

CONSTRUCTION PROFILES

- Oatlands
- Pelican Waters

TURF SPRAYER EVALUATION Gravel Drainage Aggregate How to Play the Lakes

April - May 2001

SHORT OF CAPITAL?

Wheelease can help you overcome your capital requirements to upgrade, replace or add new equipment with a number of innovative leasing products tailored for the Golf and Turf management industries.

> We offer fully maintained (maintenance and insurance inclusive) leasing solutions for: Golf cars and Utility vehicles, Turf Maintenance Equipment and Motor Vehicles.

Golf has become an increasingly popular pastime over the past decade and the golfing industry is enjoying unprecedented growth. The rise in golf's popularity has caused an increase in the number and quality of courses and this has led to intense competition amongst courses to attract members/players.

This competition is placing pressure on golf course managers to ensure their course is always presented in perfect playing condition and that players are offered a full range of facilities such as golf cars.

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The move from the outright purchase of equipment in favour of leasing has taken some time for the turf and golf industries to embrace and as a result, there are few financiers specialising in providing leasing finance for these industries. Those organisations that have moved to leasing for their capital equipment have found that they needed to deal with different financiers for each piece of equipment, as there was no specialist financier addressing all the industries' needs.

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The principals of Wheelease have used their wealth of experience gained over many years in the motor vehicle leasing and fleet management industry to develop sophisticated and flexible leasing solutions to satisfy your capital equipment financing requirements.

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inf Maintenance Equipme

s and Utility Vehicles

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payments with no residual risk for the lessee

Seasonal lease – our unique lease concept where monthly payments are structured to match cash flows with no residual risk for the lessee

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IBC (insert)





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Silt and Clay in sand can block greens drainage

Dirty sand can damage the drainage qualities of a green even if tests show that the sand particles are of optimal size. William Knoop explains.

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CONSTRUCTION



Today's turf managers are more often than not required to act as project managers for almost any major redevelopment that the Club or turf facility may be undertaking.

This is most certainly the case when some form of turf construction or renovation is taking place and it is likely that the turf manager will be required to solve complex soil physical and chemical equations, make recommendations on and source materials that will ultimately determine the success (or otherwise) of the project.

This makes a thorough understanding of construction materials more important than ever before. With a number of articles focused on these topics, this edition of ATM seeks to help.

In RESEARCH, Turf Consultant William Knoop discusses how 'dirty' sand can ruin drainage rates even if it has been sieved and specified and Gary Beehag reviews what is known about drainage aggregate.

'Pelican Brief' profiles the construction challenges associated with building a resort course on Queenlands Sunshine Coast and Jamie Dawson discusses how the Oatlands Golf Club in NSW have improved golfing strategy, fairness and water storage.

Trevor Siviour gives you almost all you need to know about calcium and if you are planning on playing in the AGCSA Golf Championships in June, Peter Schumacher's guide to the back nine at the Lakes, could be worth a few shots at least!

In addition to all this and more, the second edition of TOOL TEST visits Castle Hill Country Club to have a close look at six very different turf spray units. This is proving to be a popular section and I hope you find it useful.

See you at the Conference

Phil George Editor



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President's Pen

In keeping with the AGCSA's philosophy of providing relevant information to its members, you will find this edition of Australian Turfgrass Management full of useful technical articles, product evaluations and turf management case studies.

AGCSA Members ranked information as a key role of the association in the latest membership satisfaction survey and with the excellent support our magazine receives from advertisers, the HRDC and readers, ATM continues to set the standard as the industry's best source of information. Indeed, the recent survey has ranked ATM as the No. 1 turf industry publication.

On other AGCSA matters, the AGCSA's technical services division AGCSATech, with the financial support of the Queensland Government EPA, successfully launched the "Manual to Improve the Eco-Efficiency of Queensland Golf Courses" in March at the Brisbane Golf Club. So successful was the launch that within the day, Premier Beattie's office was on the phone requesting a further 15 copies! The manual will be sent to all Queensland Golf Clubs this month. The NSW EPA has now also expressed an interest in supporting the AGCSA to undertake a training program in NSW on the subject of the cost benefits of environmentally aware maintenance of golf courses.



Autumn also saw the AGCSA join forces with the State Associations to stage a series of workshops/turf tours around the country. These ranged from "time management" in WA to "turfgrass stress management" in SA. The AGCSA is presently negotiating with an international speaker for the Spring workshop series, which is to be held in September/October.

The AGCSA is currently working towards the formation of a historical committee to oversee and undertake a detailed fact finding mission to unearth the true beginnings of golf course maintenance in Australia and the earliest golf greenkeeping associations. We hope to invest the services of some respected elder statesmen of the association to assist in the compilation of the records into a history of greenkeeping in Australia booklet. If you have any old documents from the early history of the AGCSA or State Associations, please contact the AGCSA office.

Despite an increased number of nominations this year, I remain concerned that the AGCSA

Awards program fails to engender a greater response from the membership. The Awards present a great opportunity to recognise our industry achievers and promote them to the wider community, with the obvious beneficial effects to the industry as a whole.

The 17th Australian Turfgrass Conference will see a minimum of two new AGCSA Board members elected. For myself and Peter Schumacher this conference will be our last as Directors, and I look forward to thanking all of those that assisted the association during my term, in person at the conference.

Nomination forms have been sent out with our last AGCSA ACTION Newsletter and 1 would encourage you to consider nominating. For me the experience was challenging, at times frustrating, exciting, immensely rewarding and overall, very enjoyable.

Peter Frewin GCS Barwon Heads Golf Club AGCSA President

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COLTEST Turf Spray Units

Clearly benefiting from the vast sums of money channeled into research and development for applications in broad acre agriculture and the intensive production methods of horticulture, no other turf maintenance practice is undergoing greater change than chemical application. For this reason, todays professional turf manager is in the enviable position (or not), of being faced with a variety of choices that encompase a range of technologies, theories and ideas all of which precipitate into a list of quite different turf spraying units.

What a turf manager looks for in a turf spraying unit depends on a number of factors such as budget, turf type and frequency of chemical use, so what one turf manager views as the ideal unit is likely to be quite different to what someone else sees as the most suitable. Essentially, this makes a direct comparison between units to be of little value so what this edition of TOOL TEST seeks to achieve is a comprehensive 'evaluation' of each machine to help you decide what might be the most suitable for YOU!

So, off to the Castle Hill Country Club in Sydney's west we travelled to evaluate six turf spraying units that our panel of evaluators felt gave a fairly good representation of just what is available.

The units tested included:

- Enviromist Spraydome 5000
- C-DAX 200 Litre Trailed Sprayer
- · Hardi Twin 200 Turf Sprayer
- Silvan 400 Litre Tray Mount Turf Sprayer
- · Toro Multi-pro 1250 Spray Unit
- HD 200 Sprayer for ProGator Utility Vehicle (John Deere)

As with the last edition of TOOL TEST (Volume 2.6, Greens Mowers) a panel of evaluators representing a broad base of knowledge and experience was taken from within the industry to help formulate the testing criteria and actually do the evaluation. This team was lead by John Kent, senior lecturer and chemical application expert from the Charles Sturt University and also included, Dave Warwick (Avondale GC), Mick Searle (Asquith GC), Jeff Jones (Castle Hill CC), Simon Cuisack (Castle Hill CC), Andrew Kinsella (Pennant Hills GC)

This report is presented in two sections; the first is a list of specifications and results of the evaluation and John Kent concludes with a discussion on what points you should consider when choosing a turf spraying unit.

Section 1: SPECIFICATIONS AND RESULTS

ENVIROMIST SPRAYDOME 5000

Traction unit: 12-volt power supply & sufficient towing capacity.

Tank: 300 litres

Chassis: Steel powdercoated construction with articulated outer wings to follow the contours of the ground.

Agitation: 12.75 L/min using float and hose set up.

Control unit: Individual flow metres and light indicators for each spray head. Outer wing sections can be switched on/off independently.

Pump: Flojet 4100-505 (14 L/min)

Filtration: 40 mesh filter in tank sump & 50 mesh filter inline.

Spray boom: 5m boom with 5 x ulva+ Controlled Droplet Applicators (CDA) heads, with solenoids to ensure instant shut off of chemical. Shroud construction is plastic with brush skirting.

Spray rate: 1.25 L/min (total of all 5 spray heads).

Droplet size: 130 microns.

Foam marker: PortaFoam marker with either left or right hand foam dropping.

Wheels: Turf tread, sealed bearings and smooth action castors on rear wheels.

PRICE OF UNIT AS TEST	
(not including traction unit)	= \$16,180
AVAILABLE OPTIONS	
Twin Lifting Rams	= \$2,825.00

Pressure Spray Nozzle Kit

 Category
 Score

 Tank
 4.6

 Controls
 3.5

 Boom
 4.0

 Ease of Operation
 4.8

 Ease of Admintenance
 3.6

 Afterly
 2.8

 Total Score
 27.5

Please note: 6=best 0=worst

= POA

With its large fill hole, non-spill feature and excellent durability the Spraydome 5000 received excellent marks in the 'tank' category but the marks would have been even better if the volume indicator was clearer and if the tank had baffles.

This machine did not receive great marks for controls with most evaluators wanting to see more in areas of pressure and flow regulation. However, the Spraydome 5000 rated highly for 'ease of operation' and 'ease of maintenance' with the technicians being particularly impressed with easy access to the outer CDA disks (middle disk was harder), and the durability of the shroud although they did feel that it could be improved by having a 'breakaway'. General comments indicate that most felt that this unit is ideally suited to the broad acre application of herbicides to fairways and most expressed an interest in the CDA technology but one evaluator did make the point that most chemicals have a 'dilution factor' stated on the label which suggests that labels have not kept pace with evolving technology.

C-DAX 200 LITRE TRAILED SPRAYER

Traction unit: 4WD bike or Turf Utility Vehicle.

Chassis: Height: 840mm Width: 1340mm Length: 2000mm: Weight: 75kg. Mounted on Leaf Sprung Trailer and fitted with Turf Tyres.

Tanks: 200L polyethylene tank with internal baffle.

Agitation: Bypass action and Venturi jet.

Filtration: Three Filtration Points.

Spray control: C-DAX Rate Rite Spray Controller (matches flow rate with ground speed and logs data). Not Standard.

Spray boom: 5.4m Controlled Droplet. Application (CDA) Boom fitted with Foam Marker.

Droplet size: 250-300 micron.

PRICE OF UNIT AS TESTED	
(excluding utility)	= \$6572.00
AVAILABLE OPTIONS	
C-DAX Rate Rite Spray Controller	= \$1,100.00
3.6m boom	= \$POA
7.2m boom	= \$POA

Carrier States :	Category	Score
	Tank	2.9
ALL AND ADDRESS OF THE	Controls	4.3
	Воот	3.4
	Ease of Operation	4.4
CALCULATION OF THE OWNER OWNER OF THE OWNER	Ease of Maintenance	4.1
	Safety	3,7
and the second second	Flexibility	3.7
-	Total Score	26.6

Please note: 6=best 0=wors

Although considered very durable, the C-DAX 200 Litre Turf Sprayer scored poor marks for the 'Tank'. This was mainly due to a volume indicator that was hard to see, small drainage and filler holes and the very square shape which is not considered ideal for adequate agitation.

Evaluators were very impressed with the galvanized construction, the well designed 'break away' and the simple manual height adjustment but the boom was marked down significantly for the poor protection given to the CDA disks, which are not cheap to replace. Excellent marks were given for controls which were simple and easy to use.

Marks for ease of operation and ease of maintenance were good and all evaluators were impressed with its compact and simple design. Some thought it was 'just too small' but I heard one evaluator comment that it would be an ideal unit to have in the shed if you were on a 'Primo' program.

HARDI TWIN 200 TURF SPRAYER

Traction unit: Compact Tractor

Chassis: Powder coated steel construction in two sections. Steel undercarriage remains bolted to the tractor when tanks and carry frame are removed.

Tanks: Twin interconnected 200-litre chemical and impact resistant UV stabilised polyethylene tanks with calibrated liquid level.

Agitation: Hydraulic by-pass system with Venturi Nozzle in each tank.

Filtration: Lid filter, bowl suction filter with isolating valve & nozzle filters.

Pump: Model 1202 HARDI dry-sump diaphragm pump with a maximum pressure of 15 Bar. Maximum flow rate is 98 L/min.

P.T.O. shaft: Series 2, with safety covers and check chains.

Spray control: HARDI EVC/3, 12 Volt, Hardimatic unit, with remote control for: master on/off, pressure up/down and on/off for 3 individual boom sections. 100 mm glycerine filled pressure gauge is fitted. The remote control box is mounted on a panel that sits on top of the right hand tank.

Spray boom: Rogers Windfoil aluminium and polyethylene construction 3-section frame with a replaceable, non-absorbent, drift-stop skirt. Wing Breakaway protection. Hardi 2080 spray nozzles and three separate (section) outsidemounted nozzle flow indicators.

Clean water tank: 15 L Tank is standard

Hose reel: Rear mounted with 30 metres of 12.5 mm pesticide hose and a HARDI model 60S spray gun. A reel isolation valve is mounted on the spray control.

Foam marker: Elite-2, double side, foam marker is standard.

PRICE OF UNIT AS TESTED	
(excluding tractor)	= \$22,833.80
AVAILABLE OPTIONS	
Model 1302 Pump (115L/min)	= +\$430.10
HARDI Pilot 3880 Controller	= \$4,089.80
HARDI HM 1500 Spray Monitor	= \$1,756.70
HARDI HC 2500 Spray Controller	= \$3,053.60



The Hardi Twin Turf Sprayer fitted with the Roger Windfoil Boom scored outstanding marks in the 'controls', 'boom' and 'flexibility' categories. The electric height control and the monitor were liked by everyone and the 'floating balls' were considered useful in monitoring flow rate and blockages but they are harder to see than they should be (perhaps a rearview mirror would help?)

The boom scored such high marks because of its light-weight construction, good 'breakaway', good access to and protection of nozzles and a good filtration system.

Most evaluators felt that this spray unit really needs to be considered as a dedicated spray unit because taking the unit off the tractor is a time consuming task but it still scored good marks for flexibility because it can be used for all applications and the boom allows the sprayer to be used in all conditions.

Although not many comments were provided, the Hardi sprayer didn't score great marks for 'ease of maintenance' and it was marked down for safety, mainly because of the difficulty experienced getting on and off the machine.

One comment worth mentioning is that all the evaluators thought the tractor carrying this particular unit was too small and that 'ease of operation' was highly dependent upon selecting the right traction unit.

SILVAN 400 LITRE TRAY MOUNT TURF SPRAYER

Traction unit: Turf Utility Vehicle.

Chassis: Fully Galvanised RHS steel sled frame. Removable stand legs when not in use.

Tanks: 400L, polyethylene construction, moulded calibration. Non-spill screw down lid, internal baffle.

Agitation: Bypass action and Venturi jet

Filtration: Lid strainer, suction line strainer and nozzle strainers

Pump: Silvan self-priming oil locked diaphram type with nitrile diaphragms, corrosion resistant, cast anodized aluminium body – 2000kpa pressure. Direct gearbox driven by 5.5HP Honda engine

Hose reel: 20m x 1/2" Ag hose, Topline spraygun with extension lance

Spray control: Arag 3 section electric controller, cabin mounted control box with pressure guage.

Spray boom: 12-volt electric fold 6m with stainless steel spraylines, non-drip nozzle holders

(excluding utility)	= \$8,646.00
Silmix	= \$1.022.00
8m boom	= \$347.00



Although not on the unit tested, all units will carry 14-litre wash tank as standard.

The Silvan 400 litre Tray Mounted Sprayer scored excellent marks in the 'controls' and 'boom' categories.

Apart from the height control, all aspects of the evaluation in the 'controls' section scored well but because a constant speed for correct output is required, a computer controller is recommended for this unit.

The boom was strong and durable with good 'breakaway' and the protection and ease of changing nozzles was as good or better than any.

I am sure the unit would have scored better marks for ease of operation had it been fitted with a computer controller but it was marked down for poor visibility of the boom and nozzles and the high (hard to reach) position of the fuel tank and spray tank filler hole ('Silmix' would help). The tank was marked down for the less desirable square shape and poor volume indicator.

