

APPENDIX J: ASSESSMENT OF NOISE IMPACT

J1. GENERAL

Eskom is planning the construction of a 100 MW concentrating solar power (CSP) plant in the Upington area of the Northern Cape. The likely site for the CSP Plant is in the central western sector of the farm Olyvenhouts Drift at a point about 10-kilometres west of Upington.

The assessment of the noise impact was guided by the requirements of the South African National Standard SANS 10328 (SABS 0328) titled *Methods for Environmental Noise Impact Assessments* and the Noise Control Regulations. A comprehensive assessment using the appropriate noise impact descriptors (standards) has been undertaken. The noise impact criteria used in this investigation specifically take into account those as specified in the South African National Standard SANS 10103:2004, *The Measurement and Rating of Environmental Noise with Respect to Land Use, Health, Annoyance and Speech Communication*, as well as those in the National Noise Control Regulations. Relevant aspects of these Regulations and SANS 10103:2004 are provided in Appendix H.

For this study the position of houses/dwellings on the farms and other noise sensitive areas/sites was taken off the following 1:50 000 topographical cadastral maps:

- SOUTH AFRICA 1:50 000 Sheet 2821AC UPINGTON Second Edition, 1990.
- SOUTH AFRICA 1:50 000 Sheet 2821CA KANONEILAND Second Edition, 1990.

It should be noted though that the mapping is 15 to 25 years out of date. The specific land use (type of farming activity) and position of the farmhouses, labourers' houses and other habitations have thus not all been confirmed. There are new houses in the area and some of the houses/buildings shown on the maps are now derelict. It has however been confirmed by the team undertaking the Social Impact Study that there are no presently no farmhouses, other habitations and noise sensitive sites within the noise area of influence of the proposed CSP Plant.

J2. ASSESSMENT OF THE PRE-CONSTRUCTION PHASE

Activities during the planning and design stages that have possible impact implications in the study area are related to field surveys (such as seismic testing and geological test borehole drilling for large building/structure foundation investigations). As these survey activities will be of short duration and take place during the day, they are unlikely to cause any noise impact.

J3. ASSESSMENT OF THE CONSTRUCTION PHASE

J3.1. General

The potential noise climate was established in general for the construction of the CSP Plant inclusive of appurtenant works such as the construction of new access roads.

Although many of the details of the planned Plant have not yet been finalised, general concepts have been used in the noise impact evaluation and these are adequate to provide a sound basis for the analysis of typical noise conditions and impacts that are likely to prevail on the project. Data related to construction have been sourced from various consultants and the experience that JKA has had working on similar sites.

J3.3. Construction Noise Conditions

Construction will likely be carried out during the daytime only (07h00 to 18h00 or 20h00). It should however be noted that certain activities may occasionally extend into the late evening period, while others such as de-watering operations may need to take place over a 24-hour period. Some of the activities such as the construction of the central receiver plant tower could take place continuously (24-hours a day) over a number of days if a continuous sliding shutter concreting operation is used. It is estimated that construction will take place over a period of 3 to 4 years and at the earliest the Plant could be commissioned by Year 2012.

J3.3.1. Sources of Noise

The following are likely to be the main construction related sources of noise for the CSP Plant and its infrastructure:

- i) Construction camp establishment. This will be for the site offices, workshops and possibly the accommodation camp for the workers on site.
- ii) Activities related to the relocation of services.
- iii) Excavation of building basements and service trenches. Blasting may be required in places but in general pneumatic breakers will be used where rock is encountered.
- iv) Piling operations for large buildings/structures.
- v) Erection of shuttering for concrete.
- vi) Fixing of steel reinforcing.
- vii) Placing and vibration of concrete. Poker vibrators will be used.
- viii) Stripping of shuttering after concrete pour.
- ix) Erection of structural steelwork.
- x) Finishing operations on buildings. Cladding, services installation, etc.
- xi) Installation of generating plant and ancillary plant.

- xii) General movement of heavy vehicles such as concrete delivery vehicles, mobile cranes, mechanical dumpers and water trucks (dust suppression) around the site.
- xiii) De-watering pumps. A 24-hour operation may sometimes be necessary.
- xiv) Road construction equipment. Scrapers, dozers, compactors, etc. (Construction of the internal road system, access roads and the possible need to upgrade Road D3276 between National Road N14 and the entrance to the CSP Plant).
- xv) Construction site fabrication workshops and plant maintenance workshops.
- xvi) Construction material and equipment delivery vehicles.
- xvii) Concrete batching plant and asphalt batching plant on site.

