



---

# **Soil Sampling Procedure**

## **Agribusiness Soil Monitoring**

**COR/17/5600856008**

**Revised 23/11/2017**

**Gippsland Water**

## Document Details REVIEW DATE -

<b>Business Owner</b>	Gippsland Water
<b>Procedure</b>	Agribusiness Soil Monitoring
<b>Process Owner/s</b>	Agribusiness
<b>Document Title</b>	Soil Sampling Procedure- Agribusiness Soil Monitoring
<b>TRIM Record No.</b>	COR/17/56008
<b>Document Version</b>	1.1
<b>New Review Date</b>	
<b>Print date</b>	23 August 2018

## Document Authorisation

	<b>Name</b>	<b>Date</b>
<b>Written by</b>	Christine Bingham	28/07/2017
<b>Reviewed by</b>	Anna Kelliher Jono Craven/Jo Wade	09/08/2017 23/11/2017
<b>Authorised by</b>		

## Document History

<b>Version</b>	<b>Date</b>	<b>Author</b>	<b>Description of Update / Change</b>
1.0	28/07/2017	Christine Bingham	Peer reviewed by Anna Kelliher from RMCG
1.1	23/11/2017	Christine Bingham	Reviewed by Jono Craven and Jo Wade from Agribusiness

---

# Contents

<b>1</b>	<b>Introduction</b> .....	<b>4</b>
1.1	Purpose .....	4
1.2	Scope .....	4
<b>2</b>	<b>Sample Collection</b> .....	<b>5</b>
2.1	Frequency .....	5
2.2	Sampling Locations .....	6
2.3	Equipment .....	7
2.4	Training .....	7
2.5	Method .....	8
<b>3</b>	<b>Laboratory Results</b> .....	<b>9</b>
3.1	Analytical Suite .....	9
<b>4</b>	<b>Reporting</b> .....	<b>10</b>
4.1	Responsibilities .....	10
<b>5</b>	<b>References</b> .....	<b>11</b>
<b>6</b>	<b>Appendix 1- GPS Sampling Locations</b> .....	<b>12</b>
<b>7</b>	<b>Appendix 2- Agricultural Analytical Suite</b> .....	<b>13</b>

---

# 1 Introduction

## 1.1 Purpose

The Agribusiness division manages multiple agricultural assets in Central Gippsland. A key purpose of these sites is sustainable irrigation of reclaimed water from the associated wastewater treatment plants.

All properties are managed in a sustainable manner with a focus on soil health. Regular sampling of soils is therefore required to identify potential agronomic and environmental risk to soil and crop health, through consideration of soil structure and soil chemistry.

This document identifies the methodology of monitoring soil that is managed for agricultural use. This will cover sampling for irrigated and dryland paddocks. A consistent approach to soil sampling is required to ensure repeatability in data and meaningful interpretation of test results (particularly for trends over time).

Under the EPA licence Gippsland Water is obligated to monitor the environmental impact reclaimed water may have to soil properties. It is the responsibility of Agribusiness officers to monitor and report soil as described in this document as well as the Agribusiness Management Plan 2017 -COR/17/25523.

## 1.2 Scope

This document describes the standard operating procedure for sampling soil. The procedure is applicable to all properties that are managed by Agribusiness. The properties that fall under this category are:

- Drouin
- Mirboo North
- Heyfield
- Maffra
- Stratford
- Dutson Downs
- Seaspray

---

## 2 Sample Collection

### 2.1 Frequency

It is the responsibility of the Agribusiness Officer to have the soil tested at the following minimum frequency:

- For agricultural benefits – topsoil sampling will occur yearly, with subsoil sampling every second year.
- For environmental impact assessment – every 2 years for larger sites (Drouin, Dutson Downs and Maffra) and every 4 years for smaller sites (Mirboo North, Heyfield, Stratford and Seaspray). This is to be aligned with the subsoil sampling year for agricultural sampling.