The Silvan sprayer received poor marks for safety mainly because the position of the motor required the operator to wear earmuffs and it did have some visibility issues.

General comments tended to indicate that this was not the ideal unit for greens but that it was a quality, highly versatile unit that was ideally suited to a facility that needed to retain the services of their utility vehicle for other tasks.

TORO MULTI-PRO 1250 SPRAY UNIT

Traction unit: 4-wheel, rear wheel drive, front steer, single operator. Integrated transaxle with 3 forward speed ranges and reverse. Petrol capacity – 23 litres.

Tanks: 606 litre

Agitation: Inductive agitation

Spray monitor: Spray ProTM system, multifunctional with liquid crystal display, back lit.

Pump: Dual diaphram pump, proportional ground speed control system, 11.4 litre/minute output. Capacity range up to 15 bar max.

Spray control: Arag 3 section electric controller, cabin mounted control box with pressure guage.

Spray boom: 6m Open Boom System fitted with electric boom lift kit and 'sonic boom' height adjustment (not on base unit).Foam Marking Kit.

Clean water tank: 15 litre

PRICE OF UNIT AS TESTED	= \$43,450.00
AVAILABLE OPTIONS	
Single Nozzle Kit	
(Boomless Sprayer)	= \$390.00
Enclosed Boom(deduct price of	
standard boom)	
(includes electric lift kit)	= \$14,000.00
Electric Boom Lift Kit	= \$1,300.00
Boom Pivot – shock absorbing	= POA
Enclosed Walk Boom and trailer	= \$4,000.00

Electric Hose Reel Kit	
(incl 150' of 5/8" hose)	= \$2,500.00
Spray Gun Kit Only	
(incl 25' of 5/8" hose)	= \$400.00
ROPS	= \$750.00



Out of a total of 42 points, the Toro Multi-pro 1250 scored a remarkable 39.1 points!

The evaluators loved almost everything about this machine but were most impressed with the low profile, easy access to and thoughtful options associated with the 600-litre tank and the acute level of accuracy that the comprehensive controls (operated by hand and foot) allow. The 'sonic boom' was also a huge winner but it is not on the standard on the base unit and does not come cheap.

However, the turf technicians did feel that the engine was hard to access and felt that a four post lift would be required to service it easily and they felt that the seat lock was a little dangerous.

General comments summed up the feeling; "A

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The complete unit can also be easily detached from the vehicle, one person can remove the complete unit from the vehicle. A wide range of options are also available

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SILVAN PUMP5 & SPRAYERS (AUST.) PTY LTD ACN 005 160 074 ABN 55 061 908 258 Head Office: 89 Lewis Rd. Wantirna Sth. VIC 3152 Ph: (03) 9887 2788 Fax: (03) 9887 1035 QLD Office: 44 Lysaght St, Acacia Ridge QLD 4110 Ph: (07) 3345 9500 Fax: (07) 3345 9511 WA Office: 9 Aitken Way, Kewdale WA 6105 Ph: (08) 9353 2422 Fax: (08) 9353 2622 For further information or your nearest dealer visit our website at www.silvanpumps.com.au lot of thought has gone into the design of this machine" and "It is a must for the shed!"

HD 200 SPRAYER FOR PROGATOR UTILITY VEHICLE (JOHN DEERE)

Traction unit: ProGator 2030.

Chassis: Heavy duty frame.

Tanks: 200 U.S. gallons, (750lt) tank with non. siphoning fill top.

Agitation: Sparge tube agitation.

Pump: Centrifugal pump, hydraulically driven. Electric motor plunger valves and electric flow regulating valve.

Spray control: Manual electric spray control

Spray boom: Multipurpose 18 ft breakaway boom.

Clean water tank: Personal wash tank.

PRICE OF UNIT AS TESTED

(excluding utility)	= \$11,660.00
AVAILABLE OPTIONS	
Auto Rate Control	= \$3,314.00
21 ft Boom	
(can turn off outer 3 ft)	= \$220.00
Rogers 5m Windfoll	= \$10,758.00
Electric Lift Kit	= \$1,531.80
Ground-plane wheels	
(JD Boom)	= \$684.90
Foam marker (electric)	= \$1,922.20
Hose reel (200 ft)	
-manual	= \$1,472.80
-electric	= \$2,446.90
Throttling valve	= \$74.10



4.3 5.2 5.1 4.7 5.3 5.2 34.2

Score

The John Deere HD 200 Sprayer on the ProGator 2030 scored excellent marks for 'controls', 'boom', 'ease of maintenance' and 'safety'. The machine received outstanding marks for flow and pressure regulation and the pressure guage (only in PSI).

Although evaluators indicated that the boom could have bigger, (bigger option is available), ease of changing the nozzles was excellent as was the strength, durability and nozzle protection. One of the turf technicians was confused by the decision to paint the boom black (as was the Toro unit) which makes it very hard to see in the shed. High scores for maintenance were due mainly to the easy access afforded by the tilt tray on the ProGator and easy access to nozzles and other critical parts. High marks for safety were due to the good visibility, low center of gravity, good warning signs, ROPS and seatbelts.

The tank was marked down because it didn't have baffles, it had a flat bottom which isn't

great for agitation, and the volume indicator is not visible from the operators seat and is in gallons rather than litres.

General comments indicated that the evaluators were satisfied with the ability to keep the ProGator available for other tasks and rated it as an ideal 'mid-range' unit, making the observation that it is a little big for greens and the boom fitted was not quite big enough for fairways, (ie: bigger boom would be preferred).

Section 2: CHOOSING AND USING SPRAY RIGS

Following best practice when applying insecticides, fungicides, herbicides and other products is becoming more important because of the pressures of community expectations, occupational health and safety, environmental safety, regulatory obligations, cost minimisation and effective control of target pests. Choosing the right spray rig for your needs is only the start. It must be properly adjusted for each task, accurately calibrated to apply the correct rate of chemical and operated by a well-trained and competent person.

Choosing the right sprayer

With a very wide range of sprayers available, from low budget to very sophisticated specialist machines, it is important that you spend some time thinking about your needs. How much can you afford ? What products are you applying? What area do you need to cover and how often, and therefore what size machine do you need? Is the terrain flat and open, or is it rough and tight requiring a highly manouverable machine? Do you need a sprayer that is very versatile and can be used for a range of applications eg spot spraying as well as broadcast spraying? Are you able to afford a dedicated self-propelled sprayer, or do you need to use the transport vehicle for other tasks? If the vehicle has multiple uses, then the spray unit must be quick, easy and safe to take off and refit (the Silvan sprayer had a good system for this). Are your needs best met by a conventional sprayer with pressure nozzles, or a CDA (Controlled Droplet Applicator) with spray formed by spinning atomisers?

Having defined your needs and your budget, you need to find the best sprayer available. Many manufacturers start with a basic unit which can be built up with options. Rather than buy solely on price, always buy a machine with the best features that you can afford, and very importantly, with very good parts and service backup. A cheap sprayer which is not up to the job will work out more expensive (and frustrating) in the long run.

Features to look for

Some of the more important aspects to consider are:

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The tank:

Tanks need to be durable with a rounded shape to help with agitation of spray mixes (especially important to keep powder products suspended) and cleaning. A large filler hole with easy access (like on the John Deere sprayer) helps cleaning, maintenance and loading chemical and water. When filling, a quick release hose coupling is good, provided valves are fitted to prevent back siphoning and contamination of the water supply. A chemical hopper system can be very good for safe and easy loading of chemical into the tank and can usually be used for rinsing empty containers. Make sure the tank and hose outlet design allows all the spray to be pumped from the tank, and that the tank can be easily and completely drained for cleaning. Does the tank sit low on the machine to give a low centre of gravity for spraying on slopes? A baffled tank (like on the Silvan sprayer) will reduce liquid surge while moving. How easy is it to see the level of spray mix in the tank while driving?

The controls

A good, durable pump is essential, with enough capacity to recirculate spray mix back to the tank for agitation. Good filtration (filling, in-line and at nozzles) is also essential. Pressure nozzle sprayers require accurate regulation of pressure and a good oil-filled pressure gauge that is easy to see from the drivers seat. Sprayers with mechanical spray controls require a constant forward speed for accurate application. Electric ball valve controls for turning spray on and off, and electric adjustment of pressure, are convenient as are spray monitors which give accurate display of speed, pressure and application rates. Computer controllers automatically increase or decrease flow rates as forward speed changes to keep application rates constant . However, monitors and controllers must be calibrated and operated correctly within their limits. Some controllers can be pre-programmed with required spraying parameters while others can download spray data information to computers for record keeping.

The boom

Booms carrying either spray nozzles or CDA rotary heads need to be rugged, light weight and resistant to corrosion. Breakaway devices will minimise damage if an object is contacted and nozzles must be well protected and need some system to keep them at a constant height. Booms with hoods or shields (Hardi and Enviromist) will help minimise spray drift (and may be a public perception bonus). A useful inclusion is a system to indicate nozzle are working correctly and are not blocked eg the Enviromist and Hardi sprayers have flow meters for individual nozzles. A foam or dye marker or GPS guidance systems, helps indicate sprayed areas.

Ease of maintenance and cleaning

Give thought to how easy it is to gain access to things like nozzles, filters and pumps, and how easy it is to empty and clean the tank.

Safety

This should be a high priority and includes things like a clean water tank for washing blocked nozzles and cleaning hands; an enclosed cab with activated charcoal filter; safe easy access to the drivers seat; stability of the machine on slopes; and not having to climb up on the sprayer for filling. PTO shafts must be well guarded and appropriate warning signs should be standard. Of course, adequate protective clothing must be worn during mixing and spraying.

Ease of operation

Give thought to the overall ease of operation. A light weight trailed unit like the Cdax CDA may be more suitable than a larger unit. The CDA also has advantages with some chemicals (especially herbicides) with lower spray application rates and therefore less refilling required.

Training

Finally, it is very important that the spray operator is well trained with the knowledge, skills and attitudes necessary to achieve safe and effective results. Completion of the national ChemCert chemical user training and Accreditation is an excellent step towards this.

The AGCSA wishes to thank the Castle Hill Country Club and all companies and individuals involved with this evaluation for the tremendous support they have shown.



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(review) a guide to the world of opinion & ideas

Designing for maintenance

Horizons Golf Club

Most golfers play the game for relaxation and enjoyment. Generally, they are not overly concerned with design strategies and most do not bother to analyse the intricacies of each golf hole in order to take advantage of playing strategies.

However, almost all golfers are acutely aware of the maintenance level of their golf course, as issues such as uneven greens and bad fairway lies have a negative effect on their overall enjoyment level.

Undoubtedly, the high wear areas, particularly greens, fairways and tees, followed closely by bunkers are the areas for which maintenance expectations are at their highest.

It should be remembered that it is impossible to have any given course in U.S. Open condition all year around, (if at all). To do this requires months of planning and huge labour forces, to have the course in first class condition for just 4 days.

Labour is becoming harder to find and is becoming more expensive, so all Golf Course Superintendents are forced to strike a balance between manual works and mechanized maintenance. The challenge for golf course architects is to ease this dilemma by trying as much as possible to achieve the following, while still making the golf course challenging, interesting, playable and enjoyable:

1) MINIMISE AREAS REQUIRING MANUAL LABOUR

Small scale garden beds can be attractive on the golf course, but their design must be such that they do not require endless manual labour for their upkeep. This costs money and takes manpower away from other areas.

Spacing of obstacles such as trees in such a way as to either allow machine access, or make the area totally maintenance free is also good practice.

Every course needs a long term landscape strategy that will ensure a balance is struck between an effective landscape effect and a realistic maintenance cost.

A balance must also be achieved with the number of bunkers with edges that require manual trimming, as well as items such as steep slopes which must be mowed by hand. A sprinkling of these items will create impact but too much will blow the budget as well as diluting the impact.

2) MINIMISE PLAY ZONES

With the golfing population becoming increasingly environmentally aware, and the cost of maintenance becoming higher, a healthy trend is to leave areas between holes

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Rear Roller Power Brush

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in a natural, unmaintained state. Obviously, golf holes must be designed or altered specifically with this concept in mind, but the results can be outstanding. The contrast between heavy rough (whether it be tropical jungle or temperate bushland) and the maintained fairway will make maintenance standards appear higher even if they're not, and the cost savings are obvious. In addition, the designer should be careful to lay the course out such that there are no large tracts of land within the layout that are not in play but need maintenance. This is not only a very wasteful design practice, but obviously dilutes the effectiveness of the maintenance team.



Before and after shots of revegetation work, done at the Beerwah Golf Club to minimise play zones.



3) DRAINAGE AND IRRIGATION

These two items must correlate, in that there is no point installing an irrigation system that can distribute large amounts of water if the soil and drainage system are unable to dissipate it.

Drainage design is a key element to golf course design. It is an essential item and the challenge is to blend the drainage system into the design so that it is not at all noticeable yet achieves all that is desired from the view point of playability.

4) TREATMENT OF HIGH WEAR AREAS

Access points from paths to tees and greens are examples of areas that require special design attention to ensure (a) they drain well and are irrigated adequately, and (b) the design elements are arranged such that the wearing effect of foot traffic is spread as evenly as possible.

BY NIGEL DOUGLAS



Small scale garden beds can be attractive but shouldn't require endless maintenance

Quite often you will see a bunker placed between a green and an adjacent path which causes golfers to walk around it to access the putting surface. Not only does this concentrate wear on the bunker edges resulting in bare patches and unhealthy turf, but it is also annoying for the golfer to have to walk the long way around.

Preferred lines of access should therefore be observed as much as possible in design.

Golf course design is a marriage between art and science and in all cases, the design direction is dictated by the technical issues. As golf course architects, it would be stupid to disregard the site constraints and the projected maintenance strategy, as these items will ultimately decide whether a design will be sustainable in the long term.

Those items play a bigger part in the design process than one might think, and in actual fact, the difficult items such as drainage and circulation pathways are initially the prime consideration in working up a detailed design of a golf hole. It is pointless to create a wonderful looking golf hole if it does not physically function and cannot be properly maintained.

Great golf design encompasses "the full package" in that it must be popular for golfers, and if popular must also be able to be maintained at a high standard. The "invisible marriage" between science and nature is the key to this and is the hallmark of successful golf course design.

Nigel Douglas is a Provisional Member of the Society of Australian Golf Course Architects and works as a Golf Course Architect with Ross C. Watson Golf Course Design # **A Company Which** Makes A Utility **Vehicle For Every** Task, Every Course & Budget? I'D LIKE TO TURF 1 TURF 2 TIIRE A TURF 272 & TURF 2 XRT. FOR YOUR NEAREST DEALER FREECALL 1800 680 088

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TECHTALK

Importance of Cultivation



On recreational turfgrass sites, cultivation (also called "aeration") is a common practice. As intensity of use increases on a site, the cultivation requirements also generally increase. Unfortunately, clientele using a turfgrass facility often do not understand cultivation as an essential management practice. Instead, it is viewed as an aggravation imposed on them by the turf manager.

WHY IS CULTIVATION ESSENTIAL?

Lack of Macropores. The primary benefit of all cultivation techniques is to create temporary "macropores." A soil pore is a void in the soil that may contain water, gases, or roots. Larger pores of greater than 0.10 mm diameter are called macropores; and the percent on a volume basis is termed "aeration porosity" or "noncapillary porosity." In contrast, pores of <0.10 mm diameter are micropores with the total volume of these called "capillary porosity."

Macropores provide three important functions within the turf-soil-atmosphere system. First, water movement into the soil (infiltration), through the root zone (percolation), and past the root zone (drainage) is through macropores. If excess water cannot be rapidly removed, the site would be water-logged, soggy, exhibit low soil aeration, and be unstable for traffic. Also, irrigation is not efficient if water cannot penetrate into the soil surface, resulting in high runoff and evaporation losses of water.

Secondly, macropores are the channels for oxygen (O_2) movement from the atmosphere into the soil and for soil generated gases (CO_2 , H_2S , methane, etc.) to dissipate into the atmosphere. Root cells require O_2 for cell respiration (just as human cells do) 24 hours per day for survival. Initially, low O_2 stress is demonstrated by inhibition of water uptake (wet wilt for example) and reduced nutrient uptake, while continued stress results in root dieback.

