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NOISE LEVELS FROM WATER SKI TOW BOATS

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1. INTRODUCTION

The Noise Advisory Council document (NAC(Tech)(76)7) "Draft Guidlines on limitation on Noise from Water Ski Towing Boat" suggests that the average peak noise emitted by a towing boat should not exceed 75dB(A) for a boat speed of 22 mph when measured at a height of 1.2m and a distance of 25m. However, there seems to be some reluctance amongst local authorities and water authorities to believe that boats will comply with these guidlines.

Recently, on three occasions, I have been asked to monitor noise levels from skiing demonstrations which were organised for the benefit of planning authorities who were considering applications from the British Water Ski Federation. The results of these measurements are presented in this paper with the intention of showing the water skiing which takes place under the control of the Water Ski Federation is not an excessively noisy leisure activity but one which can take place in many locations with little environmental disturbance.

2. NOISE MEASUREMENTS

2.1 Description of measurement locations:

Noise levels were monitored at two reservoirs

a) Grafham Water, Huntingdon which covers an area of 2⅛ square miles and is located in an area which is flat and open. The reservoir is an active reaction centre and the area designated for water skiing is shown in figure 1. The ski-path was 100m from the reservoir edge.

b) Bottoms Reservoir, Langdendale which has a surface area of only 0.08 square miles and lies at the bottom of a valley. At present it is little used as a recreational amenity. The two ski-paths used during the demonstrations are shown in figure 2.

2.2 Details of towing boats

Three boats were used in the demonstration at Grafham Water and one boat only at Bottoms Reservoir, the details of which are given in table 1.

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Table 1.

Boat type and length	Engine type and size	Engine position	Fuel
*Mastercraft 19'	Pleasurecraft V8.351m^3 (approx 280 HP)	Inboard	Petrol
Glastron 14'6	Evenrude 60 HP	Outboard	Two stroke
Glastron 17'	Evenrude 120 HP	Outboard	Two stroke

*This type of boat was used on both occasions at Bottoms Reservoir as well as at Graham Water.

2.3 Measurement Procedure

On all occasions the maximum slow A-weighted sound level was monitored using a precision sound level meter.

During the Graham Water demonstration the weather was most unsuitable for making noise measurements. A strong SSW wind of average speed 10ms^{-1} blew throughout the measurement period with gusts as high as 17ms^{-1} occurring. This made monitoring on the reservoir edge impossible. The only meaningful measurements obtained were made in a stationary safety boat moored to one of the buoys close to the centre of the ski path.

The sound levels taken at this position are given in table 2 while the average levels corrected to a distance of 25m are shown in table 3. In working out the average noise level for each boat the asterisked values have been omitted as they were influenced by background noise (typically 60-65dB(A)). The correction to 25m was made assuming a reduction of 6dB per doubling of distance. All measurements were made with the boat towing a skier and with only one boat operating at a time.

The weather conditions during the first demonstration at Bottoms Reservoir were more favourable than at Grafham Water although there was still a stiff wind of average speed 6ms^{-1}.

The noise was monitored at a position on the edge of the reservoir at approximately 100m from the ski path A (figure 2). The sound level meter was monitored 1.2m above the ground at 1m from the water edge. As well as the maximum by pass level the Leq during the by pass was also monitored and the noise was recorded and later analysed to give a one-third octave band spectrum.

The measured levels are given in table 4 and 5.

For the second demonstration ski path B was used and the levels were monitored at two positions at the reservoir edge (figure 2). The measured levels are given in table 6. Only three runs were made with the boat towing the skier as the water was very cold.

3. COMMENTS AND CONCLUSIONS

1. For any boat the monitored noise levels were essentially independent of the speed at which it was travelling and whether or not it was towing a skier.

2. The Mastercraft, which was powered by a 280 HP inboard motor totally enclosed under a fibreglass insulated canopy, gave average by pass levels of 69.7, 69.5 and 74.7 dB(A) when corrected to 25m. The highest level was measured during the first demonstration at Bottoms Reservoir and as it was the same boat that was used for the second demonstration it is difficult to explain the 5dB(A) difference in levels. The most likely explanation is that the distance estimate was in error. No marker buoys were used and a visual estimate of the distance had to be made based on the known width of the reservoir. Nevertheless all levels were within the suggested limit of 75dB(A).

