# A Growers' Guide to

# The Management of Greenhouse Nutrient Discharges

**Based on "A Code of Practice for the Management of Greenhouse Nutrient Discharges"**

## June 2007

Horticulture™ New Zealand

Sustainable Farming Fund

www.maf.govt.nz/sff

# Contents



# Acknowledgements


Thanks to the following for their contributions toward the writing of this guide and the supporting Code of Practice:

Industry working group: A. Ivicevich, C. Smellie, B. Smith and K. Robertson
Code Authors: J. R. Lewthwaite, I. S. Cornforth and W. T. Bussell (Unitec NZ)
Industry workshops, updating the Code and preparation of this Guide: A. Barber (AgriLINK NZ) and L. Wharfe (The AgriBusiness Group)

Thanks go especially to the funding support from:

Horticulture™ New Zealand

Fresh Tomato Product Group

Northern Flower Growers' Association

Horti centre

Fert Research

Sustainable Farming Fund
www.maf.govt.nz/sff

# About this Guide

The purpose of 'A Growers' Guide to Managing Greenhouse Nutrient Discharges' is to assist growers with the practical, sustainable and legal management of discharging greenhouse nutrient solution.

All greenhouses with crops grown in soilless media will at some stage need to discharge or release excess nutrient solution. As the solution will contain nitrogen there will be the potential that the solution could contaminate water bodies. This Guide sets out what a grower needs to do to ensure that pollution does not occur when irrigating discharged nutrient solution.

The Guide is based on 'A Code of Practice for the Management of Greenhouse Nutrient Discharges' It does not replace the Code of Practice (COP) – growers will need to refer to the Code of Practice when working through any manual calculations, the Record Sheets and Fact Sheets.

The Code of Practice focus is on land application as the option for disposing of nutrient solution. Other options, such as denitrification, are not covered in this Guide but are included as options in a decision process. Future projects may provide more details on these other options.

The Code of Practice is designed for crops grown in soilless media. It is not intended to be used where a crop is grown directly in the soil.

Considerable research has been undertaken in the dairy industry on the land application of dairy shed effluent, and many aspects of the dairy industry guides are applicable to the greenhouse industry. Visit www.dexcel.co.nz and click on the environment link.