Thirdly, macropores are required for maximum root growth. These serve as channels for roots to penetrate more rapidly and deeply into the soil.

Cultivation is essential on many soils to create temporary macropores for water movement, gas exchange, and root growth. The goal is to cultivate frequently enough and to a depth sufficient to create and maintain macropores throughout the whole root zone depth or at any location within the root zone where they do not exist.

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Table 1. Common field problems on recreational turfgrass soils that require periodic cultivation

FINE-TEXTURED SOILS	(>10% silt or clay content)
Field Problem	Comments
 Excessive Quantities of Silt and/ or Clay. Throughout the whole profile. Within the B horizon. 	Often lack sufficient macropores. Tend to have high soil strength. Susceptible to compaction and structural detenoration by sodium.
 Soil Compaction. Surface 0-8 cm is most common form. Deeper compacted zone. 	Very few macropores. Very high soil strength.
3. Sodic and Saline-Sodic.	High sodium (Na) causes soil structure to deteriorate. Often called "permeability hazard" since water permeability rapidly declines. Surface is affected first.
4. Uneven/ Unstable Soil Surface.	Often caused by excessive moisture that cannot drain due to lack of macropores.
 Layers Differing in Texture or Composition. Wind/ water deposited From clay/ silt in topdressing. 	Layers containing more "fines" (i.e., clay and silt) than the overlaying soil have fewer macropores.

	COARSE-TEXTURED SOILS	(<10% silt or clay content)
	Field Problem	Comments
1.	"Hard" Sand Surfaces. Wide particle size distribution of sands Unusually angular sand shape.	Lack of macropores. Hard, compact surface.
2.	Excessive Organic Matter in the Surface. OM accumulating climates. Climates favouring root death in the summer within the surface high OM content zone.	Insufficient level of macropores, especially if lack of sand allows the OM to become compacted.
3.	Subsurface Layers of Clay/ Silt or Organic Matter. (and associated black layer).	Within the layer, insufficient level of macropores. Clay-layers may exhibit high soil strengths. These often also exhibit " black layer " above the initial layer impeding drainage.
4.	Uneven/ Unstable Soil Surface. (and associated black layer).	Where high Na contributes to dispersed particle (colloidal clay and/ or organic matter) migration and accumulation within a zone. Black layer may form above this initial layer.

For additional information on these soil physical problems see: Carrow, R.N. 2000. Managing sports soils. Proceed. Millennium Turfgrass Conference. 5-9 June 2000. Melbourne, Australia. AGCSA, Glen Waverly, VIC. p. 153-163. Table 1 lists soil physical problems commonly encountered on recreational turf soils - often more than one of these problems occurs on the same site. One of these problems, soil compaction, is considered by turf scientists/ managers as the number one problem on recreational sites. A common theme in all of the field problem situations noted in Table 1 is lack of macropores.

ALLEVIATE HIGH SOIL STRENGTH

On fine-textured soils especially, many problem fields exhibit high soil strength throughout the root zone or within a zone (Table 1). Compacted soils containing 1:1 clay types (kaolinitic, Fe/ Al oxides; non-shrink/ swell, non-cracking) or high clay content soils all tend to exhibit high soil strength. Also, any finetextured soil demonstrates greater soil strength as it dries below field capacity.

A high soil strength soil is the result of strong attractions between clay particles. Even if macropores are not present, roots can "push aside" soil particles to grow deeper into the soil provided that soil strength is not excessive. Cultivation techniques that have a loosening or shattering action reduce soil strength between



Table 2. Comparison of Different Turfgrass Cultivation Methods".

Entitivation	Comments Tine dia. (mm)	Orpth of Penetration	Soil Moisture for Rest	Deep Collivation Method (>150mm.depth)	Direct Injection Possible
1. Coring with hollow tine, spoon, screw devices.					
a. Tractor-drawn units with spoons or tines that enter the soll at an angle. Some units are motorized.	Several types Interchangeable spoons, hollow tines, slicing blades, 12-19	76-152	FC	-	-
b. Drum-type	Several types Hollow tine	50-76	FC		
c. Verti-Drain, Soil Reliever	Hollow tine	250-300	FC-DFC	Yes	_
d. Vertically operated tines	Most common form of cultivation Many types, HT 9-22 dia.	75-125	FC	-	-
e. Deep-Drill Aerofier - Floyd McKay - Hines	Screw device 12-19 dia. 5-19 dia	125-250 80	FC FC	Yes Yes	Yes - Granulars Yes - Granulars
2. Coring by solid tinedevices.					
a. Verti-Drain, Soil Reliever	8-25 dia.	300-400	DFC	Yes	-
 Shatter-core vertically operated tines. 	12-19 dia.	75-125	DFC		
c. Units where tines enter the soil with	12 dia.	80	FC-DFC	-	-
a rotary pattern (Aera-Vator).					
d Small diameter solid tine often as a quad tine	6 dia.	50-75	FC	-	
3.Slicing - Solid tines or blades, are not power driven. Many types, tines into the soil.	Blades pulled through the soil or the weight of the unit pushes				
a. Straight-line tines	Most common.	75-175	FC	Some units	-
 b. Straight-line blades (Verti-Slicer) (Verti-Groover) 	Thin width blades.	50-150	FC	Yes	Yes - Granulars
c. Offset tines (Aerway Slicer)	Larger width blades, 6-12	150-200	DFC	Yes	
4. Spiking, Blades are not power driven (i.e. do not cut through the soil but penetrate by machine weight)	Small spikes or knife-like blades. Units may be pull type or motorized drive (Spikeaire).	6-50	FC		
5. Subaerification.					
a. Yeager-Twose, Turf Conditioner	Blades vibrate side-ways.	50-200	DFC	Yes	Yes - Granulars
b. Green Care, Shatter Master	Blades vibrate front to back.	100-300	DFC	Yes	-
6. High Pressure Water Injection *Toro Hydro-Ject *Other Units	Uses high pressure water action.	100-500	FC	Yes	Yes - Liquids (some); some units inject granulars.
7. Air Pressure			1		
a. Terra Lift probe.	25, one	150-900	FC-DFC	Yes	Yes - Granulars
b. Aerragreen	12, 4 probes 12, 1 probe	150-300 900	FC-DFC	Yes	Yes - Uses polystyrene beads
8. Grooving. ¹ Power driven blades that cut through the soil and thatch layer	Used for renovation and not for routine cultivation.	25-125	FC-DFC	Transfer a	
9. Forking. spot treatment cultivation method	The "original"	150	FC	Yes	

²Grooving causes severe injury to the turf and is not generally used as a true cultivation method but is used to "open up" the turf in renovation or for verticutting/ dethatching.

'FC = field capacity; DFC = drier than field capacity.

*After Carrow, R. N. Golf Course Management Vol. 58, 1990. Commercial examples are to illustrate particular types of cultivation

units and does not imply an endorsement

"Conversions: _" = 6.3 mm; _" = 12.5 mm; 4" = 4 inch = 10 cm; .6" = 6 inch = 15.2 cm.

Figure 1. Example of cultivation: a) to alleviate a compacted zone in surface 25 mm; b) creation of a large macropore (i.e., the white area) to a depth of 200 mm in this fine-textured soil; c) penetration through a "black layer" zone at about 75 to 125 mm depth; and d) combining cultivation with the white sand to amend a soil.

the cultivation tines/ blades at the same time as creating macropores in the tine/ blade holes.

Table 2 lists the nine types of cultivation methods and characteristics of typical units. Cultivation devices with a significant loosening/ shattering action are Verti-Drain, Soil Reliever, Aerway Slicer, Green Care Shatter Master, Terra Lift, and Aerragreen (or similar devices).

AMEND THE SOIL

Cultivation provides a means to remove soil and fill the holes with physical or chemical amendments. The most common example is surface cultivation to 75 to 125 mm depth by hollow-tine aeration with cores removed and sand added to amend the surface of finetextured soils. Repeated cultivation plus topdressing for 3 to 4 years can result in altering the surface so that compaction is reduced as sand begins to dominate the surface. Some devices allow for direct injection of lime, gypsum, water-absorbent polymers, sand substitutes, or other materials (Figure 1). These devices are noted in Table 2.

THATCH CONTROL

Soil removed by cultivation that is deposited onto the turfgrass provides an effective means of controlling thatch on golf course fairways or athletic fields. As the soil integrates into the thatch, it promotes more favourable conditions for microbial activity within the thatch.

RENOVATION

Cultivation is normally required for renovation and over seeding to ensure good seed or sprig contact with the soil.

SUMMARY

Maintenance of a healthy grass requires that adequate water (i.e., neither too moist or too dry), soil oxygen, and an acceptable rooting environment is provided. Additionally, soils often require chemical or physical amendment to improve growing conditions and thatch must be controlled. In each of these situations, cultivation is an essential tool.

Routine cultivation programs targeted to prevent adverse soil physical conditions are analogous to "preventative medicine." The medicine (cultivation) does not always taste good but a healthy patient (grass) is worth the effort and inconvenience.

Dr. R. N. Carrow is the Professor of Department of Crop and Soil Science, University of Georgia, Griffin, GA



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Calcium and Sportsturf

Calcium (Ca) is a poor fourth in the list of major elements derived from the soil, yet with its influence on soil and irrigation water, I regard it as the most important essential element in turfgrass management.

Significant experience as a consultant in the sports turf industry has lead me to conclude that for the most part, turfgrass managers do not clearly understand the influence that calcium (Ca) has. I hope this article helps to clear up some of the calcium 'mystique'.

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CALCIUM AND THE PLANT

Following plant uptake, Ca is permanently fixed in the middle lamella of cell walls and is not readily remobilised or translocated downwards. Redistribution from old to young leaves is negligible, thus sufficient levels in 'soil water' must always be available for satisfactory plant growth. Mineralisation in heavier soils usually results in adequate levels but in sand constructions Ca applications are usually necessary.

Aspects of the physiology of calcium use in plants can explain nutritional effects:

1.Plants do not have a highly efficient uptake mechanism for Ca. This can be improved with some chelated products.

2.Ca uptake by roots occurs in the non-lignified zone just behind the root tip and by root hairs. Hence an active fibrous root system is important. **3.**The upward rate of movement of Ca from the roots is controlled by the rate of transpiration.

4. Ca²⁺ ions influence the uptake and absorption of other ions especially potassium (K*) and magnesium (Mg²⁺).

CALCIUM AND THE SOIL

Various terms discussed in this section include pH, Lime Requirement (LR), Cation Exchange Capacity (CEC), Sodicity, Exchangeable Sodium Percentage (ESP), Gypsum Requirement (GR) and Base Saturation.

Calcium is most readily recognised for its use in pH correction and/or amelioration of high sodium soils. The two most common forms are agricultural lime (Calcium Carbonate) and gypsum (Calcium Sulphate Dihydrate).

Soil pH

 At low pH the soil is low in necessary nutrients especially Ca and magnesium (Mg). In this instance, a response can be achieved with direct application of Ca.

 $CaCo_3 + 2H^* \rightarrow Ca^{2+} + H_2O + CO_2$

 At low pH toxic elements such as aluminium (Al) and manganese (Mn) can fall into solution. $\begin{array}{l} \mathsf{MnO}_2 + 4\mathsf{H}^* + 2\mathsf{e} \twoheadrightarrow \mathsf{Mn}^{2*} + 2\mathsf{H}_2\mathsf{O} \\ \mathsf{Al} \ (\mathsf{OH})_1 + 3\mathsf{H}^* \twoheadrightarrow \mathsf{Al}^{3*} + 3\mathsf{H}_2\mathsf{O} \end{array}$

Aluminium can increase from 0.2mg/litre to 15mg/litre with a pH drop from 5.5 to 4.5.

Chemically therefore, lime neutralizes soil pH, lowers the activity of metals that could become toxic and supplies the necessary element calcium.

Lime Requirement (LR)

Considerable argument arises among researchers on the matter of lime requirement (LR). Some say it is sufficient to add lime to increase pH to 6.0 while others argue adequate lime is when toxic ions are precipitated. The amount of lime will vary with soil type, CEC and soil texture. The buffering capacity of a soil can be expressed as the amount of lime required to effect unit pH increase. Sands with a low buffering capacity require less lime than clay and/or organic soils (*Table 1*). If dolomite (Calcium carbonate/Magnesium carbonate) is used, rates need to be decreased by 8% ie. 1000kg/ha of agricultural lime is equivalent to 920kg/ha of dolomite.

Table 2 gives rates typically accepted to correct soil pH in turfgrass and Table 3 is provided as a guide to the strategies needed for the correction of pH and Ca levels in the soil.

BY TREVOR SIVIOUR

Cation Exchange Capacity (CEC)

CEC is a measure of the negative charge on soil and/or organic matter and hence the capacity to hold exchangeable cations such as calcium (Ca²⁺), magnesium (Mg²⁺), sodium (Na⁺), potassium (K⁺) and aluminium (Al³⁺). Typically, sands have low CEC (2-4meq/100g) and clay and/or organic soils have high CEC (20-50meq/100g). Optimum levels of available cations (soluble plus exchangeable) will vary with soil CEC as shown in *Table 4 (refer to page 24*). It is desirable to have Ca as the dominant cation on the exchange complex. However, Al may be dominant in acid soils, Na in sodic soils and Mg in subsoils.

In most soils Ca2+, Mg2+, Na+ and K+ comprise the bulk of cations present in exchangeable form. Historically, the total of these was called total exchangeable bases (TEB), but the more common term now is 'effective' cation exchange capacity (ECEC). When soil pH is low Al is measured and added to the total. The conventional unit of measurement is milliequivalents per 100 grams soil (meq/100g or meq%)*.

*The more recent term is centimoles of positive charge per kilogram of soil (cmol+/kg, cmol(+)/kg or cmol//kg). This unit gives values that are numerically equal to milliequivalents per 100 grams.

TABLE 1

TABLE 2

Approximate amounts of calcium carbonate (kg/100m2) needed to raise the pH of the top 10 cm of soils of different texture (From Pearson, R.W. and Adams, F. 1967)

Soil Texture	pH 4.5 to 5.5	pH 5.5 to 6.5
Sand, Loamy sand	8.5	11
Sandy loam		
Loam	19.5	24
Silty Ioam		32
Clay loam		41
Organic soil		79

The percentage of any cation can be obtained by dividing the value for its concentration by the ECEC. The optimum percentage base saturation for soils of varying CEC is given in *Table 5*.

Gypsum (CaSO_a.2H₂O) is the most commonly used amendment for increasing Ca levels where pH is not a problem. Gypsum requirement can be calculated if exchangeable cations are known and can be defined as the tonnes of gypsum per hectare per depth of plough zone (usually 15cm). Realistically though, the effect of gypsum on the soil will plateau with increasing rates such that the maximum response will occur at a value less than the calculated rate. Because of the very low CEC of sands used in greens, a constant supply of Ca is necessary in the management programme.

Sodicity

Sodicity is sometimes a problem in heavy soils and sodicity and salinity are closely related.

Sodicity in soils is assessed by the value of the exchangeable sodium percentage (ESP) and is the concentration of Na divided by ECEC expressed as a percentage ([Na]/ECEC x 100)where square brackets denote concentration (meq/L). Sodicity of irrigation waters and soil solutions is evaluated by the value of the sodium adsorption ratio (SAR) equals [Na] / [Ca + Mg] meq/L. US workers have nominated an ESP of 15 as the threshold level for sodic soils but in Australia we have favoured a lower value of 6. Ca addition displaces Na from the exchange sites allowing it to be leached.

