

Monitoring the Effluent Management System

Guideline No 15



The installation of groundwater monitoring bores in association with the construction of effluent storage lagoons is a mandatory requirement of the Environment Protection (Water Quality) Policy 2003.

Monitoring of groundwater and other components of a dairy effluent management system is optional in most circumstances, but can provide valuable information about the efficiency of the system and its environmental performance.

This information could also be used to obtain productivity gains from using the nutrients in the effluent for growing

Effluent Pond Leakage

Clause 18 of the *Environment Protection (Water Quality) Policy 2003*, which reads as follows, makes it a mandatory requirement for monitoring bores to be installed in association with the construction of effluent storage lagoons.

Clause 18:

(3) A person who constructs a wastewater storage lagoon must comply with the following provisions:

(d) A sufficient number of monitoring bores must be installed and properly placed so that the presence of any leakage can be readily ascertained;

This requirement is designed to enable checks of whether effluent is leaking from storage lagoons and, if so, what degree of impact it is having on the groundwater system.

Due to environmental variability, it is not possible to provide guidance on the number and location of bores that will be required at each effluent lagoon. Factors such as slope, soil and geology, depth to water and climate conditions will all influence the location and construction requirements of monitoring bores. Because of this, it is necessary to obtain specialist advice from groundwater monitoring experts prior to the construction of monitoring bores.

Sampling of the groundwater in the monitoring bores should be done following bore installation, development and initial pumping. These first samples set the base-line record for the groundwater quality at the site. Thereafter, any sampling of the monitoring bores should occur at the same time annually. If any of the monitoring bores show elevated levels of nutrients, then further assessment would be required.

The sampling procedure used to ensure that results obtained are accurate is beyond the scope of this document, but is detailed in "Murray-Darling Basin Groundwater Sampling Guidelines" (Technical Report #3, Groundwater Working Group), a copy of which is available at the following web site
http://www.mdbc.gov.au/___data/page/127/GroundwaterqualityguideliesReport.pdf

Again, the use of a suitably qualified person, experienced in the methods for collection of groundwater samples in a valid scientific manner, is recommended.

Samples should be analysed for the chemical substances shown in the table, “**Guide to Sample Analysis**” in this guideline.

The Effluent Management System

Monitoring the remaining components of the effluent management system is not essential but can be useful in assessing the efficiency of the system and its environmental performance. The results of monitoring can be used to improve the efficiency and productivity gains from using the nutrients in the effluent for growing crops and pastures.

This guideline provides general guidance on components that may be useful in a monitoring program. The details of a monitoring program are outside the scope of these guidelines. For more information you should contact your farm adviser or an environmental consultant.

The sampling protocols and analyses required are shown in more detail in “The Manual For Spreading Nutrient Rich Wastes on Agricultural Land” in the chapter “Sampling and Analysis of Effluent, Manure, Soil, Water and Plants”. This manual is on CD-ROM and can be purchased from Rural Solutions SA Roseworthy Information Centre, phone 1800 356 446.

Effluent Quality

Regular analysis of the effluent in the storage ponds should be carried out. This should be done at least annually, at a time when irrigation is about to start. If consistent results are obtained over a number of years, less frequent sampling may be possible.

The analysis of effluent pumped direct to pasture should also be carried out. Small samples of effluent should be taken at intervals during shed and yard cleaning and accumulated in a bucket. A representative sample can then be taken from the bucket for analysis.

The results of effluent analysis can be used to determine the rate at which the effluent can be spread to match the rate of nutrient removals from the spreading area.

Solids and Sludge Quality

Samples of stockpiled or composted solids or sludge should be collected and analysed annually. Again, if consistent results are obtained over several years, less frequent sampling may be possible.

The results of analysis can be used to determine the rate at which the solids can be spread to match the rate of nutrient removals from the spreading area.

Soils in the Effluent Irrigation Area

Sampling at 2 –3 year intervals at a time that fits in with production or cropping requirements should be carried out. Sampling should be done at about the same time of the year. Take topsoil and deep soil cores to one metre or the bottom of the root zone.

The deep soil samples can help monitor the potential for nutrient leaching. The Phosphorus Retention Index (PRI) of the deep soil samples can provide information on the risk of phosphorus leaching below the root zone. You will need to ask for this analysis, as it is not a standard analysis in South Australia.

Crop and Pasture Yield and Nutrient Content

The dry matter yield and nutrient content of crops or pasture harvested from the irrigation area should be measured each year.

The amount of nutrients removed by grazing animals should be estimated. The nutrient budget model supplied with these guidelines is one method of estimating the amount of nitrogen, phosphorus and potassium removed in milk, live weight gain or wool. The amount of nutrients removed per hectare can be used to fine-tune the application rates of effluent and solids.

Spreading Records

Records of the amounts spread on each area should be maintained with sufficient detail to enable the amounts of effluent, water or solids that have been spread to be determined over the lifetime of the area.

Surface Water

Water quality in watercourses or creeks near the effluent irrigation area and the solids spreading area should be monitored on an "event" basis. The most meaningful results will be obtained when the creek is flowing and when runoff is possible from the areas. Samples should be collected both upstream and downstream from where runoff is likely to enter. The results can be used to determine the impact, if any, that the effluent irrigation area is having in surface water resources.

Groundwater

Installing special bores or piezometers for monitoring groundwater quality should be done where there is a significant risk of groundwater contamination. These should be installed to allow monitoring of groundwater near at-risk sites such as the effluent irrigation area and solids spreading area. Where the risk of contamination is low it may be possible to use existing shallow aquifer bores to monitor groundwater quality.

Analytes (chemical substances)

The table below summarises the analytes required for the different samples.

Guide to Sample Analysis

Analyte	Water	Effluent	Soils	Sludge	Manure
pH	X	X	X	X	X
EC	X	X	X	X	X
N (Kjeldahl N, nitrate-N, and Ammonium-N)	X	X	X	X	X
Magnesium				X	X
P (Total P, Ortho-P)	X	X	X	X	X
Colwell P			X		
Exchangeable sodium percentage (ESP)			X		
Organic carbon			X		
Chloride			X		
K	X	X		X	X
Sodium				X	X
Sodium adsorption ratio (SAR).		X			
Phosphorus Retention Index, PRI			X		

You may find it useful to do some of your own analyses on a more regular basis. pH test kits and salinity meters are relatively inexpensive.

When submitting samples for testing, it is important to contact the analytical laboratory to confirm which tests are to be undertaken and the storage, packaging and transport requirements. Laboratories are often able to provide additional advice on sample collection and may also provide approved, clean sample containers.