3. Both Glastrons powered by 60 HP outboard motors gave average maximum by pass levels of 66dB(A) when corrected to 25m which is well within the Noise Advisory Council limit.

4. The third octave band spectrum of the Mastercraft showed no distinctive tonal qualities and subjectively the noise could not be considered instrusive.

Although no spectra were taken of the other boats these were subjectively similar to the Mastercraft.

During all three demonstrations the general comment of the observers was that the boats were much quieter than they had thought they would be.

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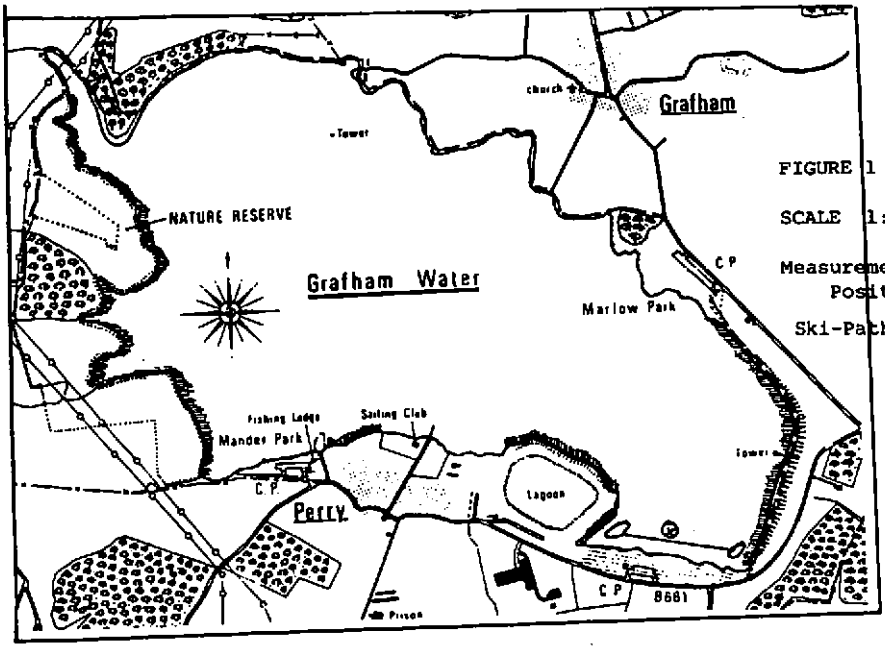