2NaX + CaSO₄ → CaX₂ + Na₂SO₄

However, the dispersive nature of sodic soils depends on the interaction between soil and

General guidelines for the amount of calcium carbonate (kg/100m2) required to correct varying degrees of acidity (Beard 1973)

Soll nH	Fescues and	bentgrasses	Bluegrasses, bermudagrasses and ryegrasses	
sou pri	Sands and sandy loams	Loams and clays	Sands and sandy loams	Loams and clays
6.3-7.0	0	0	0	0
5.8-6.2	0	0	12	17
5.3-5.7	12	17	24	36
4.8-5.2	24		36	48
4.0-4.7	36	48	48	72

TABLE 3

Strategies to correct pH and calcium levels(Simon Leake. Sydney Environmental and Soil Laboratory)

Ca:Mg	pH			
Ratio	Low	Satisfactory	High	
Very High 10.1	Magnesite (MgCO ₂)	Magnesium sulphate (MgSO_)	MgSO ₄ + Iron sulphate(FeSO ₄)	
High 7.1	Dolomite (CaCO ₃ .MgCO ₃)	Nil	MgSO ₄ + FeSO ₄	
Satisfactory 5.1	Lime:Dolomite mixture	Nil	FeSO ₄	
Low 2.1	Lime (CaCO ₃)	Gypsum (CaSO ₄ -2H ₂ O)	Gypsum + FeSO ₄	



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TABLE 4

Optimum levels of available cations and phosphate (mg/kg) with varying soil cation exchange capacity (CEC)

Element		(CEC (meq/100g)	
	5	10	15	20	25
Phosphorous (P) Potassium (K) Magnesium (Mg) Calcium (Ca)	30-50 90-120 60-120 600-1200	30-50 120-160 120-240 1200-2400	30-50 150-200 180-360 1800-3600	30-50 180-240 240-480 2400-4800	30-50 210-280 300-600 3000-6000

TABLE 5

Optimum percentage base saturation (%) for varying soil CEC

Cation		(CEC (meq/100g)	
	3-7	8-15	16-25	25-35	35+
Potassium (K)	3-8	1.5-4.3	1.0-2.2	0.7-1.3	0.5-1.3
Hydrogen (H)	0-30			0-30	
Magnesium (Mg)				11-20	11-20
Calcium (Ca)	50-75		50-75	50-75	
Sodium (Na)				0-5	0-5

aqueous solution, hence the characteristics of both solid and solution phases. In particular, the concentration of salts in solution dictates whether a soil may express sodic behaviour.

Both gypsum and calcium chloride will increase soil electrolyte levels as well as replacing sodium on the exchange sites. High soil electrolyte levels suppress dispersion and swelling by compressing the ionic double layer on soil clays. The effect of calcium chloride on electrolyte levels is short term as it is very quickly leached.

In summary;

	ESP	ECe (ds/m)
Saline/Sodic soils	>6	>4
Sodic soils	>6	<4

Note: ECe is the electrical conductivity of the 'soil extract' measured in decisiemens per metre. A soil is saline if the ECe of its aqueous phase obtained by extraction from a saturated paste has a value greater than 4.0ds/m. Laboratories commonly measure EC of the 1:5 soil/water suspension (EC1:5) and is not easily related to plant performance. Reasonable estimates of ECe can be made using a multiplier factor applicable to soils of different texture.

The factors are:	
Soil Texture	Multiplier Factor (EC1:5→ECe)
Heavy Clay	6
Light Clay, Clay loam	10
Loam, Silt Loam	15
Sandy Loam	20
Loamy Sand Sand	25

In summary, soils most likely to show economical response to gypsum applications have the following features in topsoil and/or subsoil.

•High clay content - greater than 30%

•ESP greater than 5

•Salinity (EC1:5) less than 0.4ds/m

CALCIUM AND IRRIGATION WATER

The terms discussed in this section include sodium adsorption ratio (SAR), adjusted SAR, alkalinity and hardness.

SAR and salinity will have potential influence on soil permeability and plant growth (Table 6).

It is a balancing act to achieve the best for both

plant and soil. Most researchers agree that the problems of soil permeability increase as SAR approaches 10 but the effects of a high SAR may be mediated by high salt concentrations. Hence irrigation water high in Na (high SAR) and low in total salt may result in poor soil physical condition but the same water with high salt content can provide stable conditions. This is the principle behind the addition of Ca to irrigation water. Note that 106kg of 100% gypsum in 1000 litres of water will raise the Ca concentration by 1.2meq/litre and the EC by 0.12ds/m.

Of course if a crop exists, then the level of salinity becomes important as indicated above.

The presence of carbonates (CO_3°) and bicarbonates (HCO_3°) in the water supply can complicate matters by combining with Ca and Mg to form carbonate precipitates. This leads to a relative increase in Na that can cause sodicity. Such precipitates can cause scaling of pumps and irrigation lines.

When concentrations of these are taken into account a new value referred to as adjusted SAR is calculated.

Figure 1.



ABOVE: Figure shows concentration of calcium as a function of concentration of sodium used to determine the gypsum requirement of sodium waters.



TABLE 6

Generalised irrigation water quality guidelines (University of California, 1979)

Measurement	No problem	Increasing problems	Unsuitable
Effect on plant growth EC (ds/m) Sodium (evaluated by SAR) Chloride (ppm) Boron (ppm)	< 0.75 < 3 < 140 < 0.5	0.75-3.00 3-9 140-350 0.5-2.0	> 3.00 > 9 > 350 > 2.0
For overhead sprinklers Sodium (ppm) Chloride (ppm) Bicarbonate (ppm)	< 70 < 100 < 90	> 70 > 100 90-250	> 520
Effect on soil permeability. EC (ds/m) SAR	> 0.5 < 6	< 0.5 6-9	

The gypsum requirement of sodic water can be calculated as follows (all units in meq/L):

1. Obtain laboratory test values for the concentrations of Na⁺, Ca²⁺, Mg²⁺, Co₃²⁺ and HCO₃⁺.

2.From the graph (Figure 1) and using the value of Na read off the desired value of Ca.

3.Add to this the laboratory values of carbonates and bicarbonates.

4.Subtract from 3 the sum of Ca^{2*} and Mg^{2*} already in the water – this gives the Ca^{2*} shortfall.

5.Calculate the amount of gypsum needed per megalitre of water to supply the shortfall of Ca. The percentage of Ca in the gypsum source will need to be known.

Note: A megalitre is 1,000,000 litres. If you use pure gypsum (23% Ca), the quantity of gypsum will be;

Ca shortfall (meq/L) x 86 kg of gypsum per megalitre.

Total alkalinity ascribes the entire alkalinity of water to the sum of concentrations for bicarbonate (HCO₃²), carbonate (CO₃²⁻) and hydroxide (OH²). It is expressed as the equivalent value of calcium carbonate. A water's bicarbonate hazard can also be evaluated in terms of residual sodium carbonate (RSC) where

 $RSC = [HCO_3^2 + CO_3^2] - [Ca^{2*} + Mg^{2*}] meq/L.$

Generally, water with an RSC value of 1.25meq/L is safe for irrigation: those with

Injection systems are an effective way to apply large quantities of calcium

RSC values of 1.25 to 2.5 are marginal and those with RSC values of 2.5 are probably not suitable for irrigation.

High levels of bicarbonate in the water supply may require more drastic measures such as acidification of the supply with sulphuric or phosphoric acids. Suitable injection systems have been developed for this purpose.

Hardness of water is a measure of the concentration of Ca²⁺ and Mg²⁺ expressed as calcium carbonate. This is easy because the molecular weight of calcium carbonate is 100. Hence if laboratory testing gives [Ca²⁺] as 0.8meq/L and [Mg²⁺] as 0.6meq/L, the hardness is equivalent to 70mg lime/litre water. Hardness is more relevant to the use of water for domestic and stock and becomes a problem in the range 150-250mg/L.

In summary, the chemical properties of irrigation water that must be identified and controlled in order to maintain its use in agriculture are salinity hazard, sodicity hazard and toxicity hazard. Toxicity, which is not discussed in this article, relates to levels of boron and chlorine.

SOURCES OF CALCIUM

These include gypsum (CaSO₄.2H₂O), dolomitic lime (CaCO₃.MgCO₃), agricultural lime (CaCO₃), calcium chloride (CaCl₂.6H₂O), phosphatic fertilisers, by products of superphosphate production such as phosphogypsum and some fertilisers.

The typical Ca percentages in gypsum and agricultural lime are 17-22% and 40% respectively. However, there are a wide range of products available for turf use with varying Ca/Mg content and solubility. These are summarised in Table 7. The obvious restriction on the use of fertiliser sources to supply Ca is that they cannot be used at rates as high as gypsum, but they certainly serve as a useful part of a Ca programme.

It is important to realise that Ca has virtually no 'soil' effect on sands and loamy sands other than as a source of Ca for plant growth. So



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TABLE 7

Sources of calcium

Source	Trade names	Ca%	Mg%	Solubility (g/l) in coldwater at 15°c
Gypsum	Aqua Cal	22.1	100	2.41
	Lesco prilled gypsum	17.0	161	
	Turf Gyp, Micro Gyp	20-22	145	
	Ferta Gyp, Turf Gyp Greens	20-22		
By products of superphosphate production	Phosphogypsum	18.5		2.41
Calcium Chloride	Sodex, Patons Liquid Ca	12-16		
Agricultural lime	Pure	40	100	
	Kelly's high Ca Lime	30	1	
	Lesco dolomitic lime	20	12	
Fertilisers	Calcium nitrate (Ca(NO ₃)2.4H ₂ O)	17	-	
	Triple super	23.6	1.00	
	Single Super	21	180	
Robert Barry	Patons Liquid Calbor (3%8) Patons Caltrom	15 8	18	

much attention is focused on high analysis and slow release fertilisers that the importance of Ca is overlooked. Small amounts of gypsum, superphosphate and Ca containing fertilisers are essential in fertiliser programs for sand profiles. The use of lime or dolomite coated ammonium nitrate as part of the nitrogen component of some fertilisers not only provides Ca but also reduces the salt index.

In our industry some of the gypsum products are misrepresented as soluble!

In fact, the maximum water solubility of gypsum is 2.41g/L and this actually decreases in hot water. Agricultural lime and dolomite are less soluble (see Table 7).

Calcium chloride can be an extremely useful source of Ca. However, one of my concerns is that rates are given without reference to soil conditions. Furthermore, because chloride can significantly increase EC and has the potential to be toxic to plants, changes in soil condition need to be carefully monitored and leaching irrigation programs may be required.

Phosphogypsum is a gypsum byproduct of superphosphate production. It does not contain phosphate as the name suggests but such products often have heavy metal contaminants such as cadmium, lead and mercury. Because of this, approval for their use varies from state to state. It is important that turf managers check this before use.

Perhaps the most important feature of any gypsum product is fineness. The finer the product the faster it will solvate with added water. A number of such products can be injected into the water supply using a pre made slurry or suspension but the maximum solubility is still 2.41 grams per litre of water. The principle of injection is that large amounts of Ca can be dissolved because of the large quantities of water. On the other hand, if gypsum is broadcast on the surface, small amounts of Ca are released with each irrigation or rainfall event. One deficiency of injection systems is that they rely on the efficiency of the irrigation system.

A list of suggested further reading can be obtained by contacting the AGCSA.

Trevor Siviour is the Principal Consultant with Turspec Pty Ltd # Photo supplied by Green Horticultural Group



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AGCSATech : Update

LEAF TISSUE ANALYSIS



Plant tissue analysis is the most accurate way to determine the level of nutrients

utilised by the turf and whether deficiency, toxicity problems or nutrient imbalances exist. Plant tissue analysis is extremely useful where controlled release fertiliser programs are used or foliar feeding is the main method of fertilising, as soil tests do not always accurately reflect the nutritional status.

Controlled release fertilisers release nutrients at about the rate at which they are taken up by the plant, so often very little is adsorbed onto the soil exchange sites. In this situation plant tissue analysis is the only means of determining whether or not the controlled release fertilisers are supplying adequate amounts of nutrients.

Sand profiles that typically have a very low cation exchange capacity (CEC), and a low buffering capacity can quickly become nutrient deficient. Therefore, controlled release fertilisers and foliar feeding is more common and plant tissue analysis is becoming a more useful nutrient monitoring tool.

When used in combination with soil nutrient analysis, plant tissue analysis provides a beneficial guide in developing fertiliser programs for specific turf situations. It is also the most accurate method of monitoring the level of trace elements such as manganese, zinc, copper and iron as well as available nitrogen. Soil analysis for the minor elements is very difficult to interpret accurately because the extraction techniques used, do not always reflect the availability of these elements and tend to overestimate the concentration available to the plant. However, with plant tissue analysis an accurate determination can be made as to the trace element status of the plant. A standard plant tissue analysis package is available which includes both major and trace elements.

The plant tissue analysis package includes,

N, P, K, S, Ca, Mg, Na, Mn, Fe, Cu and Zn.

When sampling plant tissue, it is possible to take clippings from the mower catcher providing that the sample is not contaminated with soil or other contaminants.

Plant tissue samples can also be taken by using scissors to remove the top 1/3 of the leaf. Using this method, sub-samples must be taken from at least 20 locations over the area and bulked together for analysis. A minimum of 200 grams wet weight of plant material is required.

It is important to take a representative sample and therefore any locations that are distinctly different (e.g. grass type, disease, mechanical damage, colour, density, moisture etc.) should be avoided or sampled separately unless samples are being taken to assist the diagnosis of a problem. Avoid sampling within 4 weeks of fertilising or chemical spraying or at least delay sampling until the end of the fertiliser cycle.

Place the samples in labeled plastic bags and send them to the laboratory that day by courier or overnight post pack. If the samples have to be stored keep them refrigerated but do not freeze.

COUCHGRASS AND BENTGRASS COLLECTIONS



The collection of couchgrass off-types from Queensland golf greens is well underway, thanks to the assistance of the GCSAQ. The collection will be ongoing and will eventually be planted at the Lakelands Golf Club trial site for evaluation.

The bentgrass collection continues to build with plants collected from Vic, SA, WA and NSW. These will be planted into the trial site at Kingston Heath Golf Club for further evaluation.

In a recent turf publication an anonymous author made comment regarding the couchgrass and bentgrass program. The general theme of the anonymous (and ignorant) commentary was that "it has all been done before". Firstly, the couchgrass project relates to collecting from golf greens rather than from golf course fairways. While there have been some localized collections, there has not been a state-wide (nation-wide) collection.

Secondly, there was a bentgrass collection in Victoria and for various reasons the project was never taken to a conclusion. The project has not been reported in the literature and the final selections were never extensively evaluated.

Finally, Australia has some of the best (if not the best) couchgrass varieties in the world. Wintergreen, Greenlees Park, Legend, Plateau, Conquest and Supersport are all examples of where selecting from common couchgrass types with special characteristics has resulted in success. Because it has been done once, does not mean that it cannot continue to be done. The anonymous commentator is belittling the efforts of people such as Peter McMaugh and Rod Riley, whose "nose to the turf" attitude has lead to the development of many of these superior couchgrass types.

The couchgrass and bentgrass projects will succeed with a positive attitude, an inquiring mind and the continued support of the Golf Course Superintendents.



DISEASE OF THE MONTH



The summer weather conditions have been extreme over many parts of Australia with very hot and dry conditions in the south and hot, wet and humid in the north. Adelaide has broken records for the number of consecutive days over 30 degrees Celsius, Melbourne has had the lowest rainfall on record (and high temperatures), Western Australia has been through the driest period for some 120 years and Sydney has had high temperatures, rainfall and humidity.

The weather conditions have taken its toll on bentgrass and Poa annua greens, with grass loss due to disease, dry patch and nematodes. The most noticeable effect has been on the root system where the roots are shortened, brown and under the microscope there is substantial sloughing of root tissue.

The damage to the turf is typical of what is now described as "summer decline". The disease organisms associated with this condition include Pythium spp., Rhizoctonia spp., Drechslera spp., Curvularia spp. and summer Fusarium. It is interesting to reflect back on when I started in turf some 18 years ago and bentgrass suffered from "summer brown patch". As with "summer decline" it also included a combination of these organisms. When "brown patch" became the common term for Rhizoctonia diseases the "disease" was lost, only to be reborn as "summer decline". As with fashions, nothing really changes.

Research into the impact of "summer decline" has shown that direct temperature

injury, humidity, high soil moisture and low soil oxygen combine to stop root growth. The weakened plant is then more susceptible to disease organisms and less able to recover from the infection and resultant tissue damage.

During periods of high temperatures and humidity, preventative fungicide applications have proven to be effective. Combinations of fosetyl-al plus mancozeb, iprodione plus fosetyl-al and chlorothalonil plus carbendazim have all been used with success.

Recent experience has shown that poorly drained greens that retain moisture can be severely affected due to both disease, heat scald and black layer. There is no doubt that well constructed greens with good drainage and aeration are far less likely to be affected by "summer decline".

