WASTE DISPOSAL GUIDELINES, FROM A TESTING LAB'S PERSPECTIVE

John Ashworth
Norwest Labs,
9938-67 ave. Edmonton T6E 0P5

SUMMARY

Analytical labs play an important role, both in site-assessment and in ensuring that waste materials are disposed of without harm to the environment. Labs are capable of rapid, inexpensive and accurate analysis of materials. Staff at testing labs are skilled and knowledgeable. Unfortunately, this laboratory expertise is seldom called on when guidelines for site and waste characterisation or disposal criteria are at the development stage.

The result of this neglect is often a guideline containing a set of analytical requirements which are inappropriate, either for the material being tested, or for the intended goal of the guidelines, or both.

Committees devising guidelines and recommendations involving analytical work are strongly advised to co-opt skilled technical members, preferably from laboratories who will be doing the testing. Government organisations involved in administering guidelines are strongly urged to include testing laboratories on their mailing lists, so that labs are not among the last to become aware of yet another new guideline.

INTRODUCTION

The term "guideline" as used here includes not only guidelines proper but also criteria, regulations, recommendations, informational letters, etc. A wide variety of guidelines exists, pertaining to waste disposal and site reclamation in the energy industry. Special attention will be given here to provincial guidelines relating to wastes from earthen pits and drilling sumps, and to oily wastes for disposal on roads. In discussing these, other relevant guidelines will also be considered.

THE PROBLEMS WITH GUIDELINES

Problem 1

With few exceptions, guidelines that require analytical work fail to give the full details needed by a laboratory in order to carry out testing. In most cases, guidelines give no details at all.

Problem 2

Guidelines may offer little, if any, background information or rationale for doing the analytical work that has been requested. Often, guidelines ask for analytical parameters that are either of no direct relevance to their main objective, or that increase the analytical cost or turn-around time far out of proportion to the amount of useful information gained.

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Problem 3.

Attempts by lab staff to resolve problems by consulting with the personnel involved in administering guidelines almost always meet with a dead-end. Typical responses are, in effect, yes our guideline is inconsistent or absurd but no, there is no easy way to change it; or, we have no technical expertise here so we have to leave the decision up to you lab people.

EXAMPLES

The good:

The latest draft of the Alberta Drilling Waste Disposal Guidelines (EUB, 1996) contains detailed instructions on sump sampling and analysis. It also tackles the problem of how waste disposal calulations are to be done in order to meet the stated criteria. The document is the result of co-ordinated efforts involving not only government and industry but also laboratory staff. No-one from any of these groups would claim that the document is perfect. It is certainly an inordinately long document; but most of the issues have been addressed squarely and relatively few inconsistencies remain. Best of all, from a lab's standpoint, there are comprehensive sections on analytical protocols.

Another example of a reasonably well thought-out set of guidelines is Alberta's municipal sludge disposal handbook (McCoy et al., 1982). The risks and benefits of land treatment of sewage are set out, and a rationale is given for characterising both waste and soil. Unfortunately, no analytical protocols are given by McCoy et al. However, these can be discerned from either analytical data or literature references also given in the document (though doing this of course requires an effort on the part of the laboratory).

The bad:

1. Lest anyone think Alberta Environment's ducks might all be in a row; requirements for assessment and remediation of earthen pits are described in cursory and sometimes contradictory terms (AEP, 1992; EUB, 1993 and 1994). Their requirements include on-site soil characterization "to the sub-group level" without elaborating on either the need or the means for achieving this goal. Fourteen "soil metals" are listed, including four which seldom if ever are a problem; namely arsenic (which incidentally is a non-metal) cobalt, manganese and strontium. "Oil and grease" (a wastewater analysis parameter) is specified for the solid contents of the pit. There are umpteen different ways to measure oil (or, if you insist, "oil & grease") but no analytical protocols are stated for this or any other parameter mentioned.

2. Saskatchewan Energy and Mines's drilling waste regulations (SEM, 1986) seem to have evolved gradually, so that different regulations apply in different parts of the province. For example, extra tests are required if the "sump fluid" - an undefined entity - has over 2,000 mg chloride per litre (1,500 in Newfoundland, sorry, make that Lloydminster).

