peoples or communities in the project area, this extends beyond the simple analysis of Indonesia register. An anthropologist will attend and undertake an assessment of cultural heritage values, involving local community figures as required. It is not believe there are any identifiable indigenous peoples in the area however DINAS offices keep a register of recognised IP's - enquiries will be made to confirm.

3.3.7 Visual Impact Survey

Visual impact is one of the major IFC noted impacts from a wind farm project. The main objective of this survey is to observe baseline landscape that potential impacted by wind farm project. Existing visual values of the project area will need to be defined by field observation and the preparation for photography which has been collected using settings that are identified as being "neutral" for the representation of near and far filed visual impacts.

The development of specific sensitive receptor locations will be mapped and overlaid with modelling.

3.4 Analysis Plan

All samples collected during the sampling program will be organized and transported by car to the appropriate laboratories in Makassar (for surface water and ground water quality) and in Jakarta for air quality analyzed according to Indonesian and internationally accepted protocols.

4.0 Project Team

The table below summaries the field survey team.

Table 1 Team Member Experience

No	Name	Role	Note
1	Andrew Sembel	Principal Environmental	Jakarta
2	Agus Dwi Wahyono	Team Leader	Jakarta
3	Rahayu Indah K.	Engineer	Jakarta
4	Ambeng	Ecological Specialist	Makasar
5	Technician	iTEC Lab Technician	Jakarta
6	Technician	iTEC Lab Technician	Jakarta
7	Technician	BBIHP Lab Technician	Makasar

5.0 Project Schedule

Overall field studies will be conducted within 30 days started on early September 2015. The table below summaries the detailed works plan for this Field Study.

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Table 2 Detailed Work Plan – Field Studies Program

UPC SIDRAP PROJECT – AECOM ITINERARY SITE VISIT FOR ESIA DRY SEASON SAMPLING					
Day/Date	**Attendant**	**Activity**	**Accommodation**	**Transportation**	**Remarks**
I	Andrew Sembel Agus Dwi Wahyono Rahayu Indah K iTEC Lab Tech 1 iTEC Lab Tech 2 VIA specialist (TBD)	Jakarta - Makasar Makasar - Sidrap First Observation to all location	Check in Hotel	Airfare Light vehicle	morning flight
	Ambeng	Makasar - Sidrap		Light vehicle	
II	AECOM team	Noise sampling #1; day1; 06.00 WITA)*		Light Vehicle	start
	iTEC team	AQ sampling #1; day1; 06.00 WITA			start
	iTEC team	Dustfall installation #1234; day1; 07.00 WITA			start
	Ambeng	Bird and Bat Observation day1			
III	AECOM team	Noise sampling #1; day2; 06.00 WITA			on going
	iTEC team	AQ sampling #1; day2; 06.00 WITA			finish
	Andrew Sembel	Demobilization Sidrap - Makasar - Jakarta		LV - Airfare	afternoon flight
	Ambeng	Bird and Bat Observation day2			on going
	BBIHP lab tech	Mobilization from Makasar - Sidrap		Light Vehicle	
	BBIHP lab tech	SW sampling #12345)**			start
IV	AECOM team	Noise sampling #1; day3; 07.00 WITA		Light Vehicle	finish
	iTEC team	Noise sampling #2; day1; 07.00 WITA			start
	iTEC team	AQ sampling #2; day1; 07.00 WITA			start
	Ambeng	Bird and Bat Observation day3			on going
	BBIHP lab tech	SW sampling #6789			finish
	BBIHP lab tech	GW sampling #12			finish
	BBIHP lab tech	Demobilization from Sidrap - Makasar		Light Vehicle	finish
V	AECOM team	Noise sampling #2; day2; 07.00 WITA			on going
	iTEC team	AQ sampling #2; day2; 07.00 WITA			finish
	Ambeng	Bird and Bat Observation day4			on going
VI	AECOM team	Noise sampling #2; day3; 07.00 WITA		Light Vehicle	finish
	iTEC team	Noise sampling #3; day1; 08.00 WITA			start
	iTEC team	AQ sampling #3; day1; 08.00 WITA			start
	Ambeng	Bird and Bat Observation day5			finish
	Ambeng	Demobilization Sidrap - Makasar		Light Vehicle	
VII	AECOM team	Noise sampling #3; day2; 08.00 WITA			on going
	iTEC team	AQ sampling #3; day2; 08.00 WITA			finish
VIII	AECOM team	Noise sampling #3; day3; 08.00 WITA		Light vehicle	finish
	iTEC team	Noise sampling #4; day1; 09.00 WITA			start
		AQ sampling #4; day1; 09.00 WITA			start
IX	AECOM team	Noise sampling #4; day2; 09.00 WITA			on going
	iTEC team	AQ sampling #4; day2; 09.00 WITA			finish
X	iTEC team	Noise sampling #4; day3; 09.00 WITA		Light vehicle	finish
	AECOM team	Demobilization Sidrap - Makasar	Check Out Hotel	Light vehicle	
	iTEC team	Makasar - Jakarta		Airfare	afternoon flight
XIX	iTEC team	Departure to Makasar		Airfare	morning flight
	iTEC team	Makasar to Sidrap	Check in Hotel	Light vehicle	
	iTEC team	Demobilization dustfall sampling #1234			
XXX	iTEC team	Sidrap - Makasar	Check Out Hotel	Light vehicle	
	iTEC team	Makasar - Jakarta		Airfare	afternoon flight

