The current trends in the wine industry are posing more challenges to Australian grape growers than ever before. There is pressure brought to bear from many sources, including market pressure through consolidation of retailers and wineries, water restrictions in the Murray Valley, downward pressure on yields at a time of low prices, and ever increasing quality demands from wineries. It is therefore vital to glean the greatest result from inputs in the vineyard. Knowing what is happening in the vineyard, being able to manipulate vine growth, and enhance the resultant fruit quality is becoming an essential skill. All sectors of the industry are confronted with an ever raising “high jump bar” of expectations from their customers, and grape growers are no different.

This following paper will present examples of application of some monitoring and subsequent control methods in use at Jubilee Park Vineyards. This is a privately owned vineyard near Renmark in the Riverland region. The total planted area is 227ha, and it produces a wide variety of wine grapes for six different wineries. The vineyard is drip irrigated, and has Enviroscan® soil moisture monitoring equipment to schedule irrigation. Jubilee Park Vineyards aims to produce fruit of the highest quality possible in the region and the crop levels are aimed at realistic targets in order to achieve this aim.

Why monitor?
There is an old saying in quality management: “if you can’t measure it, you can’t manage it”. This is particularly relevant to modern vineyard management. Monitoring includes vine growth, pests and diseases, measurement of grape maturity, and assessment of vine growth and development. It is a two-part process—firstly finding the problem, and secondly doing something about it. Effective monitoring can detect anomalies in vine growth, for example, that may be corrected through nutritional or irrigation inputs. Accurate crop forecasting may indicate an undesired crop level that could be corrected with crop thinning and notification to the winery may be needed. Careful attention to pruning levels allows a grower to aim at a production target rather than accept widely varying yields. All these measures are important tools that may give a grower more control over their quality, and all require some degree of monitoring.

Crop estimation
Jubilee Park Vineyards tested the Department of Primary Industries (Victoria) software package of crop forecasting in the 2003 vintage, through a pilot program in conjunction with Southcorp Wines. There were many features that were attractive, including ease of use of the software, elimination of subliminal bias through randomization of sampling sites and extensive statistical calculations that specify variation of sampling. The program also had the ability to calculate the minimum number of measurements needed to satisfy a specified percentage variation. This feature allowed for more efficient sampling, and so reduced the time taken. The system did, however, require a great deal of work as measurements are taken at several times during the growing season. The measurement processes were labour-intensive and the cost of performing the procedure on the entire vineyard would be considerable. Jubilee Park Vineyards has fifty different blocks and the amount of work needed to sample all to small degrees of variation would be considerable. An alternative approach may be to apply the program to blocks of each variety and similar soil types and then examine trends in each season.

For the forecasts to be meaningful, an historical list of data must be compiled. As this was the first season this program had been used within the Jubilee Park Vineyard, the results were less accurate than ideal. The ratio of mean estimated yield/actual delivery on the basis of the program was 1.29, whereas the visual assessment average was only 1.10. The industry standard uses a measure of 33% as the degree of accuracy normally found, so it would be easy to say that a 10% to 29% error is acceptable. In achieving the 110% accuracy on the blocks compared, however, there were significant errors either side of the mean, which are less acceptable.

Balancing the crop
At Jubilee Park Vineyards the maximum desired crop level is 20t/ha for red varieties and slightly higher for whites. The vast majority of pruning involves mechanical pre-pruning followed by a careful hand clean up. The general approach is to set pruning levels using bud dissection and also to refer to previous season’s crop levels as a guide. The overall approach can be summarised as follows:

• Count average number of shoots per metre of cordon.
• Calculate average number of viable bunches per bud using bud dissection.
• Allow for average bud burst—using historical averages from each block or a district average.
• Using average bunch weight and the above measurements, calculate the ideal number of buds per metre of cordon to achieve the desired yield.

When setting bud numbers, the tendency is to aim slightly higher rather than slightly lower. This allows correction of crop levels through reduction of berry size using regulated deficit irrigation, or as a last resort, through thinning. Imposition of controlled water stress has a marked effect on

I’ve done the monitoring – now what?

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controlling berry size as well as cane growth and is effective in reducing a larger than desired crop. This is especially so in the warm irrigated region of the Riverland. It is much harder to add crop when the crop level is too low—this may also result in a blow out in the berry size and lower quality fruit.

