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		MEMO CONCERNS <b>Influence of local microphone placement concerning the Oslo Airport Gardermoen NTMS (noise and track monitoring system).</b>		FOR YOUR ATTENTION	COMMENTS ARE INVITED	FOR YOUR INFORMATION
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FILE CODE	CLASSIFICATION					
40-NO 020041	Unrestricted					
ELECTRONIC FILE CODE						
40-NO 020041.doc						
PROJECT NO.	DATE	PERSON RESPONSIBLE / AUTHOR	NUMBER OF PAGES			
403129	2002-05-23	Svein Å. Storeheier	11			

## 1 Introduction

One of the tasks involved in investigating the difference between measured and calculated aircraft noise levels, was to study the possible influence of local microphone placement. This problem can be split into two parts, i.e. an investigation of the influence of local surroundings, and an investigation of the influence of microphone height above ground.

## 2 The influence of local surroundings

### 2.1 The investigation

The microphone positions belonging to OSL's permanent noise and track monitoring system were numbered NMT 4 - 11. NMT 4 and NMT 5 were located at the end of runway West and East respectively. The rest of the microphones were located in areas some kilometres from the runways, mainly North and South of the runways.

When judging the influence of local surroundings a number of parameters were investigated during an inspection survey to all the positions listed above, exclusive position 5. The parameters surveyed were :

- type of area (rural, residential, urban),
- general background noise situation,
- noisy equipment/installations/industrial plants close to the microphone location,
- distance to the nearest building,
- roads near to the location, or audible,
- ground cover.

Pictures of the microphone locations and schematic maps are shown in Appendix 1.

## 2.2 The survey results

The findings of this survey investigation are listed in Table 2.1 below.

**Table 2.1 Summary of registrations according to the listed parameters**

	Type of area	Background noise	Equipment, installations	Distance to nearest building,m	Type of roads	Type of ground cover
NMT 4	Airfield	-	-	25	-	Grass/gravel
NMT 5	Airfield	-	-	-	-	-
NMT 6	Rural	low / agric.	no	275	-	Agricult.
NMT 7	Rural	low / agric.	no	75	local/ rv 120, 100 m	Agricult.
NMT 8	Rural *	low / agric.	no	15	E6, 500 m	Agricult.
NMT 9	Rural *	low / agric.	no	100	Fv462, 100m	Agricult.
NMT 10	Rural	low / agric.	no	140	local	Agricult.
NMT 11	Rural	low / agric.	no	30	local	Agricult.

\* Small residential area in the vicinity.

All the locations have the same microphone height above ground, i.e. approximately 6 m. All locations NMT 6-11 have generally low background noise levels, but the noise level will increase during periods of agriculture activities. Location NMT 7 is situated close to a local road. Vehicle traffic on this road may occasionally give rise to high maximum noise levels. NMT 8 is located relatively close (approximately 15 m) to the nearest building. This may represent a possible cause of sound reflections from the nearest vertical building façade.

As far as one could experience during the inspection survey, none of the locations NMT 6 - 11 were exposed to noise from permanent technical installations or local industrial plants. At location NMT 8 noise from garden activities (for instance grass cutting) may represent a certain background problem during summer time. At this location traffic noise from the distant E6 main road was clearly audible.

Locations NMT 4 - 5 are situated near the end of the western and eastern runways respectively. The microphones were attached to the runway light bar arrangement approximately 6.5 m above ground. Only NMT 4 was visited, the conditions at NMT 5 were assumed to be similar. All the locations NMT 6 - 11 can be easily accessed.