Samples are to be collected in approximately the same month each year. It is preferable that this is at the end of the irrigation season to determine the cumulative impacts of irrigation water on soil quality and to avoid the autumn/winter/spring period when sites are likely to be too wet to sample effectively.

## 2.2 Sampling Locations

Sampling locations have been selected based on the following guidelines:

- A minimum of one composite sample per 20 ha irrigation area (with the exception of Dutson Downs where one sample is to be taken for each pivot area)
- Where multiple irrigation methods are used (e.g. flood plus sprinklers), a minimum of one sample per irrigation type is required.
- A minimum of one composite sample is required for the dryland area

Sampling transects will be documented in content manager under Land Management-Agribusiness Work System-Monitoring- (06/19/02) for each property to enable repeatability between years.

**Table 1: Summary of Sampling Requirements by Property**

Site	Timing of Sampling	Minimum Number Sampling Sites		Sampling Frequency - Agricultural		Sampling Frequency - Environmental	Additional Site Specific Parameters
		Irrigation	Dryland	Topsoil	Subsoil		
						To align with subsoil sampling	For environmental sampling
Drouin	Feb/Mar	5	2	Annual	2 years	2 years	Mehlich P
Mirboo North	Feb/Mar	1	3	Annual	2 years	4 years	Mehlich P
Heyfield	Feb/Mar	2	1	Annual	2 years	4 years	Mehlich P
Maffra	Feb/Mar	6	2	Annual	2 years	2 years	Mehlich P
Stratford	Feb/Mar	2	1	Annual	2 years	4 years	
Dutson Downs	Feb/Mar	9	Refer to Dutson note	Annual	2 years	2 years	Mehlich P (Pivot 9 only)
Seaspray	Feb/Mar	1	1	Annual	2 years	4 years	

Notes on irrigation sampling sites:

- Drouin – 1 sample per centre-pivot
- Heyfield – 1 sample flood irrigation, 1 sample cannon irrigation
- Maffra – 3 samples flood irrigation, 1 sample centre-pivot, 2 samples cannon irrigation
- Stratford – given relatively small area acceptable to sample only two of the four paddocks
- Dutson – Dryland paddocks are sampled for agricultural purposes when required

## 2.3 Equipment

The equipment used for sampling is a hydraulic soil sampler in Figure one. When sampling ensure the sampler is cleaned between transects or between topsoil and subsoil samples.



Figure 1: Agribusiness hydraulic soil sampler.

## 2.4 Training

Prior to operating the hydraulic soil sampler a safety toolbox is required; this will be done by a trained Agribusiness Officer. The safety toolbox will cover the Agribusiness safe work procedure –COR/09/4079- and the soil sampler operation checklist –COR/10/13306

---

## 2.5 Method

For a reliable and repeatable soil test the following method should be applied:

For topsoil, the sample is to be taken at a depth of 0-10 cm, with a minimum composite of 20 sub-samples.

For subsoil, the sample must be aligned with the topsoil location to a depth of 10-30 cm with a minimum composite of 5 samples.

Composite samples are to be combined and mixed thoroughly in a clean bucket ensuring gloves are worn if mixing with hands. Once this is completed take a representative sample from the mix that is approximately 500 g in an appropriate zip lock bag.

Sub-samples are to be collected by transects. A GPS recording should be taken at the start and end of each transect to record the sampling zone. Sub-samples are to be spaced evenly along the transect. Where there are distinct changes in soil type, ensure transects stick to one soil type only.

When sampling, avoid areas that are not representative such as animal tracks, gateways, fences, obvious manure patches and water troughs. Before sampling ensure that organic matter is removed from the soil surface. When sampling ensure that minimal damage occurs to the crop by removing any material or breaking off the top of the sample before depositing in the sample bucket.

Samples should not be collected within 4 weeks of fertilizer or compost use, when soil is saturated or under irrigation. This will ensure that the analytical results are not skewed by presence of non-soil content.