QUEENSLAND TRIAL SITE



Despite persistent wet weather and 350mm of rainfall just prior to planting, the AGCSA's trial site has been established at the Lakelands Golf Club. The trial site has plots of various couchgrass varieties including Tifdwarf, Tifton 328, Legend, Wintergreen, Plateau, Greenlees Park, Supersport, Conquest, Santa Ana, CT2 and the seeded varieties Princess, Sydney and Mohawk. There is also an area for planting out the couchgrass collection and any other new types that may come along.

A special thanks to Steve Marsden (Course Superintendent), Dean Scullion (Assistant Superintendent) and the Lakelands staff for their efforts. #

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Silt and clay in sand can block greens' drainage



The Australian Golf Club

The construction of a golf course putting green can be very expensive. Through many years of research and experience, some very specific criteria have been developed for the materials that go into the green and the way these materials come together to produce the green.

All this trouble and expense is related mainly to water drainage, especially vertical or internal drainage. Poor drainage has always been the No. 1 enemy of the golf course putting green. The quality of the putting surface can be so easily affected by the results of poor drainage.

Sand has become the key ingredient in green construction. In past years, it was very common for a golf course to be built with push-up greens - mounded native soil. Most native soils have significant clay content. Clay tends to hold water and reduce drainage. These greens relied mostly on surface drainage, and a turtle-back design was

not uncommon. They had very little internal drainage.

As golf became more popular and the number of rounds increased, native soil greens began to

Many options allow

superintendents to

protect the quality

of the sand in their

greens' root zones.

lose putting quality. Turf thinned and lost density. The problem was soil compaction. It became apparent that there was an inverse relationship between the clay content of the green and the number of rounds the green could support without

declines in turf quality. As the percentage of clay in the green was reduced, more rounds could be played without damaging the green.

Ultimately, it became evident that even a small percentage of clay in a green's root zone could

have a negative effect on internal water drainage. Greens then became nearly 100 percent sand. Because, by definition, the term "sand" refers to soil particles ranging

> in size from 0.5 to 0.25 millimetres, it was determined that particles smaller than 0.25 millimetres and larger than 0.5 millimetres were not desirable. Greens constructed by using sand in this "ideal" particle-size range

have proved to have excellent drainage. Why then, do some new greens built from the best materials, using current construction standards, fail before one season of play has passed?

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WASHED SAND IS BEST FOR NEW CONSTRUCTION.

DIRTY SAND

These failures are caused by very fine soil particles finding their way into the green and plugging up internal drainage pathways. How can this happen when so much care is given to construction? It is possible, and maybe not too uncommon, that the sand that has passed the sieve test and is the correct particle size is "dirty." It may be coated with very fine clay particles. After the green is constructed using dirty sand, the clay particles will wash off the sand and accumulate in the soil profile. Now the green is in trouble. Drainage is reduced. The turf may begin to thin, and the green may be susceptible to disease attack.

It's easy to check sand as it is being delivered to make sure it meets particle-size criteria, using a set of commercially available sieves. It's also easy to check the sand for "dirt." Put a sample of the sand in a clear container, shake it up and see just how dirty the water becomes. Let it sit for a few hours and find out just how much very fine, undesirable material that sand would add to the green. Washed sand should always be specified for the construction of greens and for

topdressing, but it doesn't hurt to grab a sample or two just to make sure. Once the "dirt" gets into the green, it cannot be easily removed.



When placed in water, an unwashed sand releases a cloud of smaller particles that are not wanted in a putting green root zone.



After settling in water, a layer of silt and clay particles from a sand sample rests on the top of the sample.

BY WILLIAM KNOOP, PH.D.

DIRTY WATER

Dirty sand is one possible source of contamination, but there are others. Dirty irrigation water can be a significant source of clay particles. Many courses use lakes or ponds to capture and hold runoff water for irrigation. Because water is expensive and somewhat limited in some parts of the country, it makes good sense to capture and hold as much water as possible. The problem begins if soil is allowed to erode into these future lakes and ponds during course construction. Erosion can be so severe that a high percentage of the lakes' capacity can be lost before they're filled.

If the irrigation system's intake is at the bottom of the lake or pond, or pointed toward the bottom of the pond, loose material may be sucked into the system. The intake must be located so it does not pull water from the bottom of the lake or pond.

If possible, the mud should be filtered from the water, especially if the water is intended for irrigating greens. The source of irrigation water may be directly from an already muddy pond or river; there may be no holding pond at all. Set out a few clear glass containers to catch water



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samples the next time the irrigation system runs. Let the water settle for a few hours and find out just what, if any, material is being deposited on the greens via the irrigation system. As much as greens are irrigated, it doesn't take a lot of muddy water to plug up the system.

TOPDRESSING

One further source of "dirt" may be associated with any organic material that was used in the original green mix or is being used as part of the topdressing. Ideally, organic matter should decompose completely and leave nothing behind. Any residue left behind after organic matter decomposition may also reduce drainage. There is a lab test that reduces organic matter to ash. The amount of ash in relationship to the original weight of the sample determines the percent of non-decomposable material in the organic sample. The cleaner the sample, the lower the percentage and the lower the chance of reducing drainage.

FALLOUT

Clean sand, clean water and clean organic matter are all more or less controllable, but one source of very fine particulate material being deposited on greens is not controllable atmospheric fallout. The potential for fallout varies across the country. It can be fairly significant.

The golf course putting green must be protected from every possible source of contamination. Part of the defence against this kind of contamination must be the use of the core aerifier, assuming that clean topdressing is used to fill the aerifier holes. The ideal is to replace any dirty sand with clean sand.

In a way, the life or death of a putting green depends on its vertical drainage. As vertical drainage becomes inhibited, the life of the green is shortened. Some golf courses rebuild their greens to modernize the design, but many others are forced to rebuild because of poor drainage. Clean sand, clean water and clean organic matter must be considered in the overall green construction and management program. There is no question that if they had been, more than one course might not have had to spend hundreds of thousands of dollars to rebuild greens.

William E. Knoop, Ph.D., is a turfgrass consultant based in Mount Vernon, Texas.



Washed sand may not readily reveal contamination from silt and clay particles.

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"This article was originally in the February 2001 issue of Golf Course Management the monthly magazine of the Golf Course Superintendents Association of America"

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ustralia's leading rural spraying Using a dry-break chemical transfer Michael Frost, Silvan Spraying system, liquid is pumped from drums Equipment National Sales Manager said developed ChemDuctor - a new into Silvan's onboard ChemDuctor the ChemDuctor system saves a lot of chemical handling method as an option calibrated polytank located remotely or time in chemical handling and was a

operators to transfer bulk volumes of chemical rates is as simple as flipping environmentally friendly," he said. chemicals accurately from large levers to activate the suction system. "It also complies with many OH&S safe

to the spraying regime required.

more accurate system.

From the on-board ChemDuctor tank, "As the system is based on bulk filling calculating and mixing the correct from recyclable drums it's also more

capacity drums or envirodrums into the Chemical is transferred to the main spray work practices and eliminates the risk main spray tank without the risk of tank and mixed automatically according of the operator coming in direct contact with chemical."

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Monday	Monday June 18th		Every Dron Counts			
Morning	AGCSA Golf Championships: The Lakes Golf Club.	Every brop counts				
1	Presented in partnership with the Toro Company					
Evening	5.00pm Opening Session and AGCSA Awards					
	Presentation Ceremony followed by					
	Welcoming Cocktail Reception	17th Alt				
	Surface Convention Contro Pallroom	-	2981nTr			
	Sydney Convention Centre Balloom		III YI UJJ conference			
Tuesday	June 19th					
9.00am	Welcome and Keynote Address	3.30pm Architects as Part of a Team				
	A National Approach to Water System		Presentation from the Society of Australian Golf Course			
	Efficiency and Sustainability		Architects			
	Duncan Malcolm, National Chairman, IAA	5.30pm	AGCSA Annual General Meeting			
10.15am	Morning Tea					
10.45am	Every Drop Counts - Open Forum	ry Drop Counts - Open Forum Thursday June 21st				
	Panel made up of Golf Course Superintendents,	8.00am	Workshop 1A	Workshop 1B		
	Water Industry bodies, Catchment		Development /	Flora and Fauna		
	Management Groups, EPA NSW		Redevelopment Applications	Surveys		
12.15pm	Lunch		- Planning and Management	Greening Australia, Birds Aust		
1.00pm	Presentations from AGCSA Award Winners		Greg Britton, Patterson Britton & Partners			
3.30pm	Afternoon Tea	10.00am	Trade Exhibition, Morning Tea and Lunch			
4.00pm	SportsTurf as Part of a Water Catchment	12.30pm	Workshop 2A	Workshop 2B		
	Frouke de Reuver, NSW Environment Protection Agency		Total Assett Management	Water Quality		
4.45pm	Close		Using CAD and GPS	Management		
		2 20.00	Paul Jones and Associates	John Neylan, AGCSATech		
Wednesday June 20th		2.30pm	Trade Show Close			
8.30am	The Superintendent and Committees - Open Forum	3.30pm	Workshap 2 A	Westerland O.D.		
	Chairman: Martyn Black, GCS Castle Hill Country Club	3.30pm	Salary Dookaging	Workshop 3 B		
	Peter Smith, Craig Easton, Roderick Hetherington;		Power Planning	Profile of a Golf Course		
10.00-	Carnarvon Golf Club		Gerry Power	Allan Maw, Greenmaw		
10.30am	Morning Tea, Trade Show, Lunch	6 30nm	Conference Dinner	Alian maw, Greenniaw		
12.30pm	Biological Products Research Update	0.00pm	Sydney Convention Centre Ballroom			
	Manual for Oursenaland Calf Courses lake Made		Sydney convention centre balloom			
	Mactare Degree Pacareth Paparet	Friday June 22nd Turfgrass Tour: Visiting Concord Golf Club, Ryde Parramatta Golf Club and Olympic				
	Mark Couchman: Efficiency of Nutrient Strinning Ponds					
	Peter Speight: Bridging Factors					
	Daryl Sellar: A study of the dominant bent	Tous includ	Siles Tour includes Lunchoon and Knungte Descentation by Calif Course Architect Pace			
	(Agrostis spp.) cultivars of selected greens	Watson at Ryde Parramatta Golf Club				
	of the Royal Adelaide Golf Club	watson at	nyue ranamatta Gun Club			
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Championship Golf Course!

Championship Golf?

With the Australian Turfgrass Conference moving to Sydney this year the AGCSA Championships are scheduled to be played at The Lakes Golf Club. In recent years The Lakes Golf Club have hosted many major professional events including the Australian Open and the Greg Norman Holden Classic. All of these professional events have produced tremendous appeal for the golfing public and produced extremely worthy champions. No doubt the AGCSA Championship will do the same.

The key to a successful outcome at the Lakes for the eventual champion could well be his strategy for play on the back nine. For what its worth, here is my advise on how to successfully navigate your way around the back nine, thus giving you every chance of holding aloft the champions trophy.

NUMBER 10 - Arguably the most difficult hole on the golf course with a lateral hazard that runs the entire length of the hole on the right hand side.

A perfectly struck long iron is required from the tee, make sure you miss the deep fairway bunkers and you finish in the middle or right middle of the fairway. Any shot hooked from the tee will end up in the cabbage high on the sand dune or at best you'll have an obstructed approach shot with long rough, bunkers and trees blocking your passage to the green. Careful club selection is required for the second shot as there is a lot of dead ground not seen from your position in the fairway. Once at the green, conditions are alittle more sympathetic with a mostly flat green that should relent and give up two putts fairly easily. NUMBER 11 - A reachable par 5 that requires a long tee shot down the right hand side of the fairway that will shorten the second shot over the lake to the green.

Beware, anything but an extremely well hit 3 metal or long iron will surely end up in the lake (Sydney's first water supply). Of course if your tee shot is not in a position to attack the green you can always lay up with a mid iron, carefully avoiding the fairway bunkers, and pitch to the green with a short iron, thus making your birdie in the traditional way.

NUMBER 12 - Possibly the least intimidating of all the tee shots on the back nine.

However, a wild shot to the right will end up in the cabbage and make 4 unobtainable, 5 remarkable, 6 more than likely and 7 a distinct possibility. After your successful tee shot you must wary of the deceptive length of the approach shot. The second shot is up the hill to an elevated green thus making the shot further than you think. The green has considerable slope from back to front making a two putt something you might see on the threatened species list.

NUMBER 13 - A downhill par 4 that doglegs severely right at about the 180m mark.

From the moment you step on the tee you are faced with one of two options. Athough not recommend unless you are 21 years old and living in Spain, you could pull the driver out and attempt to shorten the hole by slicing a large section off the dogleg. Failure, (most cases) would see your ball in the trees or even lost, as you can't see your ball land. A good tee shot for those of us who do not live in Spain and our hearts beat considerably faster, is to take a long iron, say a 3 or 4 and strike it right to the end of the dogleg. From there you will only have left a short iron to a green with more pimples than you'll find at Sydney Grammar School. Beware the 3-putt bogey.

NUMBER 14 - What a par 5!

Who could forget the day that Greg Norman stood in the middle of the fairway and hit shot after shot into the water as he attempted a water based attack on the Australian Open. Needless to say that the resulting 9 put paid to his attack. To reach the green in two shots the best line off the tee is a drive down the left side of the fairway, being careful not to finish in the fairway pots. From there you have a mid to long iron all the way over the water to a green that slopes from back to front. When standing in the fairway be careful of wind as a good shot that is sweetly hit could easily balloon up and finish right next to Mr Norman's four. For the pea hearted players (like me) out there you could hit driver, a mid iron straight up the fairway towards the ladies green (tells you something doesn't it) and then a short iron across the water to the green.

NUMBER 15 - A good par 3 that only requires one thing, a straight tee shot!

Any ball that finishes to the left, right or over the green is highly unlikely to bring a par. It would be far better to finish short of the green and play a pitch and run shot up to the flag and tap in for 3 rather than floundering away in the tight little spots that surrounds the green.
BY PETER R. SCHUMACHER

NUMBER 16 - Quite possibly the strongest par 4 you will ever play.

A double water carry that requires strength, agility, finesse and faith. To start with you could do worse than a long bomb down the right middle and up onto the flat part of the fairway as close as possible to the water. This then leaves a shorter second shot (probably a 2 iron) over the water to a large gently sloping green. For those of you with a faint heart, too bad! The designer has left an impossibly thin strip of land that runs parallel to your second shot that is harder to hit than the green itself. If you want 4, just hit 2 perfect shots!

NUMBER 17 - One of the great par 5's with the longer hitters attempting to reach the green in two.

However, there is danger from the very first shot with an incorrect club selection bringing the water into play. For safety a long iron that travels about 190 to 195m from the tee should put you in the perfect position, ready to attack the green for your second shot. However, beware the watery grave on the left and the cabbage on the right, as a possible birdie after your first shot could quickly turn into a 7 after your second. Sleeping giants under the putting green make the positioning of you approach shot extremely important so as to avoid a dreaded three jiggle.

NUMBER 18 - The strangest thing about this hole is that it is a par 3.

Not often does a championship golf course finish with a par 3 but this hole is both suitable and appropriate. Standing on the tee with the prevailing south, south-easterly blowing straight into your face you could be excused for thinking that you won't get there with 2 shots. What's require is a long iron say 2, 3 or 4, depending on your length, that is struck so purely that it leaves the club face on an extremely flat trajectory and turns over ever so slightly from right to left. As your ball continues to climb past the 150m mark you should be seeing it straighten up and hone in on the center of the green. Players attempting to target anything except the middle of the green are risking certain 4 and quite possibly 5.

So there you have it a road map to the back nine at The Lakes Golf Club, drive on, if you dare!





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Color Atlas of Turfgrass Diseases

By Toshkazu Tani

Yet another book on disease identification and control methods written for the Asian or American market.

This book is broken into five major topics;

- 1. Turf grass disease overview
- 2. Warm season turfgrass diseases
- 3. Cool season turf grass diseases
- 4. Diseases common to both warm and cool turf grasses, and
- 5. Simple methods for disease diagnosis.

It is written by Toshkazu Tani and as the name would suggest, one of the main turfgrasses covered is zoysia sp. However, there are a large number of photographs of other cool and warm season effected turfgrasses that would be of some use.