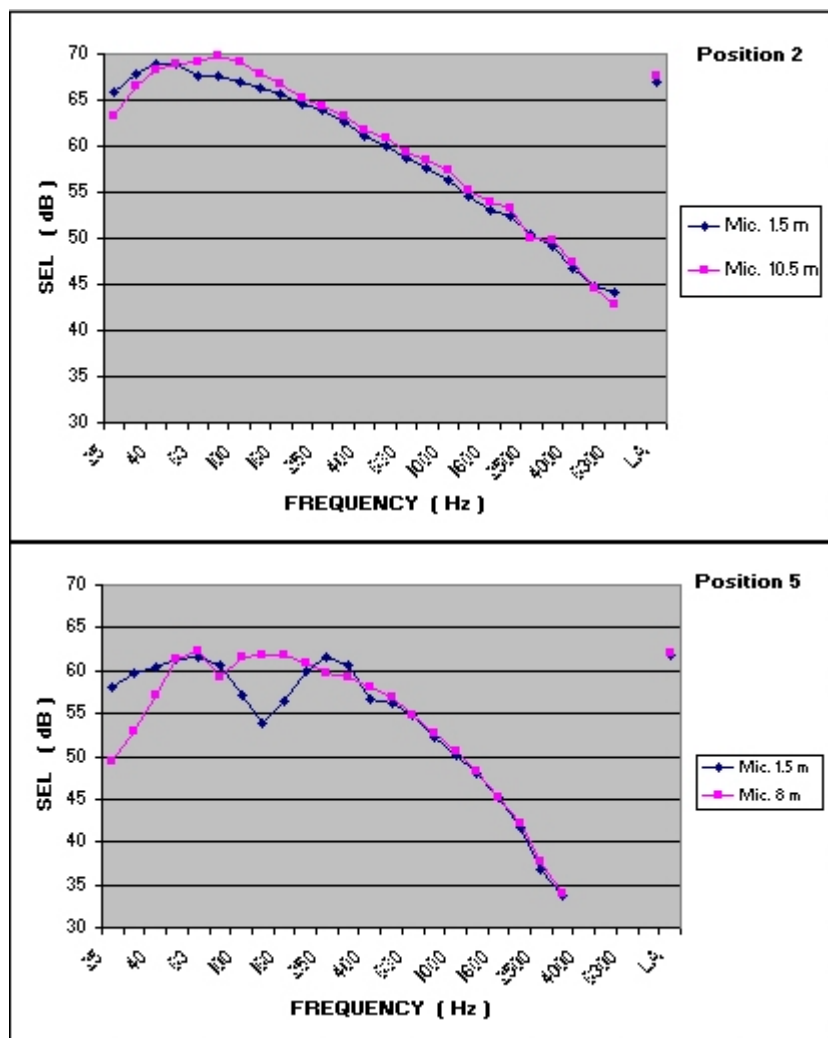
## 3 The influence of microphone height

The microphone heights above ground are 6 m for all locations NMT 6 - 11. Aircraft noise level calculations are made for a receiver height of 1.5 m above ground. The effect of this difference was investigated theoretically in an earlier investigation<sup>1</sup>. Some practical experience can also be obtained from the aircraft noise measurements at Gardermoen, June 2001.

Two examples of the influence of microphone height were prepared. At measurement position 2 the two microphone heights were 1.5 and 10.5 m respectively. This position is directly below the aircraft flight path. At measurement position 5 the two heights were 1.5 and 8 m. This position is

<sup>1</sup> R. T. Randeberg : "Validering av GMTIM", SINTEF Notat 40-2000-5930, 2000-10-18.

approximately 1250 m to the side of the flight track. Measured sound exposure levels averaged over all departure flights with B736 show differences in levels (1/3-octave band levels and A-weighted levels) that are shown in Figure 2.1.



**Figure 3.1 The influence of microphone height on measured SEL, aircraft B736**

The results show some significant deviations in noise levels measured at the two microphone heights in the low frequency range below approximately 200-250 Hz. Although the deviations amount to 7 dB in some 1/3-octave bands, this influence is well below 1 dB for the A-weighted level in the given examples. The A-weighted level differences amount to 0.7 dBA and 0.3 dBA at position 2 and 5 respectively.

