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Mr Rhuari Bennett
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[by email only]

3 November 2011

Dear Mr Bennett

I am replying to the letter to West Cumbria MRWS Partnership from Mr Alun Ellis of the Nuclear Decommissioning Authority, dated 21 October 2011, which was in response to my presentation on storage and transport of rock spoil. My presentation focussed mainly on the implications of a disposal site in the Eskdale granite. Mr Ellis's letter raises more questions than it answers.

Firstly, he discusses only the 'Reference Case' for rock volumes, excluding Pu/U wastes, whereas I assume that the latter wastes will also need to be disposed of. They exist, and there are no current plans to build a new MOX reprocessing plant, together with the new specialised nuclear reactor (or reactors) that will be required to burn such reprocessed fuel. Therefore it is irrational of the NDA to take the case excluding Pu/U as the base case. The rational base case (for a disposal site in Eskdale) is:

- higher strength rock,
- an inventory including Pu/U,
- no new build wastes

The problem of what to do with the spoil, either permanently, or for re-use up to a century later, comprises one of the largest such projects ever undertaken in the UK. For example, the Channel Tunnel excavations produced about 4 million cubic metres of spoil at each end. Dr Murray Gray has analysed 34 major landraising projects in England between 1990 and 2000; only one was bigger (at 8 million cubic metres, and refused planning permission) than what is currently envisaged for West Cumbria^[1]. It is therefore vital that a transparent and honest discussion of the alternatives be put before the elected representatives of the area, particularly since there is the possibility that such a project may be sited within the National Park.

My slide 10 stated, regarding Eskdale:

"... how and where to store the 4.84 million cu. m. of spoil to be used for backfill. It will be around on the surface for about a century. In addition we have 11 million cu. m. of excess spoil, not to be used for backfilling, which must either be stored permanently as bunds or taken away. This volume is another 3½ pyramids-worth."

In response to this Mr Ellis states:

“In the last slide of his presentation, Professor Smythe sets out spoil volume figures provided by the NDA in the Generic Environmental and Sustainability Report as the basis of his calculations. We do not dispute these, or [sic] the assumed spoil density figures used which appear reasonable. However, we do not recognise the figures quoted on slide 10 of the presentation for backfill volumes or excess spoil.”

The figures quoted on my slide 10, which refers to Eskdale, are simply the NDA’s own figures for rock volumes, multiplied by a correction factor. The figure quoted of 11 million cu. m. of excess spoil is wrong (it should be 9 million), but the volume in terms of pyramids is correct. The bulk volume of solid granite excavated (density 2.7 tonnes per cubic metre) is less than that of the excavated material, because it is in the form of aggregate or rubble. I assume a density of 2.0 for the latter, and therefore multiply the underground solid rock volume by 2.7/2.0 to get the stored surface volume^[2]. So unless my figure for granite aggregate density is much too low, my figures are valid. However, I do accept his assertion that not all of the excavated rock volume will be present at the surface at any one time, because some of it will already have been used for backfilling during the progressive exploitation of the repository.

As I made clear in my slideshow, the pyramids are merely a device for visualising the volumes, and I state that the spoil would in fact be stored in bunds. If these are 12 m high (and not the 5 m I assumed), then we require about 40 Ha (0.4 sq km) of land in Eskdale for the backfill bunds. This is in addition to the 1 sq km (100 Ha) required for the surface facilities. There is simply no room in the Eskdale district for a development on such a scale.

Spoil is brought to the surface up vertical shaft no. 1 in the generic designs, and spoil removal offsite is supposed to be by rail^[3]. Therefore a putative disposal site in the Eskdale granite will require a railway line, so my suggestion that the Ravenglass and Eskdale Railway be used for this purpose is not altogether fanciful. The alternative would appear to be a newly-constructed line running alongside the existing tourist line. In the latter case, what would be the continuing tourist attraction of the old line running alongside modern tracks and past a major industrial site?

Lastly, Mr Ellis’s suggestion that *“beneficial remediation works in reasonable proximity to a site, for example infilling of disused quarries”* does not address the problem of transport offsite of the spoil.

Yours sincerely



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[Emeritus Professor of Geophysics, University of Glasgow]

Notes

[1] Gray, J.M. 2002. Landraising of waste in England, 1990–2000: a survey of the geomorphological issues raised by planning applications. *Appl. Geog.* **22**, 209-234.
<http://web.ead.anl.gov/resrad/datacoll/porosity.htm>

[2] My figure of 2.0 for the density of granite aggregate is an estimate assuming that the porosity is about 25%. This figure is actually on the low side, so my volume correction will, if anything, be an underestimate. The recompaction (reduction of volume and porosity) on building bunds will be negligible.

[3] NDA-RWMD, *Geological Disposal – Generic disposal facility designs*, NDA Report no. NDA/RWMD/048.