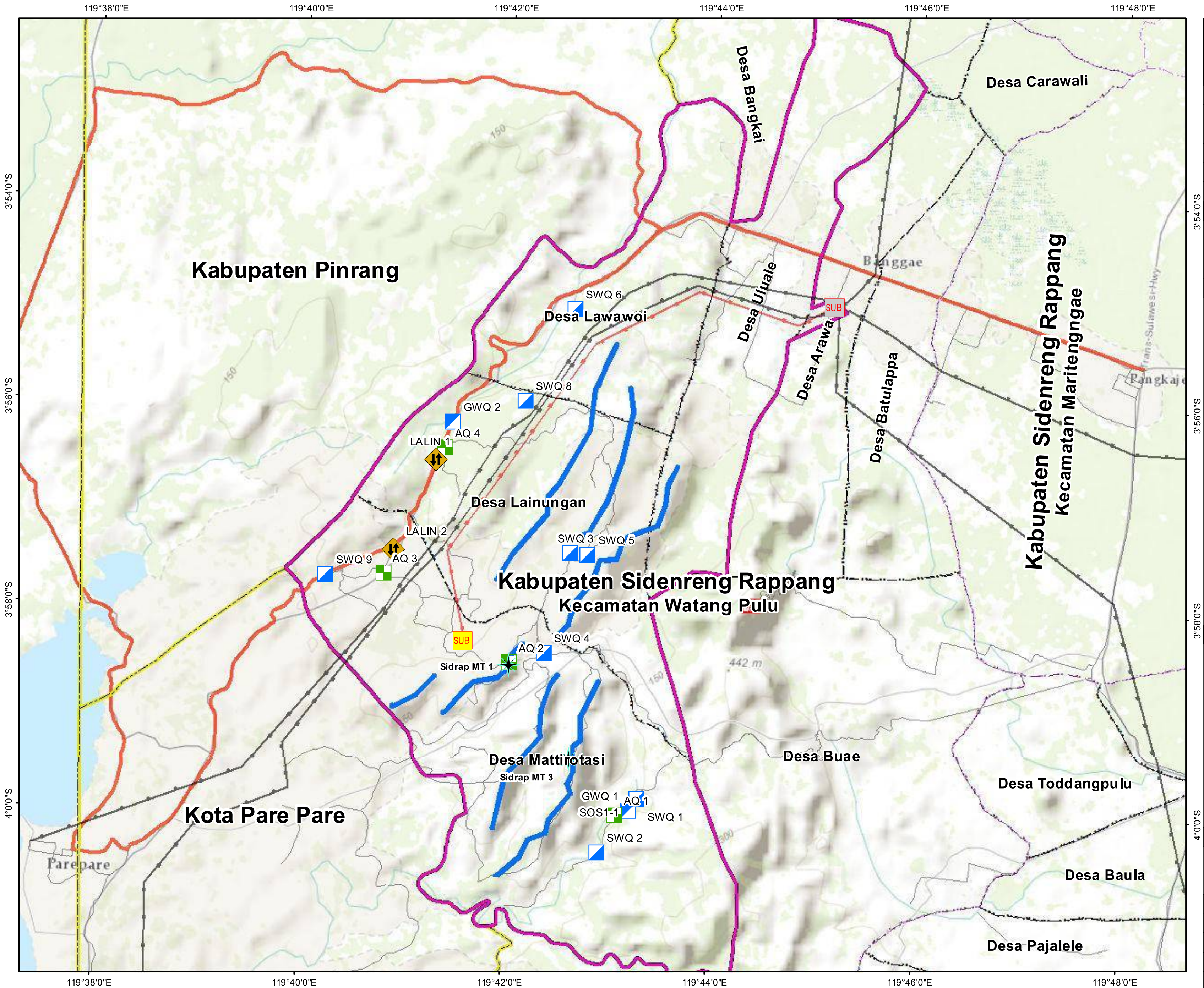
Note:
)* Noise including Sensitive Reseptor Survey
)** SW sampling including water flow measurement