## 4 Findings

All the microphone locations NMT 6 - 11 are situated mainly in rural areas, with generally low background noise levels. No specific permanent background noise sources or clearly unfavourable reflection conditions were found. Agriculture activities can cause high maximum noise levels during specific parts of the summer season. If the noise monitoring system are activated due to aircraft traffic, there is a certain chance that a false aircraft level may be recorded. The nearby ground covers are in most cases agricultural fields. This means that their acoustical properties will

vary during the summer season. In principle, this may influence on the recorded aircraft noise levels, especially in the lower end of the noise spectra. This effect is however not judged to give significant influence on the A-weighted aircraft noise levels. The microphone height of 6 m above ground can give small noise level deviations relative to 1.5 m, as far as A-weighted SEL values are concerned.

## APPENDIX 1 : The measurement locations

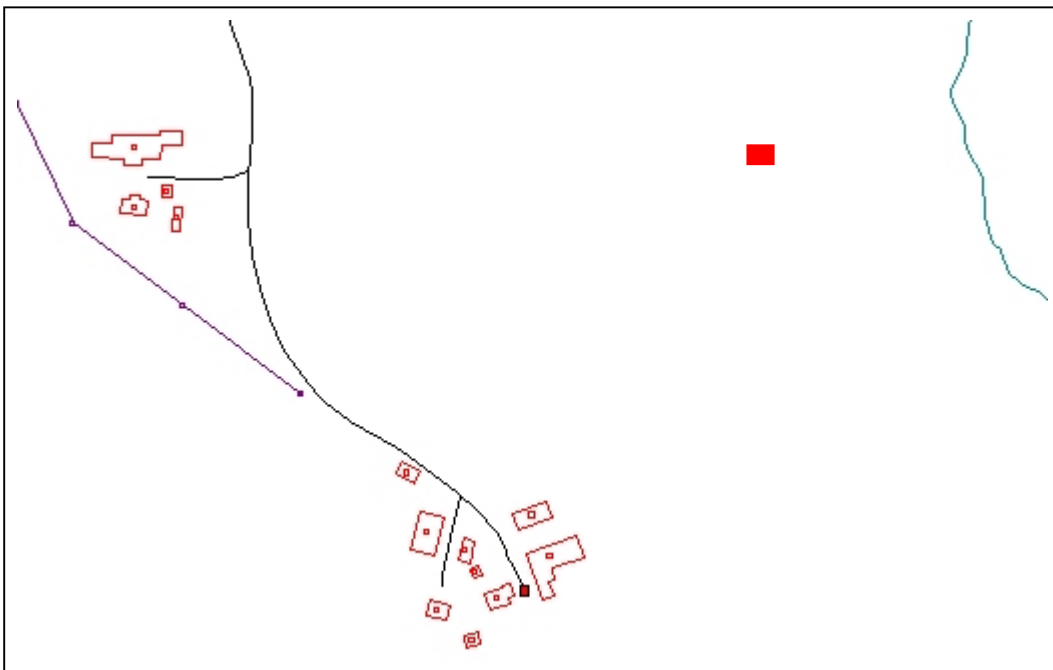
NMT 4 :



NMT 6 :



Schematic view of microphone position (red square) relative to main infrastructure.