The level and character of the construction noise will be highly variable as different activities with different plant/equipment take place at different times, over different periods, in different combinations, in different sequences and on different parts of the construction site. Typical noise levels generated by various types of construction equipment are given in Table J1a.

These noise levels assume that the equipment is maintained in good order. Conservative attenuation conditions (related to intervening ground conditions and screening) have been applied.

TABLE J1. TYPICAL NOISE LEVELS GENERATED BY CONSTRUCTION EQUIPMENT

Plant/Equipment	Typical Operational Noise Level at Given Offset (dBA)							
	5m	10m	25m	50m	100m	250m	500m	1000m
Air compressor	91	85	77	71	65	57	51	46
Compactor	92	86	78	72	66	58	52	46
Concrete mixer	95	89	81	75	69	61	55	49
Concrete vibrator	86	80	72	66	60	52	46	40
Conveyor belt	77	71	63	57	51	43	37	32
Crusher (aggregate)	90	84	76	70	64	56	50	44
Crane (mobile)	93	87	79	73	67	59	53	47
Dozer	95	89	81	75	69	61	55	49
Loader	95	89	81	75	69	61	55	49
Mechanical shovel	98	92	84	78	72	64	58	52
Pile driver	110	104	97	91	85	77	71	65
Pump	86	80	72	66	60	52	46	40
Pneumatic breaker	98	92	84	78	72	64	58	52
Rock drill	108	102	94	88	82	74	68	62
Roller	84	78	70	64	58	50	44	38
Trucks	-	81	73	67	64	60	57	54

J3.3.2. Noise Impact

The nature of the noise impact from the large building construction sites is likely to be as follows:

- i) Source noise levels from many of the construction activities will be high. Noise levels from all work areas will vary constantly and in many instances significantly over short periods during any day working period.
- ii) Exact daytime period and night-time period continuous equivalent sound pressure levels are not possible to calculate with certainty at this stage as the final construction site layout, work programme, work *modus operandi* and type of equipment have not been finalised. Typical ambient noise conditions from a construction site are as indicated in Table C1b. Ideally the daytime outdoor ambient noise levels should not exceed 45dBA for rural residential areas or 55dBA for urban residential areas (as specified in SANS 10103). For the ambient conditions, there should be no noise disturbance further than 800 metres from the construction activity. Working on a worst case scenario basis, it is estimated that the short term maximum noise levels from general construction operations should not exceed 62dBA at a distance of 1500 metres from the activity site.

TABLE J1b: TYPICAL NOISE LEVELS GENERATED BY A CONSTRUCTION SITE

Noise Source	Typical Operational Noise Level at Given Offset (dBA)							
	100m	250m	500m	800	1000m	1500m	2000m	2500m
Construction site	64	56	49	44	41	36	32	29

- iii) Slightly higher ambient noise levels than those normally considered as reasonable are acceptable during the construction period provided that the very noisy construction activities are limited to the daytime and that the contractor takes reasonable measures to limit noise from the work site.
- iv) There are however unlikely to be noise disturbance and noise nuisance effects, as the nearest noise sensitive sites are more than 8000 metres from the construction sites.
- v) For all construction work, the construction workers working with or in close proximity to equipment will be exposed to high levels of noise as can be seen from Table J1a (refer to the 5 metre offset noise levels).

The nature of the noise impact from the road construction activities (internal roads and access roads) is likely to be as follows:

- i) The level and character of the construction noise will be highly variable as different activities with different plant/equipment take place at different times, over different periods, in different combinations, in different sequences and on different parts of the construction site.
- ii) As no specific construction details or possible locations of major ancillary activity sites are available at this stage, the anticipated noise from various types of construction activities cannot be calculated accurately. In general at this stage, it can be said that the typical noise levels of construction equipment at a distance of 15 metres lie in the range of 75 decibels (dBA) to 100dBA. Refer also to Table J1a. Based on data from similar “linear” construction sites, a one-hour equivalent noise level of between 75dBA and 78dBA at a point 50 metres from the construction would be typical for the earthmoving phase.

J4. ASSESSMENT OF THE OPERATIONAL PHASE

J4.1. General

The planned CSP Plant was evaluated on the following basis:

- i) Noise impact from the CSP Plant operations:

- a) Conventional electrical power generating station (EPGS) (specifically the cooling fans).
 - b) Salt circulation pumps.
 - c) Steam generating plant.
 - d) Heliostat spraying trucks.
- ii) Noise impact from ancillary works (such as waste water purification works).
 - iii) CSP Plant generated traffic.
 - iv) Features of acoustical significance in the study area.

