Consent Consistency- Method of Measurement Defining Compliance

Water NZ

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Presented By

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Outline

- What is the issue?
- Sample conditions – across RCs
- Sample conditions – same RC
- Measurement Issues
- Why is it a problem?
- What causes the problem?
- Potential solutions

The Issues

- Lack of consistency in setting the means by which compliance will be measured, and / or
- The period over which compliance will be measured, and / or
- How the measure is defined?

These are Issues because:

- No uniformity for operators planning & implementing monitoring programmes;
- No uniformity in reporting;
- Inability to directly compare similar activities;
- No common design parameters.

Similar Activities, Different RCs

Parameter	RC 1, Consent 1	RC 2, Consent 2	RC3, Consent 3
Flow	30 Dry day rolling average	100th %ile	Mean and Maximum
Total Nitrogen	3 month Rolling Mean of Concentration (<15mg/l) and Load.	10 Result rolling 90th percentile of Concentration <15mg/l.	Annual Ave<7mg/l. Ann. Ave Load<32kg/d
Ammonia	5 Sample Ave < ANZECC Guideline Table	12Mth rolling mean and 95th%iles <15 & <25mg /l respectively	Annual Av <1mg/l Ann 90%ile<2mg/l from samples every 8 days.
Disinfection of human Pathogenic organisms	a 4 Log reduction in F-Specific bacteriophage as a 100th%ile	10 result rolling 90th%ile and geomean on E.Coli	Ann.Med.<14cfu/100 ml Ann 95%ile<43cfu/100ml

Similar Activities Within a Single RC

Parameter	RC 3, Consent 1	RC 3, Consent 2	RC3, Consent 3
Flow	Mean daily	100%ile	Mean and 100%ile daily
Total Nitrogen	Not restricted	Seasonal mean <73kg/day	Annual Ave<7mg/l. Ann. Ave Load<32kg/d
Ammonia	Annual Av <22mg/l Ann. 90%ile<29mg/l from 12 monthly samples	12g/m^3 not exceeded more than 10% of samples (26 fortnightly samples/yr)	Annual Av <1mg/l Ann 90%ile<2mg/l from samples every 8 days.
Disinfection of human Pathogenic organisms	Ann.Med<1000 cfu/100ml Ann 90%ile<20,000 cfu/100ml	200MPN/100ml not exceeded more than 10%of samples (26 fortnightly samples/yr)	Ann.Med.<14 cfu/100ml Ann 95%ile<43 cfu/100ml

What Does a Condition Require to be Effective?

- Realistic Numeric Value (e.g mg/l or kg)
  - not the subject of this discussion;
- A statistical means of measure (mean, median, %ile, absolute);
- Period over which compliance is measured (Rolling, calendar year, forever?);
- How is compliance defined / calculated?

Measurement Issues

- Annual mean – can be difficult to assess compliance till the year is over
- Rolling mean / %ile –
  - After first ‘n’ samples, there will always be a statistically valid series of data on which to assess.
  - Once a non-compliance is in the system, it takes a long time to be ‘rid of it’ and the same event may need to be reported repeatedly.

Measurement Issues

- Monthly / Quarterly sampling:
  - Difficult to get statistically valid samples
  - Effect of a single sample is greater
  - Is it appropriate to the nature of discharge?
  - Is it enough to protect the environment?
- Mean – may not be appropriate for microbiological parameters where difference is measured in $\log_{10}$ factors

Measurement Issues

- 100%ile – Shall not exceed, ever!
  - Not during a Q_{100} event?
  - Not after a toxic trade waste dump?
  - Not due to lab error?
- How will the %ile be defined (briefly)
  - Via excel?
  - Via a certain number of passes or failures (WW Monitoring Guidelines ch13)?
  - What is the min. no. samples?

Why Do These Problems Arise?

- Careless draughting
- Ratcheting up previous conditions
- Over zealous RC science – 100%iles
- Under resourced applicant science
- Lack of connection to practicalities of Design and Operations reality
- Insufficient attention to condition review
- Focus on getting it done fast instead of getting it done right

pH of Water at the Time Sampling	Total Ammoniacal Nitrogen ([NH_3 + NH_4]-N) (grams per cubic metre)
6.0	2.57
6.1	2.56
6.2	2.54
6.3	2.52
6.4	2.49
6.5	2.46
6.6	2.43
6.7	2.38
6.8	2.33
6.9	2.26
7.0	2.18
7.1	2.09
7.2	1.99
7.3	1.88
7.4	1.75
7.5	1.61
7.6	1.47
7.7	1.32
7.8	1.18
7.9	1.03
8.0	0.90
8.1	0.78
8.2	0.66
8.3	0.56
8.4	0.48
8.5	0.40
8.6	0.34
8.7	0.29
8.8	0.24
8.9	0.21
9.0	0.18

ANZECC (2000) 95%Protection Guideline for Slightly to Moderately Disturbed Freshwater Systems

Photo courtesy of Gerry Kessels: Kessels & Associates

Possible Solutions

- Create a DIN ? (12255 that is)
- Prescriptive consents as across the ditch?
- Do Nothing?
- Or maybe ……

Possible Solutions

- Some constructive middle ground? Agree:
  - What we want to achieve (with various types of consent)
  - Some acceptable common measures e.g calendar mean & 90th (95th?) %iles
  - Acceptable monitoring frequencies (activity size)
  - Easy / simple definitions of compliance under those measures (e.g number of permissible failures)
  - Wider adoption of monitoring guidelines (WW)
- Allow us to focus on getting the numbers right !

Summary

- Adequate investigation resourcing.
- Can we agree some common and consistent measurement methods?
- Care and consistency in condition drafting.
- Have the designer, owner & operator in mind.
- Try to keep it simple.

Questions

- ?
- ?
- ?