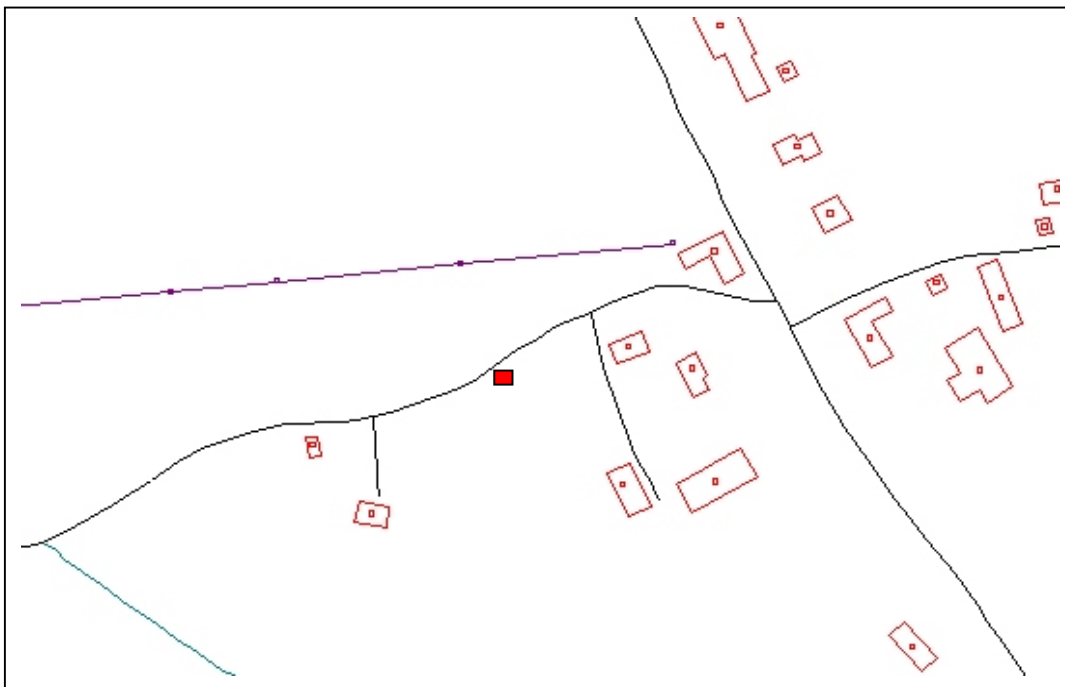




NMT 7 :



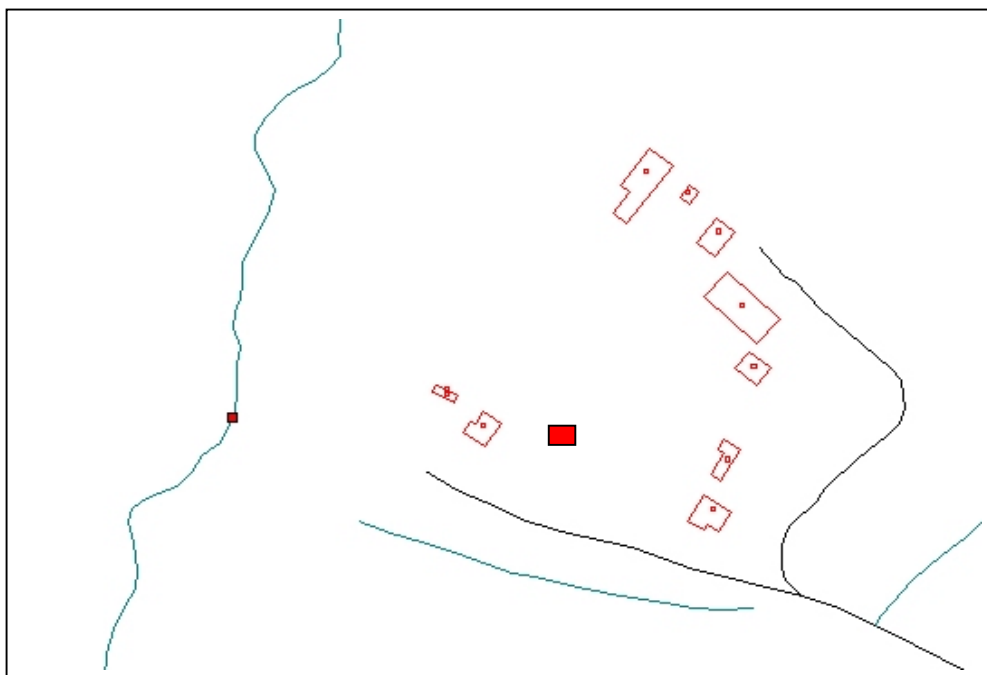
Schematic view of microphone position (red square) relative to main infrastructure.



NMT 8 :



Schematic view of microphone position (red square) relative to main infrastructure.