DRAFT

6.0 Logistic Plan

AECOM will make coordination with UPC site representative to arrange accommodation, equipment, and local support for field work within study area.

Accommodation of all team will be at the nearest location such as Hotel in Parepare.



Gambar 3-1	CLIENT UPC Renewables PT UPC Sidrap Bayu Energi

Judul Peta

PETA LOKASI SAMPLING LINGKUNGAN FISIK DAN KIMIA

Detail Administrasi

Kabupaten	Sidenreng Rappang
Propinsi	Sulawesi Selatan

Skala

Skala 1:100,000 pada kertas A4

1 0,5 0 1 2 3 Kilometers

Indeks Lokasi

Legenda

- Menara pengamatan meteorologi
- Gardu Induk PLN Sidrap
- Rencana gardu induk UPC
- Jalur transmisi PLN
- Rencana jalur transmisi UPC
- Menara BTS
- Batas Wilayah Studi
- Potensial Area Turbin Angin
- Batas Kabupaten
- Batas Kecamatan
- Batas Kelurahan
- Jalan arteri
- Jalan lokal
- Kualitas udara
- Kualitas air tanah
- Kualitas air permukaan

Sumber Data

1. PT UPC Sidrap Bayu Energi
2. ESRI Topographic Map

Parameter

Datum	World Geodetic System 1984
Proyeksi	Universal Transverse Mercator
Zona	50 South
Unit	Meter

Rev.	BY	DATE	DESCRIPTION	CHKD	APPD
0	IDR	22 Jan 2014	Draft of physic sampling location		
1	IDR	6 June 2014	WTG symbol changed into potential areas - according to the concern of the client	RBD	NHS

Revisi				
1	Dibuat IDR	Tanggal 22 Jan 2014	Project ID: IDJKT14001	
	Diperiksa RBD	Tanggal 6 Jun 2014	Nama file 3-1.Sampling Fisik Kimia	
	Disetujui NHS	Tanggal 6 Jun 2014	Status: FINAL	

Catatan

Penyedia peta

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Attachment 2.