The book contain great photographs and good descriptions of diseases and both



cultural and chemical control methods are recommended .

This book is well compiled and would be worth flicking through at the bookstore but as with most information provided from other countries ,I find that the chemicals mention for use are either not available or have been taken off the market in Australia. If I need a disease positively identified I send a sample to AGCSATech and if I need information on disease control I still use Michael Robinsons' book, "A Manual Of Australian Turf Pesticides"

By David Warwick, Golf Course Superintendent, Avondale Golf Club

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Criteria for sportsturf drainage aggregates

WER STOWER



(art

The sportsturf literature abounds with research and criteria about rootzone specifications. Materials such as crushed aggregates commonly used for engineering purposes have been adopted in sportsturf drainage. But what research has actually been conducted to substantiate the currently accepted drainage construction practices?

Aggregate and gravel are commonly interchangeable in a drainage sense and the inclusion of underlying drainage layers within sportsturf profiles is taken for granted. It is generally accepted that drainage materials have a dual function. These two functions being to facilitate the lateral movement of gravitational water to drainage pipes and, to form a perched water table at the interface with the rootzone layer. Lets consider the material composition, particle grading and shape and the depth of the drainage layer.

MATERIAL COMPOSITION

Materials used for sportsturf drainage in Australia are rock products which are processed from numerous quarries. The material composition of any quarried product is ultimately governed by the geological origin of the parent rock from which the aggregate is derived. Rocks are formed from the process of sediment deposition (sedimentary rocks) or from volcanic activity (igneous and metamorphic rocks). One prerequisite for the long term drainage efficiency of any drainage material is structural stability and the resistance against chemical and physical deformation. Civil engineers adopt parameters like particle density and water absorption to define the durability and degradation of rock aggregates. This is obvious today but regrettably, ash being an unstable by-product of electricity generation was used under many old bowling greens with disastrous results.

TOWER OTO

Aggregates used for concrete manufacture must conform to an Australian standard for weathering stability which is determined by two critical values, Sulphate Soundness Test (AS 1142.24) and the Los Angeles Abrasion Test (AS 1141.23). These two characteristics are an indication of the resistance against physical deformation of the aggregate. The reasoning for the inclusion of maximum permissible values of Sodium Sulphate Soundness and the Los Angeles Value in the current USGA specifications is to determine the particle stability of any questionable drainage material. For example, soft limestone and shale are not accepted as drainage aggregates by the USGA because of their inferior stability. The maximum permissible values allowed within the USGA specifications for Sodium Sulphate Soundness and the Los Angeles Value being 12% and 40% respectively.

nstruction of the wicket table at the Sydney Cricket Ground

"Blue Metal" is a commonly used term associated with drainage materials in Australia but what does it mean? Blue metal is a generic term generally used to describe two common rocks, basalt and picrite. Basalt is a fine-grained, igneous rock usually greenish-black in colour. Basalt is common throughout Australia and the world and the Hawaiian Islands for example are largely composed of basalt. Basaltic rocks are composed of various minerals including labradorite, augite, olivine and magnetite. Magnetite is the mineral which gives basalt its paramagnetic property. Basalt is initially crushed and subsequently screened to various particle gradings ranging from 5-24mm diameter. The resultant particle shape of basalt being angular. Picrite is also quarried from numerous locations and is a coarse-grained, igneous rock. Picrite is composed of chrysolite, hornblende, pyroxene

and biotite. Picrite being subject to physical deterioration over time nor being free from fine particles as does basalt should not be used for sportsturf drainage purposes.

Crushed river gravel or CRG is another quarried rock used for drainage purposes. CRG is produced by crushing and then screened to size, large water-worn pebbles. The resultant shape of CRG is also angular. CRG primarily comprises of quartz latite porphory and meta-sandstone. Rounded river pebble has also been adopted for drainage purposes. Table One compares the basic differences between the lower quality picrite with basalt and crushed river gravel.

As can be seen from the aforementioned table all rock derivatives absorb moisture. In Australia we think of drainage aggregates as being a solid material. In Europe pumice is used as a drainage aggregate. Pumice is a light, volcanic rock and being porous has a high capacity to store water. The German Din Standard now allows for a drainage layer with a high water holding capacity.

PARTICLE GRADING

Commonsense suggests that the ability of the rootzone to transmit gravitational water must not be compromised by the underlying drainage layer. To maintain acceptable permeability whilst avoiding particle interpacking in a layered profile there must be a grading differential between the underlying drainage layer and rootzone. In addition, to avoid constant saturation of the pore space the depth of the

Table 1: Properties of common drainage aggregates

Drainage Aggregate	Particle Density (t/m³)	Water Absorption (%)	Sodium Sulphate Soundness (%)	Los Angeles Value
Basalt	2.67	<2.0	<1.0	14
Picrite	2.12	>2.0	>7.0	19-28
CRG	2.61	<2.0	<3.5	16-24

growing media requires consideration. As far back as 1917 it was recognized that the amount of available water and "water perching" above an interface increases as the pore space differential between adjacent materials increases. Undoubtedly, the particle grading for drainage aggregates as specified by the USGA are the most widely known within Australia. The current USGA specification allows for the gravel in the drainage trenches to be between 6-25 mm in diameter. The drainage layer of the USGA specifications has been revised more than once because of questions from the sportsturf industry over the necessity for the inclusion of the intermediate sand layer. Why do some greens function successfully without the coarse sand layer? What about the scenario such as is commonplace around coastal Australia when the site consists of deep, natural sand?

The option to delete the coarse sand layer within the current USGA specification comes with a stringent definition for the gravel. When the sand layer is included at least 65% of the drainage gravel must have a particle diameter between 6 and 9 mm. Without the sand layer the sizing of the underlying gravel is governed by the particle grading of the above growing media. By comparison, the lesser known sand specification of the University of California simply states that the pea gravel must be 6mm in diameter.

PARTICLE MIGRATION

A discussion about sportsturf drainage would be incomplete without reference to particle migration. The conflicting requirements of drainage aggregates to prevent the vertical migration of particulate matter (filter) and to maintain constant permeability (drain) are well known engineering principles. Engineers determine the probability of particle migration or 'piping' by calculating the Bridging factor. This calculation is based on the fact that the



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coarser 15% of soil particles will 'bridge' over the finer 15% of aggregate particles.

The mandatory inclusion of the coarse sand layer within the USGA specifications prior to 1993 has been the subject of much debate. The 1991 review of the USGA specifications by Hummel revealed that the inclusion of coarse sand was only a precautionary measure to prevent the particle migration into underlying gravel in an early laboratory experiment. Silt and clay sized particles are now known to migrate through sand columns. One early but important study conducted in Texas over eight years concluded that there was no evidence of excessive particle migration without a layer of sand. Various workers in the United States have studied the effects of particle migration and water retention in soil profiles under coarse sand and gravel layers. In Britain, the Sports Turf Research Institute (STRI) have been recently commissioned by the USGA to conduct further research to independently review the particle size criteria of drainage materials. Initial results suggest that the criteria for bridging factors may be relaxed without compromise.

AGGREGATE SHAPE

Current sportsturf specifications for drainage aggregates do not include particle shape. Field experience shows that the relative amounts of rounded particles in aggregates affects the degree of interpacking and thus stability during their placement. Some rounded river pebbles suffer this problem making consolidation difficult in practice. Differences between aggregate particle shape affects the degree of suction imposed upon the growing media which in turn affects the height of the capillary fringe within a profile.

AGGREGATE DEPTH

It is commonplace in golf green construction to mirror the contours of the playing surface and underlying aggregate by maintaining uniform depths. The current USGA specification state of the drainage layer "a minimum thickness of 100mm". It has been previously demonstrated that it is the aggregate sizing and not the depth of the aggregate which affects moisture retention.

In summary, the most critical parameters to observe about drainage aggregates are material composition and the particle grading of the underlying gravel to match the growing media. Washed aggregates are always preferable being free of fine particles. Further work may elucidate the importance of other parameters and redefine the bridging factor. Like all material things today quality and performance do come at a higher price.

Gary Beehag is employed by M. Collins & Sons (Sydney) as Sportsturf Products Manager 🔺

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TOBO

Oatlands Golf Club - reconstruction works for golfing strategy, fairness and water storage benefits.

Over the last nine months, the Oatlands Golf Club in NSW has been in the throws of constructing three new greens complexes, two new tees and have created a new landing area across a ravine on one of the redeveloped holes.

The works were more substantial than this short introduction suggests as it involved shifting 30,000m³ solid volume of sandstone boulders and crushed sandstone. This equates to a loose volume of 40,000m³, which is similar to a rugby or soccer field 2 - storeys (6m) high. This massive earthworks project was generated from the decision to bolster the Club's existing water storage by four times its original capacity.

The impetus for the reconstruction works were:

- the need for adequate sustainable water supply to limit expensive recurrent potable water costs and any potential drought usage restrictions. It has also fulfilled a stormwater retention function required by Council.
- the preparation of a Course Master Plan that identified a range of course improvements that would be undertaken as resources permitted.
- the desire generally by the membership to improve the course and reflect current standards of presentation.

WATER STORAGE

The Club's water storage dam is serviced by both urban and bushland runoff and towards the end of last year its capacity was increased from 7 to 30 megalitres! This has extended the Club's summer storage potential from four to six weeks to a more sustainable two to four months.

Subsequently, the club has undertaken a major irrigation system upgrade throughout the course whereby a single row asbestos/galvanized pipe system has been replaced by a modern dual row irrigation system managed by individual sprinkler control from a remote or Toro LTC+ main controller.

As Murphy's Law would have it, it hasn't stopped raining since!

MASTER PLAN

A range of potential layout modifications were investigated and presented to the Club to



invoke discussion and ensure alternatives were considered but budgetary constraints, loss of mature trees and extensive disruption to play ruled out any radical change. This being the case, the Course Master Plan aimed to 'finesse' the existing layout. The Club's key requirements were that the design be a 'members course' and no 'buried elephants' in the greens.

Primarily, the Course Master Plan involved;

- Progressive rebuilding of greens with strategic improvements to shaping and bunkering, allied with ease of maintenance.
- · Review of tee sizing, orientation and shape.
- Fairway bunkering and mounding for strategic challenge and rating balanced by select landing zone benching to eliminate steep crossfalls.
- Upgrading of selected water bodies and associated landscaping
- · Reduce the risk of 'errant golf balls'.
- Landing area and sightline improvements to benefit fairness, speed of play and golfer safety.
- Improve course drainage and other turf health and maintenance issues.

These changes were undertaken in the general context of increasing the strategic thought, shot precision and risk/reward challenges for better player, whilst providing a fair and appealing course for the other members.

The Master Plan identified only one zone essential for major earthworks on the site. It was a 300 m long by 20 to 50 m wide area along the more secluded eastern margin of the site abutting steep bushland.

The primary intent of these proposals was to;

 Make the 165m par three 5th, playable by senior members and short hitters. Playing the old hole from the members tees required a carry of 125m from an elevated tee over a ravine with no bailout zone and a steep batter up to the green that often caused the ball to roll back into the ravine if hit short. A carry of approximately 150m isn't achievable on a regular basis by a number of members with many players opting to play for the 10 x 12m ladies tee bench which then offers a shorter carry opportunity over the ravine to the then elevated green. This is a tough and disheartening way to be forced to play a par three early in a round!

- Extend the short (274m) par four 16th by using localized filling to add an extended rear tee. As a separate works a slight dogleg and setback new green was also proposed. Overall this offers a short but challenging 310m par four.
- Relocating left and elevating the 15th green above the adjoining bushland and fig tree to create an exciting and long par five. This also assisted safety at the adjoining 16th tee.

FLEXIBILITY IN DESIGN AND CONSTRUCTION

The decision by the Club to enlarge the water storage was opportune and wise in that it made the Course Master Plan projects far more feasible, especially as they were near to the dam site and in the more secluded section of the course.

The Master Plan designs were more limited in earthworks as it is practical to assume that few clubs want over a thousand fully laden trucks traversing to the far end of the course if satisfactory improvements to the playability or strategy of the hole can be made with less fill.

Detailed designs were fast tracked early in the dam construction to meet changing excavation material type and volumes and design requirements and as the project developed, often significant changes were made to configuration of batters, elevations of greens and tees and the dimensions and positioning of fill zones.

The hole numbering at Oatlands has been recently altered such that the 3rd is now the 5th; 4th the 6th; and 13th the 15th.

Key features of the project included;

The 5th Hole

This par three from an elevated tee across a ravine to an elevated green was well known by members and visitors due to its undoubted difficulties for the shorter hitter and challenges for most others. The lack of even a marginally fair bailout area was a problem.

The proposal elevated the rear tee by 2 metres and carefully stepped down the tees to allow a glimpse of the rockwall edge that retained the ravine fill. This also allowed a clear view of the target. The green was lowered by one metre to both lessen the steep batter in front of the green to a mowable slope and to increase the rear mound effect so that balls didn't readily roll through occasionally in front of the next tee.

The bunkers previously were at the side and rear of the green behind mature trees so of reduced effect. As the front slope was now gentler (although balls could still roll back to a lower pad depending on the turf mowing height) it was decided to place two bunkers in front of the green. This retained the previous need to carry the green to get on for a birdie putt so the hole loses nothing for the good player. Indeed the green shaping on the tight left side ensures the 'championship' pin will be a real challenge requiring great precision to get close.

The 6th green and approach

A ridgeline nine metres above the tee in the landing area limits length off the tee. The small original green well below the ridge was therefore a blind approach to all but long hitters on this 408m par four rated as the toughest on the course. Unfortunately, poor drainage on the shallow soil over a rockshelf just in front of the green also often meant that the second shot



Sealed rock lined channel to divert flows around the fairway.

BY JAMIE DAWSON AND SCOTT LANE

must carry all the way to the green if it was to be reached in regulation.

The proposal therefore involved:

- Intercepting ground water seepage and surface flows into a sealed rock lined channel to divert flows around or be piped under the fairway (rocks obtained from the dam excavation).
- Elevating the poor draining area to allow fairway crowning and sufficient depth for stormwater pipes.
- Elevating the green by around 1.5metres so either the green or the pin was visible to many more players.
- Enlarging the green from 350m² to 580m² to better reflect the difficulty of the approach length. The steep hand mown batters on the left were replaced with two gentle grassy hollows to catch the marginally offline approach from rolling down the higher but maintainable batter. If well offline the batter comes into effect and the recovery is more challenging. On the right, low mounds and batters to the surrounds add interest with well off line shots hoping to avoid the rocky cascade.





15th green and surrounds

Prior to works, the par five 15th offered players greater than 70m from the green a blind shot in and if left, a steep batter often deflected the ball into thick bushland.

The elliptical green was reshaped and dam excavation works fill permitted the green to be raised almost 3 metres. The green was also enlarged to offer a fairer target visible from significantly further down the fairway and was pushed further left and closer to bushland to protect players on the 16th tee to ensure the hole retained its excitement and challenge. A 6m-high sandstone wall retained the fill and bunkers and low mounds with a wider surround were incorporated to catch the marginally offline shot to the left or rear.

Players on the green will now be close to the bushland with a sense of being in the tree crowns. A mature fig next to the green is a feature that was retained.

16th tee

The proposed tee extension for the short par four 16th was into disturbed bushland on a 1 in 2.5 to 1 in 3.5 steep batter below the existing tee. The availability of fill and sandstone boulders for batter facing enabled the 16th tee to be extended back 20m. This required up to 8 metres of fill. The rear tee was also trebled in width and kept slightly raised to offer a quality ample teeing ground.

The shaping retained existing significant trees and was integrated into the adjacent 15th green surrounds with mounds and hollows used to effectively widen the separations.

The ultimate increase in hole length from 274m to around 310m with a slight dogleg will assist a stronger closing sequence of holes at Oatlands.

Sandstone rock walling

The availability of large sandstone boulders from the dam excavation was critical in allowing stable rock facing of the fill batters, generally 5 to 6 metres high. At the ravine, the wall was over 10m high. A Geo-technical Engineer designed the keying in footings and determined acceptable batter slope gradients, backfilling and drainage. The rock facing was massive with over 2,250m2 of face area. This equates to a rock wall 5.5metres high and 400 metres in length! The course design used a 'waving line' for the wall intergrating the course features and landform to best effect.