J4.2. Noise Conditions Related to the Planned CSP Plant

The main noise sources at the CSP Plant will be from the cooling fans (at the EPGs), the salt pumps, and the steam generating unit. The noise from the cooling fans will be the loudest and will predominate at areas outside the CSP Plant property.

J2.4.1. EPGs Fans

It is predicted that the noise levels from the CSP Plant will be the following at the given offsets from the cooling fan installation. The equivalent continuous sound pressure level for one hour of operation ($L_{Aeq,1h}$) is given.

<u>Offset from the Plant</u>		<u>Noise Level ($L_{Aeq,1h}$) (dBA)</u>
500m	-	58
1000m	-	51
2000m	-	43
3000m	-	37
4000m	-	33

Assuming daytime operations, noise sensitive sites (in a rural setting) further than 1800 metres away from the Plant will not be significantly impacted by the noise from the Plant. If night-time operations are allowed then noise sensitive sites within 3200 metres of the Plant will be impacted. The noise levels given are the unmitigated values. A conservative approach has been taken in that a hard intervening ground condition has been modelled. There will be greater attenuation than shown with distance where there are houses, other buildings and terrain restraints in the intervening ground between the source and the receiver point. The sparse vegetation in the area will not assist the attenuation with distance.

J4.2.2. Salt Pump Station(s)

The pump station noise profile (with external pumps) is conservatively predicted to be:

<u>Offset from the Plant</u>		<u>Noise Level ($L_{Aeq,1h}$) (dBA)</u>
250	-	46.8
500m	-	39.5
1000m	-	31.3

Assuming daytime pumping operations, the noise sensitive sites (in a rural setting) further than 300 metres away from the pump station will not be impacted by the noise from the pumping operations. At night noise sensitive sites within 750 metres of the pump station could be affected. In an urban setting during the daytime, there would not be any significant impact beyond an offset of approximately 70 metres from the pump station.

J4.2.3. Steam Generating Plant

No data on the steam generators is available at this stage, but generated noise levels are likely to be less than the pump station.

J4.2.4. Heliostat Spraying Operations (Trucks)

This will be an intermittent operation. While the trucks are spraying the heliostats maximum noise levels are not expected to exceed 50dBA at 1000 metres.

J4.2.5. Ancillary Plant (Waste Water Purification Works)

For a typical installation that could be used and when the aeration rotors are working, the ambient noise level will be of the order of 40dBA at a 300 metres offset.

J4.2.6. Cumulative Noise Effects of the CSP Plant

The noise from the cooling fans will be the loudest and will predominate at areas outside the CSP Plant property. Noise from the other sources will hardly contribute to the new external ambient noise levels. Conservatively an additional 1,5dBA has been allowed for over and above the fan generated noise. It is estimated that the CSP Plant will on average operate for 10 hours per day. However it has conservatively been assumed that the average operating time will be 12 hours per day. The predicted equivalent continuous daytime period rating (noise) levels ($L_{Req,d}$) (based on a 12-hour per day operation) and the continuous operation (for 1-hour) noise levels ($L_{Aeq,1h}$) at various offsets from the CSP Plant are summarised in Table J2. The $L_{Aeq,1h}$ is the actual noise level from the CSP Plant that will be constantly be heard at a receptor during a period of continuous operation of the Plant. The

$L_{Req,d}$ is a factor indicating the “average” noise level over the 16-hour daytime period but allowing for 12-hours of operation during this period.

TABLE J2: NOISE LEVELS GENERATED BY THE CSP PLANT

Offset	Noise Level (dBA)	
	($L_{Aeq,1h}$)	($L_{Req,d}$)
500m	59.5	58.3
1000m	52.5	51.3
2000m	44.5	43.7
3000m	38.5	38.9
4000m	34.5	36.6

J4.3. CSP Plant Generated Traffic

The total volume of traffic generated by the CSP Plant will be very small in relation to the total volume of traffic on the adjacent main road, namely National Road N14. The average maximum number of vehicle trips to and from the Plant daily is estimated to be in the order of 60 (two-way trips). These volumes will be far too small to cause any significant noise impact. Refer to Section C5.

J4.5. Features of Acoustical Significance

J4.5.1. Wind

On an annual average, the wind blows mainly from the north-east (48% of the time), for 21% of the time from the north-west, and there are still periods 7% of the time time. This will result in a slight enhancement of noise levels in the areas to the south of the Plant under windy conditions.

J4.5.2. Topography

The terrain in the study area is relatively flat with few features in the near ground to the development site that will assist with attenuation.

J4.5.3. Vegetation

The vegetation in the study area is sparse and will not contribute to the noise attenuation.