---

## 3 Laboratory Results

### 3.1 Analytical Suite

All samples taken by the Agribusiness Officer are to be analysed by the NATA accredited laboratory, Environmental Analysis Laboratory (EAL). It is the responsibility of the Agribusiness Officer to ensure that Agricultural – (Albrecht/Reams plus Totals) is selected for all rounds of sampling. Ensure the final results are obtained in an excel format. For the analytical suite refer to Appendix 2.

For environmental monitoring ensure Mehlich III (Phosphorus) is added to the suite for sites identified with high nutrient risk (refer to Table 1 for site listing). This parameter will coincide with the environmental sampling frequency.

Results will be reviewed by the Agribusiness Manager and then passed onto the Environmental Team. For more detail on reporting and results refer to section 4 of this document.

## 4 Reporting

### 4.1 Responsibilities

*The Agribusiness Team will:*

- Ensure the above methods are applied to all forms of soil sampling.
- Obtain soil samples at the end of the irrigation season from proposed irrigated areas and dryland paddocks where appropriate.
- Analyse soil condition for addition of fertiliser and/or compost if necessary
- Submit the final soil analysis laboratory report to the Environment Team

*The Environment Team will:*

- Keep records of all monitoring results and analysis for compliance with EPA Guidelines 464.2
- Ensure the soil analysis reports are copied into the Agribusiness Soil Analysis Data spreadsheet- COR/17/54115.
- If there are any outstanding parameters contact Agribusiness Manager
- Interpret the soil data every 5 years (assuming overall environmental risk continues to be low)

---

## 5 References

EPA Victoria (2009), *A Guide to the Sampling and Analysis of Waters, Wastewaters, Soils and Wastes*, Publication IWRG701

Environmental Analysis Services (2013), *Soil Sampling Guide*

RMCG (2017) *Soil Data Analysis-Reclaimed Water Irrigation Sites*

Gippsland Water (2017) *Treated Wastewater Reuse Scheme Site Management Plan*

Gippsland Water (2017) *Agribusiness Soil Analysis Data Spreadsheet*

Environmental Analysis Services (2013), *Agricultural Soil and Plant Price list*

---

## 6 Appendix 1- GPS Sampling Locations

Future references spot for GPS soil sampling location.

## 7 Appendix 2- Agricultural Analytical Suite

Method	Nutrient	Units	Method	Nutrient	Units
Morgan 1	Calcium Magnesium Potassium Phosphorus	mg/kg	CaCl <sub>2</sub>	Boron, Silicon	mg/kg
Bray 1, Colwell, Bray 2, Mehlich 3*	Phosphorus	mg/kg	LECO IR Analyser	Total Carbon Total Nitrogen	%
KCl	Nitrate Nitrogen Ammonium Nitrogen Sulfur	mg/kg	Composition	Basic Texture/Colour	
1:5 Water	pH Conductivity	Units dS/m	Total Acid Extractable	Calcium Magnesium Potassium Sodium Sulfur Phosphorus Zinc Manganese Iron Copper Boron Silicon Aluminium Molybdenum Cobalt Selenium	mg/kg
Calculation	Estimated Organic Matter Effective Cation Exchange Capacity (ECEC) Calcium/Magnesium Ratio Carbon/Nitrogen Ratio Chloride Estimate	% OM cmol <sup>+</sup> /Kg ratio ratio equiv.ppm	Base Saturation Calculations	Calcium Magnesium Potassium Sodium (ESP) Aluminium Hydrogen Zinc Manganese Iron Copper	%
Ammonium Acetate	Calcium Magnesium Potassium Sodium	cmol <sup>+</sup> /Kg, kg/ha, mg/kg	DTPA	Zinc Manganese Iron Copper	mg/kg
KCl	Aluminium	cmol <sup>+</sup> /Kg, kg/ha, mg/kg	Acidity Titration	Hydrogen	cmol <sup>+</sup> /Kg, kg/ha, mg/kg

\*Mehlich III (phosphorus) is to be added to the suite when environmental risk for soil nutrients is high in line with the environmental sampling frequency