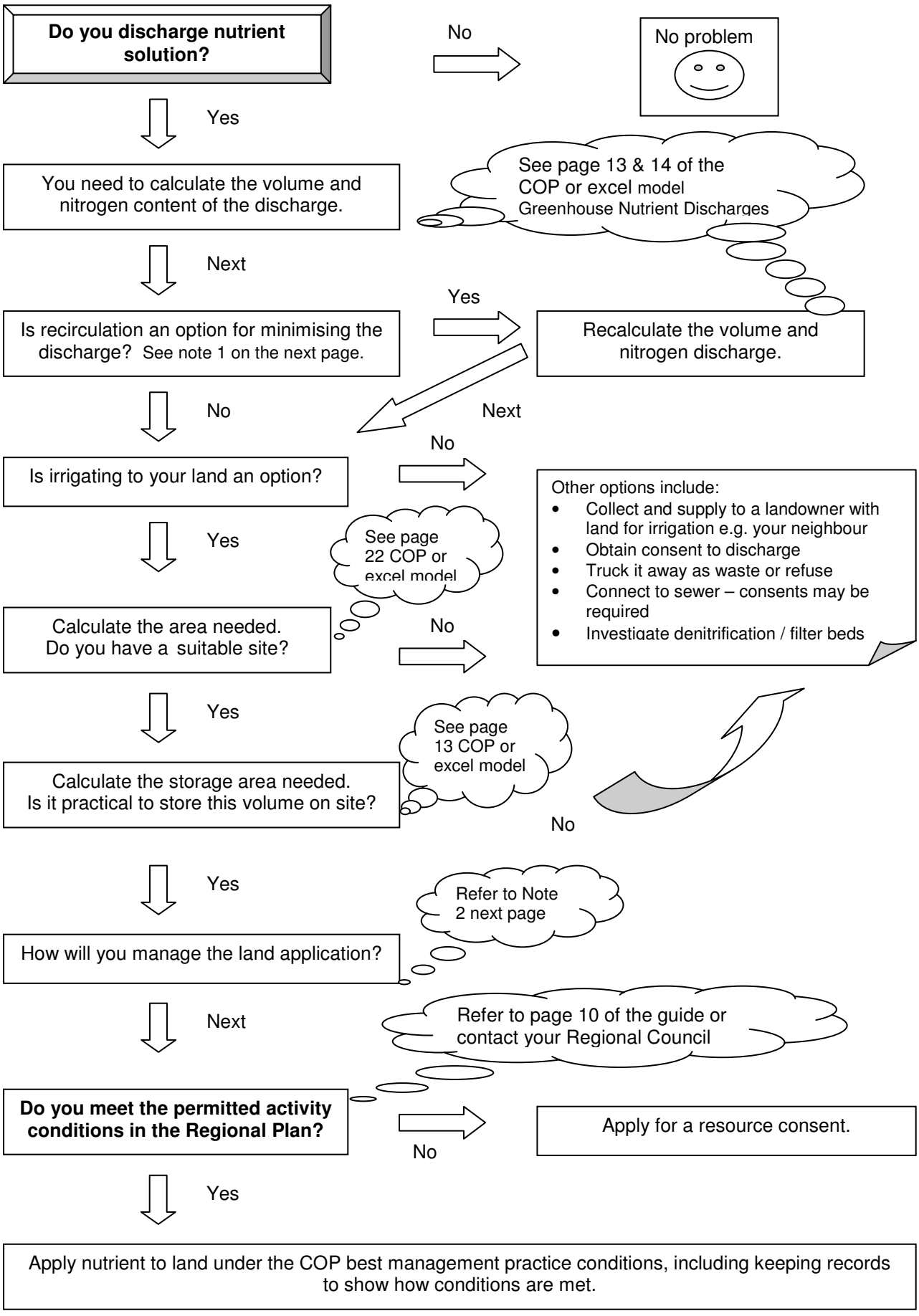
Electronic copies of the Code of Practice are available from www.hortnz.co.nz Hard copies of the COP and excel model 'Greenhouse Nutrient Discharges' are available from The Business Manager – Fresh Tomato Product Group, Horticulture New Zealand. Phone 04 472 3795 or Facsimile 04 471 2861.

Direct discharges of unwanted nutrient solution to waterways or drains, including swampy ground, roadside drains and streams are not environmentally acceptable.

**In the past some operations have discharged nutrients to waterways, streams and drains - if you are still following this practice you need to upgrade your system IMMEDIATELY. The Guide and Code of Practice will assist you.**

**NOTE: This Guide is based on the application of nutrient solution to land.**

# Nutrient Solution Decision Process



**NOTES:**

1. Recirculation considerations:
   - Incoming water quality e.g. sodium levels
   - Water treatment system See COP Fact Sheet 1 page 10
   - Cost – capital and running
   - Disease management

2. What management decisions need to be made for irrigation?
   - Site suitability. See COP Fact Sheet 3 page 26
   - Type of irrigation system
   - Soil moisture monitoring. See COP Fact Sheet 7 page 39
   - Soil nutrient balance – regular soil nutrient testing

3. Resource Management obligations. See COP page 5 for further details
   - Generally, if an activity is not permitted in a plan a resource consent will be required.
   - A permitted activity does NOT mean that you can simply carry on as you always have.
   - Permitted activities may have conditions attached to them that are required to be met by users to enable the activity to be a carried out as a permitted activity.
   - A council may monitor permitted activities to ensure that the requirements of the permitted activity are being met.
   - Releasing nutrient solutions into the environment from soilless horticulture, whether to land or water, is classified as a discharge of a contaminant to the environment under the RMA.
   - In some cases resource consent may be needed if the volume of the nutrient solution being released is beyond a certain permitted level.
   - Growers need to ensure that they are aware of the requirements in their own region, and either comply with their regional council's permitted rules or obtain a resource consent for the release of nutrient solution.

# Stage A – Minimising Nutrient Discharges

## Why is it important?

Reducing the volume of nutrient solution water discharged will save time, money (e.g. reduce the cost of your fertiliser) and improves the environment, regardless of the treatment system used.