FIGURE 1

SCALE 1:32000

Measurement Position ⊗

Ski-Path

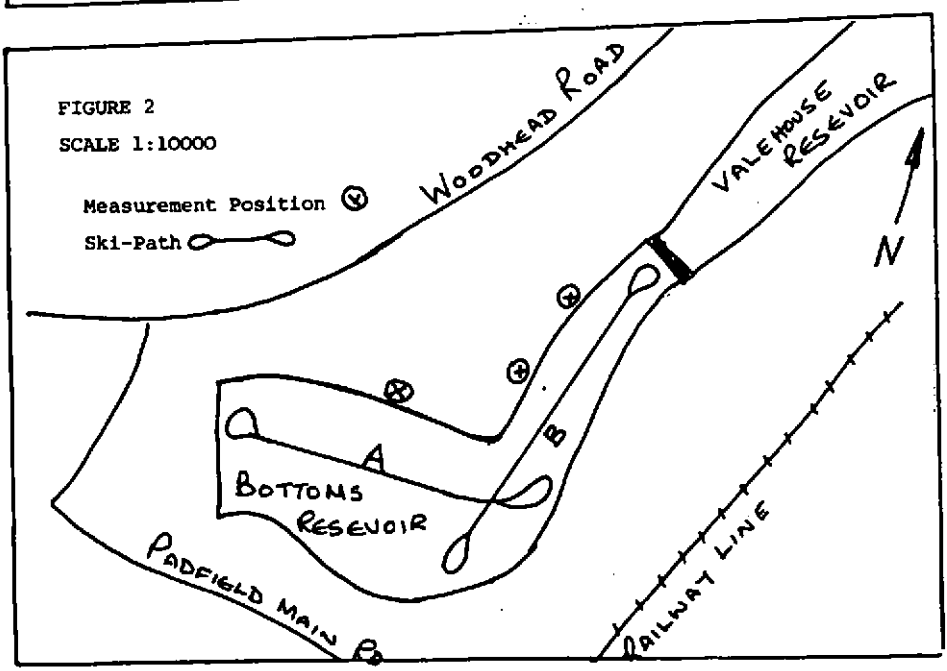

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Table 2. Maximum By-Pass Noise Levels in dB(A)

Boat	Distance to Measuring Posn	Wind Towards (T) or From (F) Monitor	Approx Speed MPH	Max Level
Mastercraft	10	T	Take up	77
"	10	F	30	77
"	10	T	30	80
"	10	F	30	79
"	10	T	36	79
"	10	F	36	78
"	10	T	30	73
"	10	T	30	75
"	10	T	30	76
Glaston 14'6"	15	F	30*	65*
"	10	T	30	75
"	10	T	30	69
"	10	T	Take up	68
"	10	T	Take up	80
"	10	T	30	75
"	20	T	Take up	69
"	10	T	30	74
"	20	T	30	62*
Glaston 17'	15	F	30	61*
"	10	T	30	73
"	20	F	30	62*
"	20	F	24	63*
"	7	T	30	75
"	10	T	30	75
"	10	T	Take up	75

Average background noise level due to wind and wave slap 60-65dB(A)

Table 3. Average Maximum Noise Levels in dB(A) Corrected to a Distance of 25m

Boat	Level
Mastercraft	69
Glaston 14'6"	66
Glaston 17'	66

Table 4. Measured Noise Levels for Mastercraft Measured at Approximately 100m

Run No	Direction	Boat Alone Speed 36mph		Boat with Skier(Tricks) Speed 18mph		Boat with Skier(Slalom) Speed 36mph	
		Max By Pass Level dB(A)	Leq* dB(A)	Max By Pass Level dB(A)	Leq dB(A)	Max By Pass Level dB(A)	Leq dB(A)
1	Upwind	64	64	64	63	65	63.5
2	Downwind	64	65	64	63	65	63.5
3	Upwind	66	64	64	63	65	63.5
4	Downwind	66	64	64	62	65	64.5
Average level		65	64.3	64	62.8	65	63.8
Correction for background noise		-2	-2	-2	-2	-2	-2
Correction to 25m		+12	+12	+12	+12	+12	+12
Level at 25m		75	74.3	74	73.8	73	73.8

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Table 5. Third Octave Band Sound Levels of Mastercraft Measured at Approximately 100m

Third-Octave Band Centre Frequency (Hz)	SOUND PRESSURE LEVELS (dB) Boat Alone	Boat with skier(tricks)	Boat with skier(slalom)	Background Noise
100	67	57	66	53
125	69	60	70	49
160	57	58	58	47
200	57	54	56	46
250	56	54	58	46
315	55	54	55	45
400	55	55	57	47
500	53	56	55	48
630	53	55	54	49
800	53	55	54	50
1000	53	54	53	49
1250	52	54	53	49
1600	52	54	52	48
2000	51	53	51	48
2500	50	52	50	47
3150	49	51	49	45
4000	47	49	47	44
'A' Weighted	63	64	64	59

The levels for the boat/boat and skier are the average of four runs.

Table 6. Max By-Pass level (dB(A)) of Mastercraft Measured at Approximately 40m

Run No	Direction	Boat Alone Speed 36mph		Boat with Skier (Tricks) Speed 18mph		Boat with Skier (Slalom) Speed 18mph	
		Pos 1	Pos 2	Pos 1	Pos 2	Pos 1	Pos 2
1	East	66	67	-	67	64	67
2	West	68	68	65	62	65	65
3	East	67	64	64	64	67	67
4	West	67	67				
5	East	64	64				
6	West	-	67				
Average level		66	66	65	64	65	66
Correction to 25m		+4	+4	+4	+4	+4	+4
Level at 25m		70	70	69	68	69	70