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Application of ANZECC Guidelines to Stormwater Discharges

As runoff flows to receiving waters it potentially carries with it a range of substances, which may act as either toxicants or stressors on that aquatic environment. In New Zealand and Australia the predominant set of standards that are used to protect receiving water quality are the 'ANZECC Guidelines'. These are published by The Australian and New Zealand Environment and Conservation Council (ANZECC) as part of its National Water Quality Management Strategy. The most recent revision of this document was in October 2000 and is commonly referred to as 'ANZECC 2000'. There are several key issues that need to be taken into account when applying the ANZECC Guidelines to stormwater discharges.

The most important directive in ANZECC 2000, with regard to stormwater discharges, is the following: ***"The Guidelines have not been designed for direct application in activities such as discharge consents, recycled water quality or stormwater quality, nor should they be used in this way"*** *(page 2-17, Section 2.2.1.9).* Elsewhere in the document this is restated in the following manner: ***"The trigger values are ambient figures and do not apply directly to effluents"*** *(page 8.3-36, Section 8.3.5.1).* In other words, the trigger values should be compared to the pollutant levels measured in the ambient water body as a whole, rather than in specific inputs to that water body.

Given that they do not define discharge limits, the key concept which determines how to apply ANZECC's ambient water quality guidelines to discharges is the mixing zone. With regard to mixing zones, ANZECC 2000 states the following: ***"Even when stringent effluent limits are set and strict waste minimisation is practised, effluents may be of poorer quality than receiving water. It has been accepted practise to apply the concept of the mixing zone, an explicitly defined area around an effluent discharge where certain environmental values are not protected"*** *(page 2-17, Section 2.2.2)*. This is further clarified in the appendices to ANZECC 2000: ***"In a management context, mixing zones are often defined as an explicit area around a discharge site where the Management Goals of the ambient waters do not need to be achieved and hence the designated Environmental Values (EVs) may not be protected. In this context mixing zones are sometimes termed exclusion zones"*** *(Appendix 1, page A1-1)*. Since ANZECC Guidelines do not apply within the mixing zone, it is of primary importance to define the extent of this zone from a stormwater outfall. This is the most problematic aspect of practically applying the guidelines. The extent is dependent on a variety of factors, some specific to the body of water in question. Furthermore, it is open to interpretation. In practical terms the concept of a '*reasonable* mixing zone' is invoked. In New Zealand, NIWA and the Ministry for the Environment have published documentation on this subject[1]. With respect to applying ANZECC to stormwater discharges, it is therefore important to perform water quality testing at the boundary of this 'reasonable mixing zone'.

[1] *Resource Management Ideas No. 10: A discussion of reasonable mixing in water quality management.* Kit Rutherford (NIWA), Bob Zuur, Penny Race (Ministry for the Environment). Available on request.

The most common use of ANZECC to stormwater is to mandate acceptable levels of metals that may exist in receiving waters. It is important to realise that with toxicants in general ANZECC concerns itself, generally, with the bio-available fraction, rather than the total load. In the case of metals this amounts to the *dissolved* metal concentration *only*. There is often confusion over this point, since portions of the ANZECC document recommend performing initial water quality analyses for 'total metals'. In fact this is only part of ANZECC' recommended decision tree approach. This approach proceeds as follows:

1. Compare total (or acid-soluble) metal concentration with the trigger values. If they are exceeded then proceed to 2.

2. Compare total (or acid-soluble) metal concentration with the hardness-adjusted trigger values. If they are exceeded then proceed to 3

3. Compare dissolved metal concentration with the trigger values. If they are exceeded then proceed to 4.

4. Compare 'bioavailable' metal concentration with the trigger values. If they are exceeded then proceed to 5.

5. Perform direct-toxicity assessment (DTA) on the waters in question.

Strictly speaking, only if the result of step 5 is positive (i.e. toxicity is confirmed) is the site declared 'high-risk' and remedial actions are required. The problem is that steps 4 and 5 are difficult, time-consuming and expensive. As such it is usually more practical to stop at step 3. In other words, the dissolved fraction is considered to equate to the bioavailable fraction and if these breach the trigger value then the site is declared 'high-risk' at that point. From a practical standpoint this decision tree approach can be time consuming and costly, since it may require multiple sampling efforts in the field. Since there is little extra cost and effort involved, the simplest solution is to perform dissolved metals analyses, initially.

In summary, the key points to applying ANZECC guidelines to stormwater discharges are:

- to define a reasonable mixing zone
- to implement a protocol to sample the receiving waters appropriately at the extent of this mixing zone during periods of stormwater discharge
- that where metals are concerned, the ANZECC trigger values are with reference to dissolved metals only. Sampling and analytical protocols should address this requirement.