Irrigation management
Soil moisture is monitored using the Enviroscan® capacitance soil moisture sensors. The majority of irrigation valves have a probe to monitor the soil moisture. In addition to carefully tracking the soil moisture for efficient water use, the readings give an immediate indication of any malfunction in the irrigation distribution system which may otherwise go undetected on a large vineyard. The associated software is valuable in applying regulated deficit irrigation (RDI) to control berry size and cane length. Ideally the period of mild stress will occur after fruit set when canes have reached a length deemed adequate to ripen the anticipated crop. In the past this has been assessed visually but Jubilee Park has now commenced taking objective measurements during the season to assist the decision-making. The Enviroscan® graphs are not used in isolation for reference during the period of RDI. Shoot growth, leaf temperature and health of the tendrils is also closely monitored. The duration and severity of RDI application is not applied in a uniform manner across all red varieties, rather each block is assessed individually. White varieties are generally not stressed.

Maturity testing
Berry samples were used for maturity testing until two years ago. Following the unreliability of the results in that vintage, bunch sampling was adopted. Bunches are carefully selected from both canes to reflect the distribution of fruit within the canopy. The fruit is crushed on site and Baume, pH and titratable acidity (TA) readings are taken. Results are then sent to the purchasing wineries twice weekly. Ripening curves of Baume, TA and pH levels are plotted in the vineyard office and used to track acid depletion during sugar accumulation. This is useful if, for example, a sudden increase in sugar accumulation occurs with no associated reduction in titratable acidity. Such a reading would be regarded with suspicion thereby reducing the chance that a decision to harvest will be made at the wrong time.

During harvest, there is regular contact with winery staff to make sure that both parties are “speaking the same language”. If a problem should occur, or for example, the flavour profile of some fruit suddenly changes, the winemaker and grower understand each other. The distance between some wineries and the vineyard makes regular trips to the vineyard in the hectic vintage period difficult.

Pest and disease
Jubilee Park uses pest and disease management consultants to monitor four indicator blocks; the remainder of the vineyard is monitored internally using a structured program. Staff operating in the vineyard are trained to recognise symptoms, as every set of eyes travelling through the vineyard is invaluable. Extra effort is directed at susceptible varieties for particular pests or diseases. For example, Verdelho is closely monitored for powdery mildew, while Chardonnay is a good indicator variety for light brown apple moth (LBAM) problems.

The company has an Integrated Pest Management (IPM) program in place, and “soft” or targeted control measures are favoured. Control of LBAM early in the season is achieved with insect growth regulator products, and late in the season using Bacillus thuringiensis (B.t.) sprays. An isolated outbreak of light brown apple moth last season was controlled with an insect growth regulator with spectacular results. When B.t. is used, care is taken to ensure the greatest effect. Sprays are applied in late afternoon to reduce possible photodegradation, no other chemical is mixed with the B.t., high volume spray is directed at the bunches, and feeding attractant is added to the tank mix.

Jubilee Park has a policy of application of sulphur early in the season as a preventive for powdery mildew at ten day intervals. This approach has largely been successful, with only minor “hot spots” of powdery developing. These are controlled using high water rates, and the application of wettable sulphur at close intervals until it is obvious the mildew is dead. Copper sprays are usually added after flowering when shoot growth has slowed, as it is difficult to maintain a protective cover on the rapidly growing tissue early in the season. Should a primary Downy Mildew infection event occur early in the season, a post–infection fungicide is used. Jubilee Park uses a “Model T” type weather station to aid in monitoring weather and to assess the need for post–infection disease control.

Planning ahead
There are many aspects to monitoring and controlling the quality of fruit in a vineyard. All too often it seems that growers and managers focus on one issue at a time. The most effective method of coordinating the production processes is to incorporate all the monitoring and responses into a management plan.

This is relevant regardless of the size of the vineyard in question. It allows formulation of a structured plan for monitoring and sampling well in advance, and the planned reactions should a problem be found. The planning ideally would include what varieties would be monitored for what pest and a plan for application of pesticide. Ideally this would be in accordance with the spray diary from the winery to which the fruit is to be delivered. Likely “what if” scenarios would be included—what would be planned if there is an outbreak of LBAM at flowering or a late season primary infection of downy mildew, for example. By planning in advance, the grower will take into account the winery requirements regarding withholding periods, different control agents available at different times of the season, possible different requirements for fruit that may be destined for different wineries and allowance for resistance problems, such as the need for chemical rotation. This approach allows decisions to be made with a cool head well in advance, and with a longer period of thought than perhaps possible during a time of crisis during the growing season. Potential problems with contravention of withholding periods therefore can be avoided. At the very least, such a plan can act as a useful reminder for issues that may be overlooked during a busy time of the year.

Summary
In order to efficiently manage a vineyard, a grower must know what is happening in the vineyard through effective monitoring. Jubilee Park Vineyards has a policy of continuous improvement and keeps abreast of industry innovation through regular attendance at technical conferences, seminars and workshops. This has led to the ability to quantify more processes in the vineyard and have a better understanding and control over vine growth and fruit quality. The management of the vineyard is viewed in a holistic manner, with the processes documented in a management plan for ready reference and guidance during the growing season.