J5. FUTURE TRAFFIC GENERATED NOISE CLIMATE

The traffic generated noise climates along National Road N10 and National Road N12 in the Year 2012 (the earliest commissioning date) were calculated using the South African National

Standard SANS 10210 (SABS 0210), *Calculating and Predicting Road Traffic Noise*. Typical situations were used for the calculation sites. The Year 2006 traffic data were extrapolated at a 3% per annum to give the Year 2012 volumes. The noise levels at various offsets from the centreline of these roads are summarised in Table J3. The noise descriptors used are those prescribed in SANS 10103:2004, namely:

- i) Daytime equivalent continuous rating (noise) level ($L_{Req,d}$) (L_d used in Table), namely for the period from 06h00 to 22h00).
- ii) Night-time equivalent continuous rating (noise) level ($L_{Req,n}$) (L_n used in Table), namely for the period from 22h00 to 06h00).
- iii) Day-night equivalent continuous rating (noise) level ($L_{R,dn}$) (L_{dn} used in Table), namely for the 24 hour period from 06h00 to 06h00).

The noise levels given are the unmitigated values. A conservative approach has been taken in that a hard intervening ground condition has been modelled to simulate winter conditions (burnt veld). The sparse vegetation in the area will generally result in little attenuation with distance. There will also be greater attenuation with distance than shown where there are houses, other buildings and terrain restraints in the intervening ground between the source and the receiver point.

TABLE J3: PREDICTED NOISE CLIMATE ADJACENT TO MAIN ROADS (YEAR 2012)

Road	Noise Levels Alongside Roads at Given Offset from Centreline (SANS 10103 Indicator) (dBA)											
	50m Offset			100m Offset			250m Offset			500m Offset		
	L_d	L_n	L_{dn}	L_d	L_n	L_{dn}	L_d	L_n	L_{dn}	L_d	L_n	L_{dn}
N10	64.6	55.8	65.0	61.6	52.8	62.0	57.6	48.8	58.0	54.6	45.8	55.0
N14	66.7	57.8	67.1	63.7	54.8	64.1	59.7	50.8	60.1	56.7	47.8	57.1
	1000m Offset			2500m Offset			5000m Offset					
	L_d	L_n	L_{dn}	L_d	L_n	L_{dn}	L_d	L_n	L_{dn}			
N10	51.6	42.8	52.0	47.6	38.8	48.0	44.6	35.8	45.0			
N14	53.7	44.8	54.1	49.7	40.8	50.1	46.7	37.8	47.1			

J6. EVALUATION OF THE SITE

The following were the findings regarding the study area.

- i) Generally, the noise climate on and in the immediate surrounds of the farm Olyvenhouts Drift is quiet (typical of a rural/agricultural area), although the noise climate in areas alongside the main roads and railway lines are degraded. The noise climate alongside the roads will continue to deteriorate as traffic volumes increase.
- ii) The potential development site lies close to the town of Uppington, and there are several large residential settlements on the section of the farm close to the Orange River. There are also several farmhouses and farm labourer homes on the section of the farm near to the Orange River, on the river bank of adjacent farms and along the far side bank of the river. The noise climate of the area thus has a character that varies between rural and urban conditions.
- iii) There are no noise sensitive areas/sites within the potential noise area of influence of the CSP Plant. The nearest noise sensitive site lies at a distance of more than 8000 metres from the proposed position of the Plant.
- iv) The Uppington Site appears suitable for the development of the CSP Plant.

J7. SIGNIFICANCE RATING OF THE NOISE IMPACT

The following assessment of the potential noise impact of the CSP Plant is based on DEAT's (1998) Guideline Document: EIA Regulations methodology. Both the construction phase and the operational phase are analysed.

J7.1. Significance of the Noise Impact during Construction

Rating Criteria	IMPACT: Noise Impact during Construction	
	With Corrective Actions	Without Corrective Actions
Nature/Extent	Local (2)	Local (2)
Duration	Short term (2)	Short term (2)
Magnitude	Minor (2)	Low (4)
Probability	Medium (3)	Medium (3)
Significance	Low (18)	Low (24)
Status	Negative	Negative
Corrective action	Refer to Section 7.2 in the main report	

J7.2. Significance of the Noise Impact during Operation

Rating Criteria	IMPACT: Noise Impact during Operation	
	With Corrective Actions	Without Corrective Actions
Nature/Extent	Local (2)	Local (2)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)
Probability	Low (2)	Low (2)
Significance	Low (20)	Low (20)
Status	Negative	Negative
Corrective action	Refer to Section 7.3 in the main report	