No	SUB STUDY /PARAMETER	UNIT	ENV.THRESHOLD			SAMPLING PERIOD			Method	Equipment
			NATIONAL		INTERNATIONAL	AMDAL	ESIA	WORK PLAN		
A	**AMBIENT AIR QUALITY**		**Government Regulations No. 41/1999**	**South Sulawesi Gov. Reg. No. 69/2010**	**IFC General EHS Guidelines: Table 1.1.1**					
1	Dust (TSP)	μg/m3	230	230	N/A	24 hours	N/A	24 hours	Gravimetric	Hi-Vol Sampler
2	PM10	μg/m3	150	150	150	24 hours	24 hours	24 hours	Gravimetric	Hi-Vol Sampler
3	PM2.5	μg/m3	65	50	75	24 hours	24 hours	24 hours	Gravimetric	Hi-Vol Sampler
4	NO2	μg/m3	400	400	200	1 hour	1 hour	1 hour	Saltzman	Spectrofotometer
5	SO2	μg/m3	365	360	125	24 hours	24 hours	24 hours	Pararosanalin	Spectrofotometer
6	CO	μg/m3	30000	30000	N/A	1 hour	N/A	1 hour	NDIR	NDIR Analyzer
7	Ozone	μg/m3	235	235	160	1 hour	8 hours	8 hours	Chemiluminescent	Spectrofotometer
8	Pb	μg/m3	2	2	N/A	24 hours	N/A	24 hours	Gravimetric	Hi-Vol Sampler
9	Dust Fall	ton/km2/month	10	10	N/A	30 days	N/A	30 days	Gravimetric	Cannister
B	**NOISE**		**Decree of MoE No. 48/1996**		**IFC General EHS Guidelines: Table 1.7.1**					
	Noise Level	dBA	Resident Area: 55		Resident Area : 55 day time Resident Area : 45 night time	Day time, Night Time	48 hours	48 hours	Decree of MoE No. 48/1996 Appendix II	Sound Level Meter
			Industry: 70		Industrial: 70					
C	**SURFACE WATER QUALITY**		**Government Reg. No. 82/2001 Class-1**	**South Sulawesi Gov. Reg. No. 69/2010 Class-1**						
I	PHYSICS									
1	Temperature	˚C	dev. 3	dev. 3	N/A	Once/Grab Sampling	N/A	Once/Grab Sampling	APHA, ed. 21, 2005, 2550-B	
2	TSS	mg/l	50	50	N/A	Once/Grab Sampling	N/A	Once/Grab Sampling	APHA, ed. 21, 2005, 2540-D	
3	TDS	mg/l	1000	800	N/A	Once/Grab Sampling	N/A	Once/Grab Sampling	APHA, ed. 21, 2005, 2540-C	
II	CHEMICALS									
1	pH	mg/l	6 - 9	6 - 8.5	N/A	Once/Grab Sampling	N/A	Once/Grab Sampling	APHA, ed. 21, 2005, 4500-H, B	
2	BOD5	mg/l	2	2	N/A	Once/Grab Sampling	N/A	Once/Grab Sampling	APHA, ed. 21, 2005, 5210-B	
3	DO	mg/l	6	6	N/A	Once/Grab Sampling	N/A	Once/Grab Sampling	APHA, ed. 21, 2005, 4500-O-C	
4	COD	mg/l	10	10	N/A	Once/Grab Sampling	N/A	Once/Grab Sampling	APHA, ed. 21, 2005, 5220-D	
5	Total Fosfat	mg/l	0.2	0.2	N/A	Once/Grab Sampling	N/A	Once/Grab Sampling	APHA, ed. 21, 2005, 4500-P-E & J	
6	Amonia (NH3-N)	mg/l	0.5	0.5	N/A	Once/Grab Sampling	N/A	Once/Grab Sampling	APHA, ed. 21, 2005, 4500-NH3-F	
7	Nitrate (NO3-N)	mg/l	10	10	N/A	Once/Grab Sampling	N/A	Once/Grab Sampling	APHA, ed. 21, 2005, 4500-NO3-E	

