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Technical note

Project	CNC Dounreay	**Date**	28 March 2013
Note	Comparison of measured noise levels of existing range with modelled impacts of proposed range	**Ref**	
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1. Introduction

1.1 This Technical Note reports the comparison of measured noise levels at chosen closest receptors around the proposed CNC firing range, with measured noise levels from the existing range at the same receptors. This exercise has been undertaken to ascertain the level of change that might be expected by the residents in the vicinity as a result of the development of the new range.

2. Modelled Noise Levels for Proposed Range

2.1 In relation to the potential for the scheme to generate significant impacts at the receptors noted around the proposed weapons training range, the design of the facility has taken into account the potential for adverse impacts and has aimed to mitigate the impacts through the use of barriers all around the firing range area.

2.2 In this case, the barriers around the site will be 10m in height, matching the required height of the bullet catcher mound, which will be located at the northern end of the facility. An entrance gate is located on the western side of the range, cut through the bund to enable vehicular access but in order to provide a degree of site security a 3m high solid gate has been placed in the opening to provide a degree of protection.

2.3 Given the above, a noise modelling exercise was undertaken to determine the noise from the guns at the closest residential dwellings. The proprietary noise mapping software IMMI 2011 has been utilised to undertake the detailed calculations, and to predict the noise incident at the closest sensitive receptors. This software package allows the prediction of noise emission levels from one or more sources. For the purposes of this assessment, the guns have each been modelled as point sources.

2.4 The noise calculations have been undertaken within the model in accordance with the noise prediction framework set out in ISO 9613-2 'Acoustics – Attenuation of sound during propagation outdoors – Part 2 General method of Calculation'.

2.5 The noise prediction model assumes that a height of 1.5m above ground level for each point source. Noise emissions levels at each of the receptors are shown in Table 1, considering the noisier Heckler and Koch GP60 Carbine.

2.6 The noise model takes into account the distance between each noise source and the receptors, the attenuation due to atmospheric absorption and potential barrier effects caused by the intervening terrain and noise barriers around the facility, which in this instance are 10m high. The receptors within the noise model are entered at a height of 1.5m above ground level. It should be noted that the prediction method used

calculates down-wind noise levels, i.e. it assumes that the wind direction is from the source to the calculation point. This is therefore a conservative approach, as it is unlikely that the receptor will be down-wind of the weapons training range at all times.

2.7 In addition, directivity corrections have been made based on data available from tests undertaken in the USA, with a correction of -11dB at 90° to the line of fire and -17dB at 180° to the direction of fire.

2.8 Given that firing is not a continuous activity, having to allow for gaps between individual shots, reloading of firearms and on-range instruction, an equivalent hourly rate of activity for firing of 33% has been assumed.

Table 1: Modelled Impact at Receptors of Scheme Design

Firearm	Calculated Noise Levels at Receivers, dB			
	1	2	3	4
5.56mm Heckler and Koch GP60C	45.4	35.9	40.0	41.0

2.9 For the avoidance of doubt the receivers are:

- 1 – Farm Immediately South of A836 and Development Site
- 2 – Vicinity of Isauld Farm
- 3 – No.3 Upper Dounreay Smallholdings
- 4 – Buldoo - in vicinity of residential property on opposite side of A836

2.10 These are the locations used in the original noise assessment.

3. Results of Measurements at Receivers During Live Firing Practice

3.1 In response to concerns from the local residents at the pre application presentation evening, measurements were undertaken of live firing at the existing range, which is to be decommissioned following the construction of the proposed firing range.

3.2 The surveys at were undertaken using a Castle Pro-DX Vocis GA131M Sound Level Meter (serial number 0062925) with a Castle MKDXP Pre-amplifier (serial number 1026) and a Castle ½" microphone (serial number 5035). The meter was calibrated using a Castle GA607 Sound Level Calibrator (serial number 035748). The meter and

calibrator were calibrated in an NPL accredited laboratory within one year prior to the survey, and the details are shown in Table 2.

Table 2: Noise Equipment Calibration

Equipment	Serial Number	NPL Calibration Certificate Number	NPL Calibration Certificate Reference	Date
Castle Vocis M Sound Level Meter	0062925	0062925/57985	S6055	31/05/12
Castle GA607 Acoustic Calibrator	035748	035748/57985	S6055	31/05/12

3.3 It should be noted that the meter was calibrated before and after each measurement to check for 'drift' in the accuracy of the meter. No drift in the calibration level of the meter was found.

3.4 Noise measurements were taken in accordance with the methodology in British Standard 7445-1: 2003 *'Description and measurement of environmental noise Part 1 Guide to quantities and procedures'*, with the microphone between 1.2 and 1.5m above local ground level. All measurement locations were also at least 3.5m away from any reflecting surface, and as a result it can be considered that all measurement locations were 'free-field'.

3.5 Measurements were undertaken with live firing being undertaken at the existing range by 3 CNC Officers using the GP60 Carbine, for a period of 5 minutes firing coinciding with measurements at each of the locations

3.6 Table 3 records the measured noise levels at the 4 locations:

Table 3: Measured Noise Levels at Receptors – GP60C

Firearm	Calculated Noise Levels at Receivers, dB			
	1	2	3	4
5.56mm Heckler and Koch GP60C	47.8	51.2	43.4	44.3

3.7 The measurement at Location 2 was affected by farming activity at this location, but weapons training activities were still apparent. At Location 4, nearby demolition works on a small building were stopped to ensure that the noise measurements were as realistic as possible for everyday activities, as the demolition works were taking place at the former visitor centre, which was much closer to the residential properties

at Buldoo. At this location there was some influence from road traffic, but the live firing was the major noise source

4. Discussion

4.1 Table 4 makes a direct comparison between the modelled noise levels for the proposed range and the measured noise levels for practice firing at the existing range:

Table 4: Modelled Impact at Receptors of Scheme Design

Firearm	Noise Levels at Receivers, dB			
	1	2	3	4
5.56mm Heckler and Koch GP60C – calculated from new range	45.4	35.9	40.0	41.0
5.56mm Heckler and Koch GP60C – measured from existing range	47.8	51.2	43.4	44.3

4.2 What is apparent from this comparison is that the existing noise levels when measured from existing firing range activity were higher at all of the locations than all of the calculated noise levels for the new range.

4.3 This is partly as a result of the existing range being open and not designed to encapsulate the noise emissions, but is also as a result of other noise sources taking place on the Dounreay site and the local road network; the noise model cannot include such sources without becoming very complex.

4.4 Nonetheless it appears that noise emissions from the proposed range will as a result of the noise containment mounds, reduce noise levels from live firing below those currently experienced. Should the Local Authority be minded a condition requiring the measurement and proactive management of noise emissions from the range could be put in place to ensure that noise emissions are kept to acceptable levels.

4.5 As an aside, it was instructive to watch the livestock in the fields around the site whilst live firing was being undertaken. This was only possible at Buldoo; the rest of the fields were largely empty, although there were animals in the barns at Location 2.

4.6 Whilst the firing was ongoing, the sheep in a nearby field at Buldoo did not appear to be affected by it at all, and carried on grazing throughout the firing period. Indeed they were much closer to a backhoe excavator with a rock breaker demolishing

former building foundations, and this did not seem to unduly concern the sheep either.