OPENING FOR PLAY

Subject to more favourable (drier) conditions which are affecting the grow-in, new greens, tees and other improvements should be ready for play in late Autumn.

Mike Wolsey, (Secretary Manager), reports very favourable comments from members and guests as the new holes begin to take shape.

Future improvements to the course will be of less magnitude, but will reflect the desire of the Club to enhance the course throughout. The new irrigation system and added surety of water supply will also greatly assist course presentation and playing conditions. The recent reconstructions integrate some exciting yet fair golf holes to ensure the popular Oatlands Golf Club, now celebrating its 70th year, is well placed to move forward into the future.

Jamie Dawson is a Golf Course Architect and is the Director of Enviro Links Design Pty Ltd and Scott Lane is the Golf Course Course Superintendent at Oatlands Golf Club



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Pelican Waters Golf Course

is a Greg Norman designed 18-hole resort course situated in Caloundra on Queensland's Sunshine Coast. It is the centrepiece of the 1200 home residential and resort development that has become the town of Pelican Waters. An additional nine holes, shopping centre and marina are currently under construction or in the planing stage as the resort expands.

Early in the planning of Pelican Waters golf course Troon Golf Management became involved and began a consulting/management agreement. Having spent the previous 10 years in the US, I jumped at the chance to return to Australia and join the Pelican Waters team.

As with any major construction works the first step was the development of a strict environmental management plan for construction and maintenance. Because Pelican Waters is built on an a flood plain surrounded by salt-water rivers and National Park swampland, a very precise system of lakes, wetlands and drainage ways was a priority.





The property now controls twelve hundred megaliters of water. Most of the water is contained for nutrient stripping, irrigation and real estate features. Wetland expert Professor Geoff Sainty was employed by the Great White Shark team to design and specify the type, size and planting requirements for the courses' wetlands. Functional wetlands are quickly becoming a signature feature on Greg Norman designs and confirm their commitment to developing and improving the native environment of all their developments.

A ground water monitoring program is also required with several sampling bores tested frequently for pesticide and nutrient contamination. To date, no contamination has been detected.

Fortunately the developers shared Troon Golf's view of the importance of getting key staff onboard very early in the construction program. One of the first was Bob Howe, a Pelican Waters caretaker turned foreman who quite fortunately had been developing a three hectare turf nursery sodded with Riley's Supersports

couchgrass. The luxury of having a turf farm on the course allowed us to plant 80% of the fairways and all of the Tiff Dwarf greens from our own stock. Next, the current Golf Course Superintendent John Lamprell and Darren Smith the Irrigation Technician were hired. Both came on early and formed the most critical part of the grassing team.

As the golf course progressed, we recruited local and international staff who have included students from The Ohio State University, Canada and Great Britain. Part of the training program for all of our employees during the construction phase of the course included labouring on the construction of greens with shaping and finishing contractors JV Golf. This gave the employees a chance to 'touch and feel' the product they would later present in maintenance and gave them an education in the art and science of building a golf course. So far four employees involved at Pelican Waters have been promoted to other Troon Golf Management Superintendent and Assistant positions.



CONSTRUCTION CHALLENGES

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Pelican Waters had the normal preconstruction and first year challenges. Those soon became insignificant as 4.3 meters of rain fell on the course during early construction, causing significant damage and delays. Frustration grew as contractors were required to rebuild

and reshape holes for the third and fourth time and lakes had to be drained then re-drained to provide fill material necessary for the course and residential development.

Building in a marine clay and sand environment requires careful management of many factors and sand capping the entire 20 hectares of

BY DAVID NICHOLLS

fairways and covering the entire long rough in native topsoil proofed difficult. However, the most significant challenge posed to us as the turf managers was the presence and subsequent management of acid sulfate soils. Acid sulfate soils contain iron sulphides, predominantly pyrite, which generates sulphuric acid when exposed to air. The formation of a yellow crust called jarosite is the first indication of the presence of acid sulfate soil. It's a greater problem when it becomes dissolved from rainfall, irrigation or seepage from ground water and is leached. At Pelican Waters the deep excavations necessary for the required fill and for the construction of fairways and tees, exposed large areas of acid sulfate soils that leached into holding lakes that then had to be neutralised with hydrated lime (Calcium Hydroxide) in accordance with the environmental management plan.

It would seem logical that by applying the correct amount of lime (Calcium carbonate) the problem would be resolved. However when the grassing program quickly follows the amendment, the pH adjustment is not rapid enough to provide a neutral plant bed. Some of the fairway sand had a pH of only 3.8 at the time of planting and thus struggled to become established. In addition to the low pH it was normal to see a base saturation of 20% sodium and aluminium at a concentration as high as 1400ppm. Of the soils I have managed this one has taught me the most and has been the one most measurably improved.

The grow in fertility program also had to be like no other I had ever experienced. We had to avoid the use of acidifying fertilisers and found the best results were achieved with foliar applied nutrient sources.

As no amendments were specified to any of the soils tonnes of composted fowl manure was applied to provide atleast some exchange

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capacity. The lack of microbial activity in the soil slowed down the decomposition rate of the manures which helped smooth out the growth surges that you often get using manures as a nutrient source. Because of the amount of sulphur (140ppm) in the soil we had to stick with Ag lime (calcium carbonate) as the calcium source to form free gypsum (Calcium sulfate) in the soil and displace the sodium. The additional calcium we applied also meant we had to continuously spoon-feed the plant with trace elements and with other cations such as potassium, magnesium. The irrigation system was fitted with a fertigation/injection system to help displace the 1400ppm Total Dissolved Salts (TDS) in the Irrigation lakes. The failure of a bund resulted in a portion of the irrigation lake being flooded with seawater.

In summary we had a soil that had a TEC of 4meq, sodium at 20%, pH of 3.8, potassium <3%, Sulfur 140ppm, Aluminium 1400ppm and we were irrigating with salty water. And then it started raining again!

One of the most rewarding parts of the construction at Pelican Waters was the design, construction and fit out of the maintenance



80% of Fairways were planted with turf grown on the property

It's what's underneath that counts

If it's worth doing, it's worth doing properly. That's why you put your best into it. All the hard work that goes into the layout and feel of the course is only a part of what makes it work The various grass types to suit the climate and particular trees & shrubs to create a picture, all require forward planning. It's what's underneath that sets you aside from the competition. Whatever your needs, Sandbelt Industries work with you, manufacturing product to your specifications After all. you only get out of it what we put into it!



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facility where the joint venture partners drew on the practical experience of the end users of the maintenance building. I was able to design a facility that capitalised on the positive attributes and avoided the costly mistakes of every building I had ever visited. Pelican Waters maintenance building is 100m from the clubhouse, first tee and driving range. It is ideally situated for each nine holes and is virtually invisible due to the thick bush that surrounds it. It sits in a 40m x 60m paved compound with roller doors on all walls to allow air circulation and 360 access to the equipment. It has separate pesticide storage, sprayer fill and equipment wash down pad. There are office facilities for the Superintendent a shared office for the Assistant Superintendent and Irrigation Technician and an office for the Mechanic. The workshop includes an equipment lift, reel grinders and anything else that mechanic Jeff King could grab from the 'Snap On' truck including a lathe. Compliance with Australian and local government standards was an obvious requirement but was much simpler than first anticipated.

Results

The results we have achieved at Pelican Water are remarkable. A construction period that had over 4 meters of rain followed by a grow in period during the lowest recorded average temperatures for 50 years and a pre-opening period that saw the lowest rain fall in 100 years was a true test of everyone's faith. To date the course has drawn rave reviews from our guests and ranked in the top ten resort courses in Golf Digest. As the course goes from construction to operation we continue to fine-tune the features of the course under the guidance of the Greg Norman Design Team.

The ownership, experience and pride gained in construction and maintenance of Pelican Waters Golf Course has ensured our staff will continue to present this Troon Golf property in 5 star condition and I thank them for their marvelous effort

David Nicholls is the Director of Agronomy for Troon Golf Australia. \bigstar

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MA news

EPA QLD and AGCSA LAUNCH ECO-EFFICIENCY MANUAL



The Director of the QLD Government Environmental Protection Agency, Dr. John Cole launched the AGCSA's "Manual to Improve the Eco-Efficiency of Queenslands Golf Courses" at the Brisbane Golf Club, in March.

"I'm delighted that the AGCSA has embraced the EPA's Cleaner Production Partnerships Program because it's a win-win situation, in terms of good

environmental management and improved profitability for golf course operators," he said. "Putting this manual into practice will mean that golf courses will be 'greener' in their approach to their day to day operations, resulting in reduced use of water and energy and reduced waste output."

The manual authored by John Neylan from the

AGCSA's Technical Services Division, AGCSATech, provides detailed management checklists and guidelines to assist Golf Course Superintendents and Golf Clubs to enhance their already sound environmentally sustainable management regimes of their facilities. The manual covers topics such as water management, integrated pest management,

" It is well known that Golf Clubs and Golf Courses play a significant role in Queensland's tourism and recreational industry but less well recognised is the significant contribution that Golf Courses make to the environment and the well being of our communities." soil management, selecting the correct grass type, pollution and training. Queensland Golf Courses already lead the way in many areas of golf course management - this document will assist in demonstrating the cost savings to be made by adopting an environmentally sustainable management regime at golf courses.

In welcoming Dr. Cole to launch the manual, AGCSA Director, Mark

Couchman stated that, " It is well known that Golf Clubs and Golf Courses play a significant role in Queensland's tourism and recreational industry but less well recognised is the significant contribution that Golf Courses make to the environment and the well being of our communities." He added that," Golf courses can provide important wildlife sanctuaries and you only need to take a look at the significant work that has been undertaken here at the Brisbane Golf Club to see first hand the excellent wetland system being provided within the confines of this golf course. This has benefits to the community far exceeding the boundaries of the course itself." He further added that," Golf courses often contain the last remaining stands of remnant vegetation, particularly in urban areas," and stated that the Grand Golf Club, home of this years Australian Open has significant stands of remnant vegetation and has supplemented this with large plantings of native grasses. Mr. Couchman went on to say that these stands of remnant vegetation provide safe habitat for much of our flora and fauna with benefits flowing to the broader community. Mr. Couchman also stated that Golf Courses are often built on degraded landscapes and that in Queensland they are leading the way with the sustainable use of effluent water, thereby reducing the load on our waterways and providing important nutrient sinks for this nitrogen and phosphorus laden water. He added that, "a study undertaken in NSW has recently found that water quality exiting golf courses is generally of far higher quality than that entering golf courses, with reduced nutrient loads."

To maximise all of the above benefits however, he said. "golf courses must be managed in a sustainable and cost effective manner." He stated that with the financial support of the Queensland Government Environment Protection Agency the development of the Eco-Efficiency Manual will provide a significant guide to further enhance the cost effective and environmentally sustainable management of Queenslands Golf Courses. He added that the Queensland Government EPA has led the way in recognising the important contribution that the golf course management industry plays to both the Queensland economy and the community, and on behalf of the industry he thanked the EPA for their support and guidance.

The Manual to Improve the Eco-Efficiency of Queenslands Golf Courses will be mailed to all AGCSA members and all Golf Clubs in Queensland in late April and other interested persons can purchase a copy direct from the AGCSA office on (03)9886-6200.

ATM

SUPER PROFILE

Name:

Brendan Warby

Age:

33

Positions Held:

1984-1988

Apprentice Greenkeeper Highlands Golf Club

1988-1989

Assistant Golf Course Superintendent, Concord Golf Club

1989-1992

Golf Course Superintendent Highlands Golf Club

1992-1998

Assistant Golf Course Superintendent Construction, Camden Lakeside Golf Club

1998-Present

Golf Course Superintendent Highlands Golf Club

Career Highlights

Working with Mark Parker at the Concord Golf Club in preparing for the 1998 Panasonic Golf Open

Working with David Scaife during the construction and grow in of the Camden Lakeside Country Club

Present Challenges:

As Superintendent at Highlands Golf Club, I have returned to where my career began and where I have lived for the best part of 20 years.

It is with a great deal of responsibility and pride that the club has started on a redevelopment of the golf course. We have recently completed one hole and after the clubhouse is rebuilt next year, we hope to tackle three more holes. With only four people on staff, the day to day maintenance of the golf course is a huge task. The club does not have a mechanic and as a result I do all the routine maintenance on machinery. We are all definitely hands on at Highlands and I think that this makes the job enjoyable as well as challenging.

The greens at Highlands were originally sown with New Zealand Browntop but have been oversown more recently with Penncross. As with most old greens they now have a percentage of Poa annua. The rest of the course is a mix of cool season grasses, although Kikuyu dominates in the summer. New greens are constructed to USGA specifications and the grass selected for the putting surface is Dominant. The rest of the golf course is on a sandstone base, which is excellent for drainage and the topsoil profile is a sandy clay. Irrigation control on the course is via a Toro LTC Central control linked to ten modular satellites which control Toro electric valve in head 730 series sprinklers. Our water supply is from a bore located in fractured sandstone some 120 metres below ground, quality is excellent.

The club is this year celebrating its 75th anniversary . We have a playing membership of over 800, which is increasing every year. Last year the club put through over 10,000 rounds of golf. Our biggest event of the year is the Pro-Am held in February during our week of golf.

At present I am working towards a Diploma on the AGCSA Skills Recognition Program and with only a staff of four it keeps me quite busy.

RESOUNDING RESPONSE TO ATM SURVEY



Rebecca Fowler, AFL Trainee and unofficial 'barrel girl' draws the winner

Colin Gibbs, Course Superintendent from the Parkwood International Golf Course in Queensland was the lucky winner of the **AUSTRALIAN TURFGRASS MANAGEMENT** Reader Survey and takes home \$200 worth of quality **AGCSA** Merchandise just for taking the time to fill it out.

The survey received a great response from readers and revealed some very encouraging and helpful information. 87.5% of respondents to the survey used the magazine as a source of research information and those that did ended up using an average of 42% of the research information to help them with management decisions.

Pests and diseases was rated as the topic of most interest and a resounding 86% of respondents ranked AUSTRALIAN TURF-GRASS MANAGEMENT (ATM) as their most preferred turf publication.



ATM

AAA news

WE WILL SURVIVE



Who says lightening doesn't strike twice. That is what Wayne Sear, Manager of Barmac Industries would be thinking at present. After surviving the Brisbane floods of 1974 when their warehouse was destroyed, Barmac have again been faced with a disaster. On March 23, 2001 the Barmac warehouse was destroyed, this time by fire.

"This was not the way we were hoping to make the evening news". Wayne Sear says, "Barmac has shown consistent growth over the past 40 years, and with the success of the business we were confident of continued success and growth throughout 2001. The fire is a tragedy, however the business has and will continue".

The Barmac team have quickly found new office space and are concentrating on setting up out-sourced manufacture. New raw materials are being sourced locally and from overseas, " This is an incident we didn't need of course, but we are working frantically at present to ensure that disruption to our clients is kept to a minimum". Wayne also says, "In recent years our range of products has become very unique, with formulations developed in Australia for the Aussie conditions".

Wayne Sear has also been working on the release of a number of new products for 2002. "The development and search for new technology for turf management will continue, and we look forward to presenting our new products to the turf industry in the near future".

New products in the Barmac range such as the DSMA Clear, Loch Ness colourant, and all of



the traditional insecticides, fungicides and fertilisers that Barmac are well known for and are being formulated to meet seasonal demands for the turf industry.

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ON DISPLAY AT

MA news

WASTEWATER IRRIGATION FOR QUEENSLAND RECREATIONAL AREAS

Department of Primary Industries scientists are evaluating the use of wastewater and treated effluent for irrigating golf courses, sporting fields and council recreational parks.

Project leader Chris Menzel, Senior Principal Horticulturist based at Maroochy Research Station, Nambour and Ph D student Peter Broomhall from Redlands, are working on the project with major input from Pine Rivers Shire staff and Lend Lease at North Lakes in northern Brisbane.

Dr Menzel said they hope to determine the responses of turfgrasses to drought and irrigation with wastewater; recommend the suitability of different grasses for use under dryland and irrigated conditions and improve the management of turf irrigated with wastewater in southeast Queensland.