D R A F T

No	SUB STUDY /PARAMETER	UNIT	ENV.THRESHOLD			SAMPLING PERIOD			Method	Equipment
			NATIONAL		INTERNATIONAL	AMDAL	ESIA	WORK PLAN		
8	Nitrite (NO2-N)	mg/l	0.06	0.06	N/A	Once/Grab Sampling	N/A	Once/Grab Sampling	APHA, ed. 21, 2005, 4500-NO2-B	
9	Sulphat (SO4)	mg/l	400	400	N/A	Once/Grab Sampling	N/A	Once/Grab Sampling	APHA, ed. 21, 2005, 4500-SO4-E	
10	Arsen (As)	mg/l	0.05	0.05	N/A	Once/Grab Sampling	N/A	Once/Grab Sampling	APHA, ed. 21, 2005, 3500-As-B	
11	Cobalt Co)	mg/l	0.2	0.2	N/A	Once/Grab Sampling	N/A	Once/Grab Sampling	APHA, ed. 21, 2005, 3110	
12	Barium (Ba)	mg/l	1	1	N/A	Once/Grab Sampling	N/A	Once/Grab Sampling	APHA, ed. 21, 2005, 3110	
13	Boron (B)	mg/l	1	1	N/A	Once/Grab Sampling	N/A	Once/Grab Sampling	APHA, ed. 21, 2005, 3110	
14	Selenium (Se)	mg/l	0.01	0.01	N/A	Once/Grab Sampling	N/A	Once/Grab Sampling	APHA, ed. 21, 2005, 3110	
15	Cadmium (Cd)	mg/l	0.01	0.01	N/A	Once/Grab Sampling	N/A	Once/Grab Sampling	APHA, ed.19,1995, 3500-Cd-B	
16	Chrom Hexavalen (Cr6+)	mg/l	0.05	0.05	N/A	Once/Grab Sampling	N/A	Once/Grab Sampling	APHA, ed.21,2005, 3500-Cr-B	
17	Copper	mg/l	0.02	0.02	N/A	Once/Grab Sampling	N/A	Once/Grab Sampling	APHA, ed. 21, 2005, 3110	
18	Iron (Fe)	mg/l	0.3	0.3	N/A	Once/Grab Sampling	N/A	Once/Grab Sampling	APHA, ed.21,2005, 3500-Fe-B	
19	Lead (Pb)	mg/l	0.03	0.03	N/A	Once/Grab Sampling	N/A	Once/Grab Sampling	APHA, ed.21,2005, 3500-Pb-B	
20	Manganese (Mn)	mg/l	0.1	0.1	N/A	Once/Grab Sampling	N/A	Once/Grab Sampling	APHA, ed. 21, 2005, 3110	
21	Mercury (Hg)	mg/l	0.001	0.001	N/A	Once/Grab Sampling	N/A	Once/Grab Sampling	APHA, ed.21,2005, 3500-Hg-B	
22	Zinc (Zn)	mg/l	0.05	0.05	N/A	Once/Grab Sampling	N/A	Once/Grab Sampling	APHA, ed. 21, 2005, 3110	
23	Cyanide (Cn)	mg/l	0.02	0.02	N/A	Once/Grab Sampling	N/A	Once/Grab Sampling	APHA, ed. 21, 2005, 4500-CN-E	
24	Fluoride (F)	mg/l	0.5	0.5	N/A	Once/Grab Sampling	N/A	Once/Grab Sampling	APHA, ed. 21, 2005, 4500-F-E	
25	Free Chlorine (Cl2) bebas	mg/l	0.03	0.03	N/A	Once/Grab Sampling	N/A	Once/Grab Sampling	APHA, ed. 21, 2005, 4500-Cl2-G	
26	Sulphide (H2S)	mg/l	0.002	0.002	N/A	Once/Grab Sampling	N/A	Once/Grab Sampling	APHA, ed. 21, 2005, 4500-S2-D	
27	Oil & Grease	mg/l	1000	600	N/A	Once/Grab Sampling	N/A	Once/Grab Sampling	APHA, ed. 21, 2005, 5520-B	
28	Deterjen	mg/l	200	100	N/A	Once/Grab Sampling	N/A	Once/Grab Sampling	APHA, ed. 21, 2005, 5540-C	
29	Fenol	mg/l	1	1	N/A	Once/Grab Sampling	N/A	Once/Grab Sampling	APHA, ed. 21, 2005, 5530-C	
III	MICRO BIOLOGY									
1	Total Coliform	individu/100 ml	1000	1000	N/A	Once/Grab Sampling	N/A	Once/Grab Sampling	APHA, ed. 21, 2005, 9221 - B	
2	Fecal Coliform	individu/100 ml	100	100	N/A	Once/Grab Sampling	N/A	Once/Grab Sampling	APHA, ed. 21, 2005, 9221 - D	
D	**GROUND WATER**		**MoH 416/1990 (Drinking water)**	**South Sulawesi Gov. Reg. No. 69/2010**	**WHO Standards for Drinking Water Quality, 2011**					
II	PHYSICS									
1	Temperature	˚C	±3°C	±3°C	±3°C	Once/Grab Sampling	N/A	Once/Grab Sampling	Direct Reading	
2	Colour	TCU	15	N/A	-	Once/Grab Sampling	N/A	Once/Grab Sampling		
3	Turbdity	NTU	5	N/A	-	Once/Grab Sampling	N/A	Once/Grab Sampling		
4	TSS	mg/l	N/A	50					Gravimetric	
5	TDS	mg/l	1000	1000	600	Once/Grab Sampling	N/A	Once/Grab Sampling	Gravimetric	
II	CHEMICALS									
1	Mercury (Hg)	mg/l	0.001	0.001	0.001	Once/Grab Sampling	N/A	Once/Grab Sampling	AAS-Flame	
2	Arsen (As)	mg/l	0.05	0.05	0.01	Once/Grab Sampling	N/A	Once/Grab Sampling	AAS-Flame	