Only in southwestern Saskatchewan (pity) calcium sulphate-based "fluids" may be spread off-lease at up to 90 m^3/ha if the EC is < 20 dS/m, but ammonium or potassium sulphate-based fluids at no more than 50 m^3/ha, if the EC is < 30 dS/m. No rationale is offered for these various numbers (there may well be one, but one is not on offer).

SEM's "extra tests" include both electrical conductivity and total dissolved solids, though the simple relationship between EC and TDS means you really only need one or the other, not both.

SEM may also ask for a "total metals" analysis (they don't state when or why they may, just that they may). Among the list of no fewer than 27 "metals" they may ask for are the non-metals arsenic (again), selenium and boron. Now, doing "total" boron gives a result (nearly always around 50 mg B per kg) that is quite meaningless, because only hot-water soluble B levels have been correlated with boron phytotoxicity. And throughout, no analytical protocols are on offer from SEM.

3. Country roads in Saskatchewan look very much like those in Alberta until, that is, you want to dispose of oily wastes on them, when they suddenly look very different. From the lab standpoint, one would far rather motor along in Alberta.

There, analytical methods are specified (at length) for a limited number of parameters in the waste as a whole. Also, an equation is given for calculating the rate of disposal. One would be quibbling to complain that the units of conductivity are given as dS/M and concentrations as mg/Kg, and that B is again called a metal.

But in Saskatchewan, the oil fraction of an oily waste is to be analyzed for a list of metals, separately from the water fraction. In a copy of the guideline, faxed to Norwest in June 1996, lead had been added to this list by hand. The water fraction is in turn to be analyzed for these same metals (oops, not forgetting that lead) plus other parameters, including phenols and sulphide (not boron).

Again, no methods are specified for either separation or analysis of the fractions, and no rationale is offered, in a brief (3 pages only) document.

The ugly:

For a story to fill lab kiddies with sheer horror, turn the pages of the British Columbia Drilling Waste Regulations. The testing lab is instructed by BC Energy, Mines and Petroleum Resources (1993) amongst other things to take the following steps:
- do a leachate extraction of the "sump fluid"
- do a 96 hour (= 4 days) fish test on this leachate
- measure boron in this leachate.

Since the "fluid" is defined by BC essentially as a "total waste" sample (as defined in Alberta; EUB, 1996) it may be almost entirely aqueous already, in which case a leachate extraction is meaningless (but a client may still tell a lab to do it, since it's a requirement). On the other hand if, as often happens, the sample has well-defined solid and supernatant phases, the technician then has to decide whether to (i) separate any solids and do a leachate on them, or (ii) do a leachate extraction of the whole fluid, or (iii) ignore the solids and just test the supernatant phase. The document, and BC's administrators, are equally unhelpful on these questions.

Shortly afterwards in this same BC document, a list of sludge analysis parameters appears out of the blue. The lab is asked to test this "sludge" for Biological Oxygen Demand, which:
- is a wastewater analysis, inappropriate for sludge
- requires a 5-day incubation period.

The BC guideline also gives a large list of other sludge analysis parameters, which might be nutrients, toxic metals, soluble ions, soil quality parameters or micronutrients, depending on how you look at it. However, one is not told how to look at it; again, no analytical protocols and no rationale are given.

CONCLUSIONS

Committees responsible for drafting guidelines which involve materials testing should include members with analytical expertise. Staff are usually willing to be co-opted from any one of a number of testing labs. It is after all in a lab's best interests to be aware of any new testing requirements. In any event, all labs should be on the mailing list for any guidelines.

New guidelines should include the reasoning behind the specified testing requirements. If this is provided, questions about why certain parameters have been included or excluded can be forestalled by the rationale given. This helps guidelines gain acceptance.

Guidelines should always include recommended analytical protocols, in detail, with appropriate documentation where possible. In this way analytical costs, turn around time and discrepancies can all be kept to a minimum.

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