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NOISE FROM STEAM TRAINS: THE WELSH HIGHLAND RAILWAY

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This paper has been prepared using evidence given at a Public Inquiry held in Caernarfon, North Wales, in December 1997 and January 1998. At the time of preparing the paper, the Inspector's decision is awaited and the contents are limited to factual matters rather than those of opinion.

1. INTRODUCTION

Blaenau Ffestiniog was, for more than a century, a source of good quality slate which was exported worldwide. In the 19th century the slate was carried by gravity in wagons for 13 miles from the mines down a 2 ft gauge railway to Porthmadog on Tremadog Bay. Horses were used to haul the empty wagons back to the mines. In later years, steam power replaced the horses and trains began to be used for passengers as well as to carry slate. Eventually other cheaper sources of slate became available, for example in Spain, and most of the Welsh mines were closed in the 1950s. There has been some revival and slate is again produced commercially, one mine is mainly a tourist attraction.

It is the Ffestiniog Railway Company which owns the railway linking Porthmadog and Blaenau Ffestiniog. The same company is now promoting the reopening of the Welsh Highland Railway. This railway connects with the Ffestiniog Railway in Porthmadog and passes Snowdon on a 25 mile route to Caernarfon. Trains were operated on this line through Snowdonia until 1937.

The railway was never legally abandoned and hence the trackbed has remained virtually intact. It is clearly visible throughout much of its length and several of the old bridges are still in place. Since the track runs through a very scenically attractive area, parts in practice have become used by walkers. Other sections run through sheep grazing areas and with the passage of time since closure in 1937 some of the farms are divided by the old trackbed. The prospect of re-opening the railway has therefore resulted in objections from local residents as well as bodies such as the Snowdonia Society and the Ramblers Association. Objectors were particularly concerned to know that it was proposed to use Beyer Garratt locomotives weighing 61 tonnes compared with the 15 tonne Alco 'Mountaineer' as used on the Blaenau Ffestiniog to Porthmadog line. They understandably assumed that the larger locomotives would be much noisier.

Currently there is a regular steam train service which has operated between Blaenau Ffestiniog and Porthmadog since the 1980s. The first short three mile section of the Welsh Highland Railway between Caernarfon and south to Dinas was opened in November 1997 in preparation for the tourist season in the spring of 1998. It was on this section that measurements of noise and vibration were carried out prior to the public inquiry held in December 1997 and January 1998. This inquiry dealt with an application by the Ffestiniog Railway Company to the Department of Trade for a works order under the Transport and Works Act to allow reopening of the railway between Dinas and Porthmadog. If this application is

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successful, there will eventually be a railway connecting Caernarfon and Blaenau Ffestiniog via Dinas, Rhyd Ddu, Beddgelert and Porthmadog.

2. NOISE TESTS

The tests were made at distances of 25 m and 10 m from the track with trains approaching Dinas station on a positive gradient and vice versa. The Brüel and Kjaer type 2231 sound level meter was mounted on a tripod at a height of 1.5 m above local ground level. The method was as given in Section III of Appendix 1 of the Department of Transport publication "Calculation of Railway Noise 1995" [1].

The Beyer Garratt was not available until the month before the inquiry when comparative tests were made to compare the locomotives hauling five carriages. In addition, the Beyer Garratt hauled a diesel locomotive weighing 30 tonnes, equivalent in weight to a further four carriages. The results are shown in Table 1. It was demonstrated that the Beyer Garratt was more than 7 dB(A) quieter in terms of SEL and L_{max} than the Alco when pulling the same load on a positive gradient. Also, it was capable of hauling the equivalent of double the load. These results removed one of the main objections concerning noise.

3. RESULTS

The highest SEL for the Beyer Garratt when on a gradient and hauling the equivalent of nine carriages was 89 dB(A) (test 12). This was used as the basis for a series of L_{Aeq} (10h) values for various distances and numbers of train movements, as shown in Table 2. Corresponding values were calculated for the Alco and the diesel locomotive with each pulling its maximum load of five carriages. These values were respectively 3 dB greater and 1 dB less than those for the Beyer Garratt.

4. NOISE STANDARDS AND CRITERIA

4.1 World Health Organization

The objectors were aware of the WHO recommendation for "General Health Welfare and Annoyance Criteria": "..... daytime limits in the region of 55 dB(A) L_{eq} might be considered as a general environmental health goal for outdoor noise levels in residential areas." [2]

4.2 The Noise Insulation Regulations [3]

It was clear from the measured noise levels and the small number of train movements per day that the 68 dB L_{Aeq} (18h) daytime limit would easily be met, even at the properties as close as 10 m from the track. The proposed operating hours are 8.00 am to 6.00 pm and noise level calculations were related to a 10 hour period.

4.3 Planning Guidance (Wales)

Technical Advice Note 11 [4] is similar to PPG 24, "Planning and Noise". In dealing with new industrial or commercial development near a residential area, the advice given in Annex A para A5 is as in PPG 24 Annex 1 para 5: "Thus when new industrial or commercial development is proposed near a

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residential area, the effect of the new noise source on the surrounding area will have to be assessed in accordance with existing procedures."