The advantages of keeping the discharges to a minimum are:

- Cost savings if pumping the water through an irrigation system
- Storage ponds can be smaller
- If irrigating - less land is required
- Denitrification systems can be smaller
- If trucking off-site, cartage costs are lower.

## How can I minimise nutrient discharges?

- Maintain hygiene in the recirculation system by avoiding contact with the soil and diseased plants
- Track and record the total quantity of water being applied to the crop
- Monitor the quantity of water applied per plant versus the quantity running off.
- Upgrade to a more efficient soilless media to reduce the volume of run off. e.g. from pumice or sawdust to fine grades of cocopeat or rockwool.
- Use or supplement with clean roof water, if less contaminated than other water sources
- Use high quality aquifer water
- Ensure there are no pipe leaks
- Use high purity fertilisers.
- Investigate and, if practical, install a recirculation and water treatment system
- Treat the water to control pathogenic fungi and remove contaminants e.g. iron, and algae

# Stage B – Solution Collection and Storage

## Why must I collect my run-off?

Nutrient rich water discharged directly from greenhouse soilless media into drains, waterways or directly into the soil (e.g. under the greenhouse floor from individual plant media) into underground aquifers contains high levels of nutrients, the most environmentally damaging of which is nitrogen. High levels of nutrients in waterways causes algal and weed growth (eutrophication), which reduces water clarity, stream ecology and aesthetic qualities. Elevated nitrate levels in surface and groundwater can have human health risks when used for drinking water or recreation.

Pictures provided by Bob Parker from the project 'Guidelines for Pastoral Management in Catchment of Dune Lakes in Northland'; funded by MfE, FertResearch and Dairy Insight.

## How do I collect run-off?

- Solid plastic trays or troughs can collect run-off water and discharge into a recirculation tank or storage pond or tank.
- Plastic film can be used to form channels leading to a tray or trough connected to a storage pond or tank
- The greenhouse floor may need laser levelling to create a fall to the collection point. To reduce ponding caused by minor humps and hollows in the floor some growers have formed plastic film channels using moulded polystyrene blocks.


Trays used to catch the nutrient discharge and plastic film wrapped around rockwool slabs on polystyrene blocks draining to an open channel.

## How much tank or pond storage do I need?

Storage may be in a tank or pond. The same principles apply to both.

- There must be sufficient storage to ensure that the solution is not applied to soil that is saturated by previous applications or rainfall.
- Generally there should be sufficient storage to hold 2 to 3 weeks discharged solution in winter or 1 weeks discharged solution in summer, whichever is the largest
- The requirement for summer storage is to allow for system repair and to avoid needing to irrigate every day
- The winter storage requirement is to avoid periods when the soil is saturated and surface ponding would occur
- The exact storage requirement can be determined using a nutrient discharge model[1] or manually from the Code of Practice page 13 and Fact Sheet 2 page 15.

[1] Contact Horticulture NZ for a free copy of the excel model "Greenhouse Nutrient Discharges".

# Stage C – Land Application

The most likely way growers will dispose of their collected nutrient solution is by irrigating it onto pasture, shelterbelts, hedgerows or another crop. There are a number of advantages with this approach:

- The waste solution becomes a valuable resource, significantly enhancing plant growth allowing higher stocking levels or higher yields from crops or harvested supplementary feed such as silage or hay
- Subject to the maximum nitrogen application rates and several other conditions, land application is a permitted activity (see RMA section below for a description of these conditions for Auckland, pg 10).

## Aspects to consider

- There should be sufficient land area available to take into account the crops' ability to absorb nitrogen through the root zone. See the section below on calculating the area required.
- The solution can not be applied to a water logged soil (surface ponding)
- The irrigation must not result in drainage or runoff
- The irrigation must be even
- Conduct soil tests to correct any nutrient imbalances
- Irrigate a larger area if it is found that nutrient imbalances (watch for high potassium levels) are occurring.