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No	SUB STUDY /PARAMETER	UNIT	ENV.THRESHOLD			SAMPLING PERIOD			Method	Equipment
			NATIONAL		INTERNATIONAL	AMDAL	ESIA	WORK PLAN		
3	Iron (Fe)	mg/l	0.3	3	-	Once/Grab Sampling	N/A	Once/Grab Sampling	Spectofotometric	
4	Fluoride (F)	mg/l	1.5	0.5	1.5	Once/Grab Sampling	N/A	Once/Grab Sampling	Spectofotometric	
5	Cadmium (Cd)	mg/l	0.005	0.01	0.003	Once/Grab Sampling	N/A	Once/Grab Sampling	SNI 6989.16:2009	
7	Chlorine (Cl)	mg/l	250	600	-	Once/Grab Sampling	N/A	Once/Grab Sampling	Titimetric	
8	Chrom Hexavalen (Cr6+)	mg/l	0.05	0.05	0.05	Once/Grab Sampling	N/A	Once/Grab Sampling	AAS-Flame	
9	Manganese (Mn)	mg/l	0.1	0.1	-	Once/Grab Sampling	N/A	Once/Grab Sampling	AAS-Flame	
10	Nitrate (NO3-N)	mg/l	10	10	3	Once/Grab Sampling	N/A	Once/Grab Sampling	Spectofotometric	
11	Nitrite (NO2-N)	mg/l	1	0.06	50	Once/Grab Sampling	N/A	Once/Grab Sampling	Spectofotometric	
12	pH	mg/l	6,5 - 9	6,5 - 8,5	6.5-8.5	Once/Grab Sampling	N/A	Once/Grab Sampling	Electrometric	
13	Selenium (Se)	mg/l	0.01	0.01	0.01	Once/Grab Sampling	N/A	Once/Grab Sampling	AAS- Flame	
14	Zinc (Zn)	mg/l	5	0.05	0.05	Once/Grab Sampling	N/A	Once/Grab Sampling	AAS- Flame	
15	Cyanide (CN)	mg/l	0.1	0.1	0.07	Once/Grab Sampling	N/A	Once/Grab Sampling	Test Kit	
16	Sulphat (SO4)	mg/l	400	400	-	Once/Grab Sampling	N/A	Once/Grab Sampling	SNI 6989.20:2009	
17	Lead (Pb)	mg/l	0.05	0.05	0.01	Once/Grab Sampling	N/A	Once/Grab Sampling	SNI 6989.8:2009	
18	Deterjen	mg/l	0.05	0.05	0.05	Once/Grab Sampling	N/A	Once/Grab Sampling		
III	MICRO BIOLOGY									
1	Total Coliform	individu/100 ml	0	0	-	Once/Grab Sampling	N/A	Once/Grab Sampling	MPN	
2	Fecal Coliform	individu/100 ml	0	0	-	Once/Grab Sampling	N/A	Once/Grab Sampling	MPN	