MMI™ NUTRIENTS AND BIOAVAILABILITY

Mobile Metal Ion MMI™ Geochemistry

The Mobile Metal Ion (MMI™) process is a totally integrated geochemical approach to analyzing soils for agricultural purposes. MMI™ is a very weak partial leach, based on a multi-ligand extraction followed by ICP analysis for a suite of 10 elements considered essential to plant growth. The MMI™ method of analysis can provide a relevant measure of nutrient bioavailability in the soil for plant uptake.

The MMI™ extraction does not break down the soil substrate but instead extracts ions within the soil pore waters and those loosely adhered to the soil particles that are the main sources for plant uptake and their direct form of nutrients.

Getting to know your field through an integrated approach of soil sample collection, analysis and interpretation of the data provides invaluable information to help control the amount and type of fertilizer required for optimum production.

In addition to the suite of elements listed below, elements such as Nickel and Cerium can be added to the list as they are useful diagnostic elements for predicting underlying geology. Many nutrients are added annually in fertilizer and depleted as fruit and cuttings are exported from the agricultural fields; an annual soil inventory is a useful viticulture management tool.

Figure 1: Sample Hole

Table 1: Typical Nutrient Concentrations Ranges in Agricultural Soils by MMI™ – Australia and Europe

Nutrient	"Low" range	"Normal" range	"High" Range
Ca	<200 ppm	200-400 ppm	>400 ppm
Cu	<2000 ppb	2000-4000 ppb	>4000 ppb
Fe	<20 ppm	20-40 ppm	>40 ppm
K	<20 ppm	20-40 ppm	>40 ppm
Mg	<40 ppm	40-80 ppm	>80 ppm
Mn	<4000 ppb	4000-8000 ppb	>8000 ppb
Mo	<20 ppb	20-40 ppb	>40 ppb
P	<2 ppm	2-4 ppm	>4 ppm
S	<10 ppm	10-20 ppm	>20 ppm
Zn	<1000 ppb	1000-2000 ppb	>2000 ppb

MMI™ PROCESS

The MMI™ process consists of:

- A simple sample collection procedure in which approximately 200 to 250 grams of sample is collected at

a continuous interval of 10 to 25 cm below the surface.

- Samples can be forwarded to any SGS Lab globally for testing. Samples are not otherwise prepared or dried prior to the analysis.
- A weak extraction is done on the soils using a multi- component solution to release the mobile ions.
- A high sensitivity ICP analysis which provides data in part per billion range.

CONTACT INFORMATION

CA.MINERALS@SGS.COM

WWW.SGS.COM/MINING

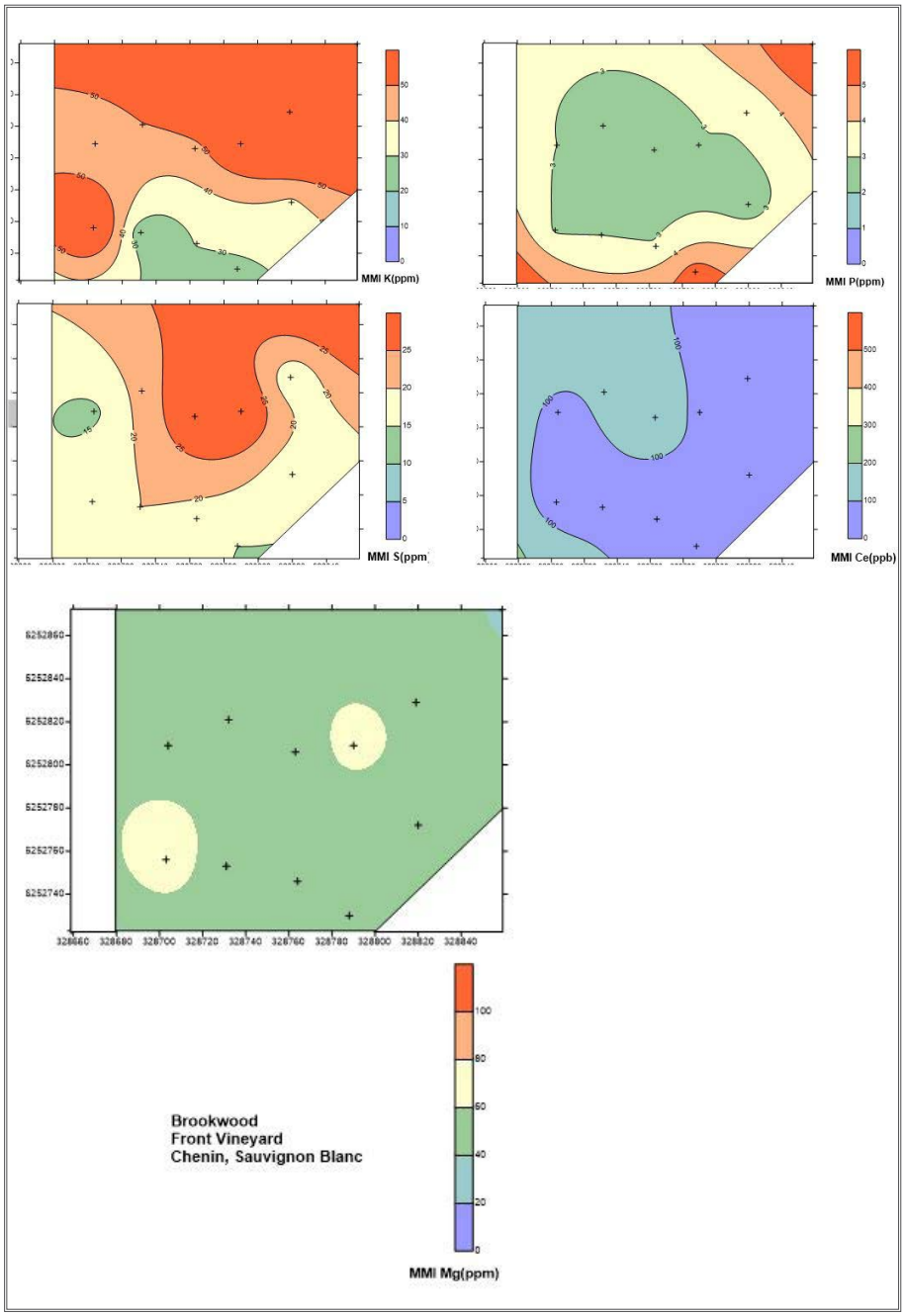

Figure 2: Example of a Real Case MMI™ Generated Map for Vineyard Nutrient Needs; K, P, S, Mg and Ce