## How much land area do I need?

- The required land area is based on the maximum annual nitrogen application rate of 150kgN/ha/year (up to 200kgN/ha/year can be applied to some soils, see RMA Plan Requirements below, or your Regional Council) and 30kgN/ha in any 31 day period. For some soil types and crops higher application rates are allowed, see the RMA section
- To determine the application area the concentration of nitrogen in the discharge solution must be known. A laboratory should be used to periodically measure a discharge sample or Merckoquant® test strips can be used (www.merck.co.nz/)
- Determine the total volume of solution to be released in a year. This can be done using a nutrient model[2] or manually from the Code on page 13 and Fact Sheet 2
- The area required can be determined (based on the maximum nitrogen application rate, the concentration of nitrogen in the solution and the volume being discharged) using a nutrient discharge model[2] or manually from the Code pages 14, 21 and 22 and Fact Sheet 5.

## Best management practice for land application

- Details of released nutrient solution (volumes and concentrations of nutrients, particularly nitrogen), should be recorded regularly. Use the record sheets in the Code on pages 23, 24 and 25
- Avoid spraying too close to drains and waterways
- Regularly maintain your irrigation system
- Use soil moisture monitoring equipment (e.g. a tensiometer), a soil moisture monitoring service, or a water budget (see the Code Fact Sheet 7) to determine when to irrigate.

[2] Contact Horticulture NZ for a free copy of the excel model "Greenhouse Nutrient Discharges".

# RMA Plan Requirements

The Auckland Regional Council's rules for discharges to land have been included in detail as many growers operate under these conditions and other councils around the country may tend to take a lead from Auckland on this issue. For the specific rules in other regions outside of Auckland or for discharges to water contact the relevant Regional Council.

**Auckland**

The Auckland Regional Air Land and Water Plan has a rule for managing discharges from production land activities, including greenhouse nutrient solution from soilless media. Through an appeal process between Horticulture New Zealand and Auckland Regional Council Rule 5.5.34 is likely to be amended to allow discharges from greenhouses up to 1 hectare subject to conditions in Rule 5.5.35.

*The land application of greenhouse nutrient solution from greenhouses with a total floor area of 1 ha or less is a permitted activity if it meets the permitted activity conditions below.*

Permitted Activities conditions of rule 5.5.35 are:

- There is no discharge into any surface water body (excluding an artificial wetland), or contamination of groundwater body
- Any discharge to land shall not result in hydraulic overloading (excluding within an artificial wetland)
- The nitrogen loading rate of the discharge, including any nitrogen contained in nitrogenous fertiliser, onto grazed pasture shall be:
    - At a rate not exceeding the equivalent of 150kgN/ha/year and 30kgN/ha in any 31 day period in those areas underlain by aeolian sands and volcanic basalt. (This includes Awhitu, Kaipara, Tapora, Pakiri, Omaha Flats, Pukekohe, Puni Waiuku, Bombay and Mangere).
    - At a rate not exceeding the equivalent of 200kgN/ha/year and 50kgN/ha in any 31 day period on soils other than those stated above
    - Nitrogen applications at rates in excess of those described above shall be considered to have complied with the rule if the application is consistent with crop uptake. This may be determined by an appropriate nutrient budget.
- The nitrogen loading rate of the discharge including any nitrogen contained in nitrogenous fertiliser onto ground other than grazed pasture, shall be in a manner and at a rate that does not exceed the reasonable nitrogen requirements of the crop being grown.
- The discharge is not an environmentally hazardous substance
- The discharge shall not result in any significant adverse effects from the spread of pathogens or the attraction of pests.
- There shall be contingency measures in place to ensure that there is no contravention of rule 5.5.34 in the event of system failure.
- Explanation: The contingency plan shall be implemented in the event of system failure or inclement weather conditions preventing land application, and consideration must be given to alternative options of storage and/or disposal in the event that normal land application cannot be undertaken.
- The payment of the Permitted Activity financial contribution
- A Rural Waste 'Permitted Activity Notification Form' shall be submitted to the ARC. A Rural Waste 'Permitted Activity Notification Form' must include:

- the name and contact details of the discharger (i.e. the grower)
- a description of the activity creating the discharge
- the daily volume of the discharge
- the system type
- the area available for land application
- an analysis of the nitrogen content of the waste (unless published industry information on the composition of the discharge is available)