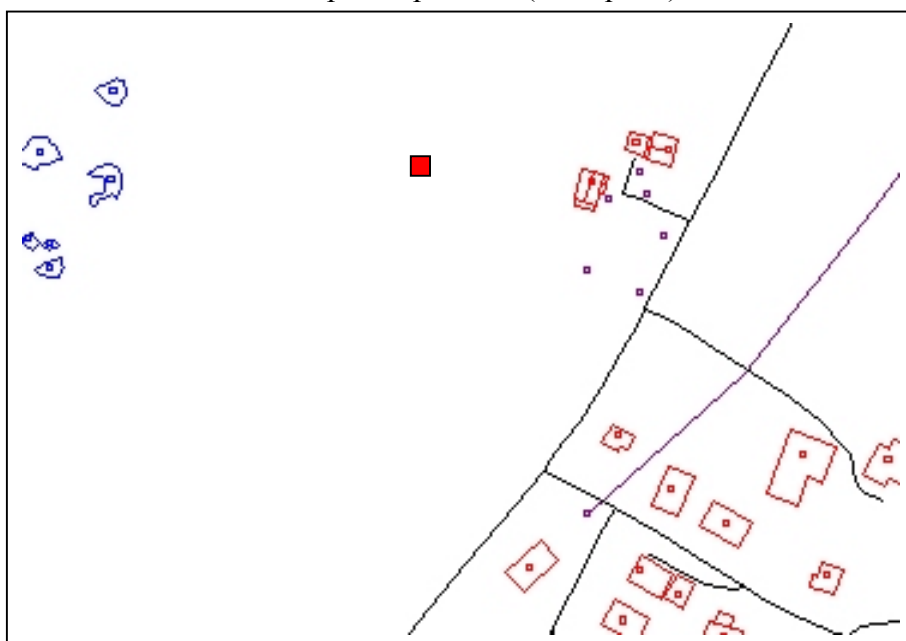




NMT 9 :



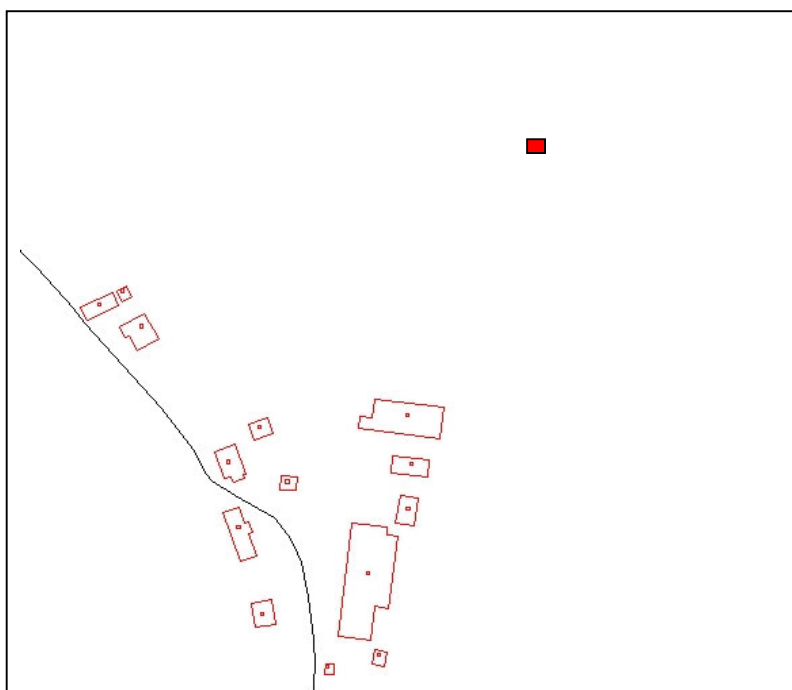
Schematic view of microphone position (red square) relative to main infrastructure.



NMT 10 :



Schematic view of microphone position (red square) relative to main infrastructure.





NMT 11 :



Schematic view of microphone position (red square) relative to main infrastructure.