5. ENVIRONMENTAL IMPACT

5.1 Effect on Local Residents

The noise assessment was based mainly on the WHO recommended L_{Aeq} of 55 dB(A). It was evident that this "free-field" level would be met with the exception of a few locations at a distance of 10 m or less. Specific calculations were made for individual objectors to determine whether the limit would be exceeded at properties where there were local factors such as the proximity of halts, bridges or cuttings.

5.2 Effect on Walkers

The area where the old trackbed lies is used by walkers and they could walk close to the line in some places. Account has been taken of reflections from the steep sides of valleys which would increase noise levels to an amount depending on the distances from the line and the reflecting surface. Trains would pass along the line about every 30 minutes.

5.3 Effect of Noise on Livestock

Train noise is not uncommon and railway lines have run through rural and urban areas for well over a century. Animals do not appear to be affected by this although the sound of whistles may cause a startle effect if animals such as horses are not used to them. There is little relevant information in the literature concerning the effect of train noise on animals but tests on lambs have been carried out under laboratory conditions [5]. The tests do not indicate any significant effects. Animals are likely to become habituated to the noise.

6. CONCLUSION

It has been shown that noise levels will generally meet the recommendations of the World Health Organization and the Planning Guidance for Wales. There may be exceptions in the case of a few properties which are at a distance of less than 10 m from the railway or are close to halts, bridges or cuttings. There should be no significant effect on livestock. At the time of preparing this paper, the result of the Public Inquiry is unknown as the Inspector has not yet submitted his decision to the Secretary of State.

7. REFERENCES

- [1] DEPARTMENT OF TRANSPORT, Calculation of Railway Noise, 1995.
- [2] WORLD HEALTH ORGANIZATION, Environmental Health Criteria 12. Noise. 1980.
- [3] The Noise Insulation (Railways and Other Guided Transport Systems) Regulations 1996. Statutory Instruments 1996, No 428.
- [4] Planning Guidance (Wales) Technical Advice Note (Wales) 11. Noise. October 1997.
- [5] Effects of Noise on Wildlife. Ed., J L Fletcher, R G Busnel, 1978.

Table 1
Results of Noise Measurements from passing trains near Dinas Station on 15 October 1997

Test	Time	Direction		Loco	Load	Noise level (dB(A))		Distance (m)	Comments
		N	S			SEL	L _{max}		
1	10.15		✓	BG	5 carrs.	87	78	25	Normal Public Service
2	10.35	✓		BG	5 carrs.	85	73	25	Normal Public Service
3	11.01		✓	BG	5 carrs.	91	84	10	Normal Public Service
4	11.35	✓		BG	5 carrs.	87	77	10	Normal Public Service
5	13.45		✓	BG	5 carrs.	84	74	25	Normal Public Service Repeat of Test 1
6	15.05	✓		BG	5 carrs.	83	71	25	Normal Public Service Repeat of Test 2
7	16.05	✓		Alco	5 carrs.	83	72	25	Normal Public Service
8	16.20		✓	Alco	5 carrs.	93	86	25	Last Public Service Train
9	17.01	✓		Alco	5 carrs.	81	70	25	Repeat of Test 7
10	17.11		✓	Alco	5 carrs.	92	86	25	Repeat of Test 8
11	18.20		✓	BG	5 carrs. + Funkey	88	80	25	
12	18.30		✓	BG	5 carrs. + Funkey	89	80	25	Repeat of Test 11
13	18.40		✓	BG		92	85	25	As Tests 11 and 12 plus brakes "on"
14	12.25	-	-	BG	-	89	96	25	Whistle only
15	12.30	-	-	BG	-	70	78	200	Whistle only
Local Weather Conditions: damp, calm, warm									
Measurement location:				at crossing approximately 400 mN of Dinas Station					
Train speed:				approximately 15 mph as limited on this section					
Directions:				Trains travel North from Dinas to Caernarfon on a slight downhill gradient and vice versa					
BG:				Beyer-Garratt 60 tonne steam locomotive					
Alco:				Alco "Mountaineer" 30 tonne steam locomotive					
Funkey:				30 tonne Diesel locomotive towed to increase load					

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Table 2

Calculated noise levels L_{Aeq} 10h

Distance (m)	No of movements per day	L_{Aeq} free-field			Excess re WHO 55 dB(A)		
		BG	Alco	Diesel	BG	Alco	Diesel
10	20	58	61	57	+3	+6	+2
25	20	54	57	53	-1	+2	-2
50	20	51	54	50	-4	-1	-5
10	16	57	60	56	+2	+5	+1
25	16	53	55	52	-2	+1	-3
50	16	50	53	49	-5	-2	-6
10	12	56	59	55	+1	+4	0
25	12	52	55	51	-3	0	-4
50	12	49	52	48	-6	-3	-7