He said major outcomes from the project should include improved management of grasses under dryland conditions and irrigation; increase turf use to treat urban wastewater and increase wastewater use in open space areas. "A recent Australian Urban Water Industry survey indicated that only 2.7% of treated effluent and 4.1% of raw effluent is reused or recycled. This is set to significantly increase after the recent adoption of the Queensland Water Recycling Strategy. A range of options are being developed to maximise water resources use and ensure safe and environmentaly sustainable recycling. The strategy should see the State's use of recycled water increase from 38,000 to 100,000 ML (megalitres) per year."

"Using recycled water in urban open space will require changes in the management of turf grasses, which currently cost more than \$60 million in subtropical Australia. Higher average soil water after irrigation with recycled water will increase maintenance costs in these areas." Dr Menzel said.

He said Mr Broomhall was investigating the water requirements of preferred low growing tropical native and naturalised grass species at Redlands Research Station. The suitability of various grasses in dryland or irrigated urban open space and their responses to wastewater will also be investigated.

"The trials include evaluation of the major turf types in northern Australia, including green and blue couches, buffalo grass, carpet grass, zoyziagrass, paspalums, and some natives."

The project activities are being funded by Horticulture Australia Limited, formerly the Horticultural Research and Development Corporation, Lend Lease through their North Lakes development in northern Brisbane, and several turf producers including Jimboomba Turf Company, Simplot Turf and Horticultural Group, Turfgrass Queensland and Twin View Turf at Wamuran.

Dr Menzel said voluntary contributions are also being made by local government, including Pine Rivers Shire Council, Townsville Shire Council, Calliope Shire Council and Ipswich Shire Council. The Queensland Branch of Parks and Leisure Australia has also been very active in developing the project and is the peak organisation representing the interests of local authorities involved in the management of open space.

Further Information: Chris Menzel 07 54 44 9648

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FNQGCSA

With summer coming close to an end and hopefully some sunny days ahead, golf courses with 328 greens can breathe a sigh of relief. All courses with 328 greens reported that summer decline although present, was not as devastating as in previous years.

Terry Anderlini from Tropical Lawns in Gordonvale and David Poulson, course Superintendent from Novotel Palm Cove Resort have been doing trials with some areas of 328 on Novotels greens that have not suffered from this crippling problem.

Terry Anderlini has now grown a trial site of this turf at his Gordonvale turf farm and is putting it through some extensive trial situations to see how it performs. If all is positive over the next twelve to eighteen months we may finally have a greens surface that can withstand the harsh, hot, humid, wet and overcast conditions of FNQ. A meeting of the FNQGCSA will be organized in conjunction with the AGCSA workshop in Cairns in May to discuss the trials.

Paul Earnshaw

President, FNQGCSA



The weather has once again been the most bizarre talking point in the southern half of Queensland with a long dry spell broken by a huge down pour up the coastal strip. Then back into dry weather for three weeks followed by a cyclone that delivered up to 14 inches of rain in patches on the far north coast of NSW up through the Gold Coast and Sunshine coast. While Beerwah Golf Club copped a flogging with over a foot of rain in two days, courses closer to the coast had 50mm Friday and 50mm the next so there were obviously some very heavy patches.

Damage up and down the coast was severe with the Pacific Highway cut in many places. Andrew Smith at Yamba Golf Club had just had a huge reconstruction job dumped in his lap when this cyclone blasted through town. With gale force winds and torrential rain lashing the town there were roofs flying off houses through the night and many big trees uprooted. Down the coast at Woolgoolga the banana farms had swathes cut through the plantations in the storms and one big sawmill was torn to pieces by the wind. David Scutts at Coffs Harbour Golf Club was once again dealing with a big wet down pour and is looking forward to some kinder weather. Barry Cox at

state Heport

Ocean Shores was in a similar position with many big trees to clean up after the cyclone. The new clubhouse renovations at Ocean Shores have been well received and would have been a good spot to sit out the storm.

The patchy nature of the falls can be illustrated by the footage of Emerald Lakes Golf Course just about completely under water shown on television. While Gainsborough Greens 30 minutes away had 60mm. The recent soaking did nothing to help the golfer numbers coming up as there seems to have been a general slow down in business through February / March.

Our Glassys Fishing World field day is still creating interest with some courses now actively pursuing the best fish for their lakes. The staff at Gainsborough Greens have discovered that we have Tarpon in our waterways, a good small sized fighting fish that puts up a real struggle and can grow up to 1m in length.

Our latest gathering was at Brisbane Golf Club where the AGCSA and EPA presented their joint Eco Efficiency Manual for improving golf courses. The effort put in by the AGCSA and John Neylan in particular in producing this document has



been immense and is well deserving of our appreciation. The manual is intended to bring together the most up to date information on the best management practices that will achieve improved environmental management, reduced inputs, reduced costs while maintaining quality turf surfaces. John Neylan gave a run down on how to get the best use out of the manual and there was a fair bit of free flowing debate on some of the more bizarre ways various departments seem to operate in local government. All in all, a very worthwhile exercise. We also got to see the great work Jeff Hegedus has done at Brisbane Golf Club in constructing three new holes and extensively re-shaping one corner of the golf course with some extreme contours now in play.

Up coming events are our Secretary Managers / Superintendents Golf Day in May and our much anticipated 'Granite Belt Tour'. Consultations continue with the EPA in regard to our code of practice for Noise Abatement with some light at the end of the tunnel.

Jon Penberthy

President, GCSAQ



Having recorded the driest December 2000 - February 2001 period in 120 years, the theme for the upcoming 17th annual turf grass conference, "Every Drop Counts" will certainly be of interest for our turf mangers here in the west.

Alan Devlin, last years AGCSA Excellence in Golf Course Management Award winner has just returned from his whirlwind tour of the U.S.A. Alan reports that without exception the hospitality of the U.S.A superintendents during the entire trip was outstanding.

After touring the U.S.A with Greg Clarke of John Deere, Alan then took some annual leave to continue his trip through to the U.K.

The third round of the CJD super series was held at Mt Lawley Golf Course on April 3rd and was combined with a time management workshop in conjunction with the AGCSA and the GCSAWA.

On the 19th of March the GCSAWA in conjunction with Challenger TAFE hosted the annual TAFE Awards night at the Mt Lawley Golf Course.



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Over 130 people attended this fabulous night as students and lecturers were acknowledged for their efforts throughout the year. The apprentice of the year went to Scott Chambers who has just accepted a position as Golf Course Superintendent at Port Hedland Golf Course. Congratulations Scott and all the best for the future.

At this stage our association in conjunction with the various other turf related associations are planning to put together a two-day trade exhibition at the Challenge TAFE campus grounds in August 2001. Titled "Turfest" this event in shaping up to be one of the biggest events for everyone in the turf industry in WA for 2001. Members will be kept informed of developments.

Rob Macdonald

President, GCSAWA



The worst summer for heat and humidity in 11 years is over and now many areas of NSW are experiencing the worst flooding for one hundred and eleven years!

Many courses have had real difficulty keeping turf healthy and for those people who may be under pressure from certain sections of your club; a quick ring around will prove you are "not alone" in your battle with "mother nature" at her worst. One of the sad side effects of some of the fierce electrical storms which have battered us recently is some fine specimen trees on several courses have been killed by lightning strikes.

Our annual golf championships were held at Avondale Golf Club on 14th February and despite the difficult weather, host superintendent Dave Warwick had the course in fine condition. Trevor Ridge (Sawtell) and Andy Hugill (Eastlakes) were declared joint winners after both shot 72 off the stick. Brad Marsden (Toukley) won the Rube Walkerdon Trophy with 42 points. Many thanks to our sponsors Patons for a great day.

The next official gathering of our State Association will be a 2 day Education Seminar in Canberra on May 6th and 7th. A bus will leave from Newcastle and pick up at several points on the way down. Guest speakers include John Neylan and Peter Frewin and a special visitor who's identity will be revealed at Royal Canberra on Monday 7th. This is definitely an event not to be missed, pay early as the bus will be filled quickly and any stragglers will have to make their own way down to the ACT.

We have not been inundated with members wishing to stand for the Board of the AGCSA so please give it some serious thought gentlemen.

Martyn Black

President, NSWGCSA



With many parts of the Australian countryside experiencing floods, it's ironic that Victoria has had to contend with one of the hottest and driest summers on record.

Over 100 Victorian towns are on water restrictions with many country districts experiencing critically low water storage levels. Needless to say many Supers are looking forward to some decent autumn rains to help restore playing conditions.

As I reported in the last issue of "Australian Turfgrass Management" Trevor Uren at the Devil Bend Golf Club hosted the VGCSA's first meeting of 2001. The primary focus of the day was to review turf training / education, and in particular the new National Turf Industry Competency Standards. A good roll up of over sixty members were in attendance with plenty of discussion taking place.

One issue raised by members was the belief that the National Turf Industry Competency Standards have lowered the educational bar (standard) here in Victoria. The AGCSA's Recognition of Skills program and in particular workplace assessment was also vigorously discussed. Whilst most members supportworkplace assessment many members believe the assessment process of such skills are not nearly strict enough. The end result of the day was that the VGCSA has identified a number of weaknesses in the current package and will be using the Victorian Turf Education Reference Group to lobby for improvements in these areas.

The autumn /winter period will be a busy time for the VGCSA with a number of events scheduled to take place. On March 20 around thirty members took part in a joint AGCSA / VGCSA day visiting turf trial sites. The day started at Keysborough Golf Club where delegates inspected the Austep rye grass trials. From they're the group moved on to Kingston Heath Golf Club to inspect the AGCSA's bent grass and couch grass plots. A great deal of interest was shown in the A & G series bent grasses along with the Plateau couch variety. I would highly recommend to anyone looking at replacing greens to visit the plots, please contact John Neylan if you're interested. From the Heath it was off to Kingswood Golf Club, one of the sites for the VGA's organic



amendment trial. This trial has been running for just over one year now and Andrew Peart from Turfgrass Technology who is overseeing the trial spoke on his findings to date. Significantly the trial has shown no major differences in overall turf performance between conventional fertilizer practices, organic based standalone programs or supplementary products added to conventional fertilizers programs. The major difference observed in the first year of the trial is the cost of the treatments and the number of applications that must be made for some of these. Andrew also states that the benefits of using these products would need to be significant in order to justify their cost and the added expense in applying some of the treatments. If you would like a copy of the interim report, (Year 1) please contact Turfgrass Technology, attention Andrew Peart.

Tuesday, April 17 is the date set-aside for this years VGCSA Annual General Meeting, which is to be held at Woodlands Golf Club. For those members wanting to play golf make sure to return your reply slips early as numbers are strictly limited to 65. Please note that soft spikes are compulsory. At this stage we have tentatively arranged for Mr. Peter Thomson to be our guest speaker. Just in case Peter is unable to come we have also arranged for Mr. Paul Daley to speak as well. Paul has recently published a book entitled "Links Golf" and should have some great stories to tell about his travels aboard.

Finally Monday, May 14 is the date for the VGCSA's Golf Turf Research day. Once again the venue will be Commonwealth Golf Club, so make sure you put your name down for what is always an enjoyable day.

John Geary

President, VGCSA

SAGCSA

After one of the hottest summers on record, we are all relieved that Autumn is here, bringing with it some cooler weather and much needed rain. From all reports most courses came through the summer extremely well, which is a credit to everyone, considering the high salt levels and minimal water supplies.

We have a busy next couple of months on the events calendar, with the AGCSA workshop at Belair Park Country Club on 1st May.

Our annual bus trip is on 6th, 7th and 8th May, visiting the Sunraysia area. The bus trip is a good opportunity to get out and about to meet other superintendents and see how they manage their courses.

The Toro/Coopers Cup will be held at Mt

Barker Golf Course on Thursday 10th May. Also coming up in the SAGCSA AGM, to be held at Royal Adelaide Golf Course on 7th June, followed by the AGCSA Conference in Sydney from 18th to 23rd June 2001.

Shawn Standfield

President, SAGCSA



Rain at last! Since my last report in January rainfall has been virtually non-existent except for a couple of threatening showers. However, as I put pen to paper the heavens have opened and I would imagine most dams would be replenished.

On the subject of irrigation it was most encouraging to see the attendance at the Field day at Country Club Casino on 14th March. Brad Fawcett (Rainbird Australia) educated all in attendance of the real advantages of Central Control Systems. The formal part of the day was followed by a superb barbeque luncheon and 9 holes of golf, trophy presentations and couple of cool ales. Thank you Brad.

Industry Changes: Steve Harris to Troon Golf Queensland. Tony Smith Promoted to Superintendent, Mowbray Golf Club.

A recent trip interstate sparked my desire to introduce couchgrass into fairway and tee situations. Although trials conducted in Hobart two years ago proved unsuccessful, I believe it is worth perseverance. With a couchgrass plot trial area set up in Tasmania it will become more evident which varieties are more suited to our rather cool testing conditions in winter. Maybe some input from seed companies will steer us in the right direction. "Food for thought".

Phil Hill

President, TGCSA



As summer becomes a distant memory and the days get shorter it is the time for many activities throughout the Turf Industry. There are numerous field days, exhibition day's etc that our sponsors are hosting. We wish them well and encourage our members to give them support.

As far as the TGAA is concerned, over 75 delegates saw the Austep Ryegrass Trials again and received the 32-page final result portfolio from the SIA. The TGAA was proud to support this trial and thank all that were involved.

Our most recent event was the Occupational Health and Active Safety Day that was held on April 4th. Following that is



- promotes deep and massive root systems
- boosts beneficial microbes
- improves wetting and spreading of water
- breaks down thatch and waste
- reduces sodium salt in the rootzone



the Administrators and Staff Day at Hailebury College Keysborough. A full day of informative speakers with a range of topics that should stimulate your thirst for knowledge. This is on the 9th of May. We encourage all to invite their people in charge to see what assets they have in their own staff and how being part of our Association is of benefit to all parties concerned.

As far as relocation may I express best wishes to Mr Tony Hemming and Staff who are now working at Colonial. Mr Brett Sipthorpe who has been appointed at Punt Rd and to everyone else, well done over Summer and Good Luck for a great Winter ahead.

Robert Savedra

President, TGAA (Vic)

TGAA (ACT & SURROUNDING REGION)

Although turf managers have been busy emptying catchers & renovating cool season turf areas during the growth period, relief from the hot summer experienced by many throughout the district has been welcomed by all.

This time of the year is also the time for renewal of application for membership & when

nominations of prospective committee members are taken for election at the AGM. Join your local turf association, receive local and international trade news, keep up to date with the latest in trends & technology & help to support your chosen industry.

In local news, the Austep assisted seed trials that have been established at the Canberra Institute of technology in Weston Creek by the ACT TGAA are proceeding well. Bare areas have been over-seeded and it should only be a few months before the first results can be logged. With a view for the need for a national body of the TGAA taking shape, an identifying logo would be appropriate. We are looking to people within the industry to come up with ideas or designs and pass them on through their local association member.

We all regret to hear of the passing of Jim Sherd, Course Superintendent of Fairbairn Golf Course. Long time Superintendent and friend to many, Grant King has broken from the pack and left his post at Queanbeyan Golf Club looking for bigger and better things. Lets hope his involvement within the industry will continue.

Justin A K Haslam

Committee, TGAA (ACT)



As the end of the season quickly approaches, the scarifier will be cranked up again for major renovation, greens will fertilised, cored and top dressed after this torturous summer we have had. As you would have noticed, quit a few clubs this year have replaced their existing bentgrass greens with Tiftdwarf. Tiff looks like the new trend in Melbourne for bowling greens, and why not, if managed correctly and the temperature remains consistently warm throughout the summer, Tiftdwarf could very well be the answer to our extended hot summers.

The invitational fours held at the MCC Bowls Club was a huge success with bowlers coming from all suburbs of Melbourne and as far away as Queenscliff. Well done to those who participated and supported this day.

Our next day will the K & B Adams Turf Pairs held at Port Melbourne Bowls Club, Thursday, 7th April at 12.30pm. This day is free so come on down and have a day out with the boys. Please call me if you would like to play on 0403 045 280.

Peter Rasmussen

Committee, VGA 🚇



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Back Cover: Launceston Casino Country Club : Rainbird Contacts

As we enter a new millenium, change is evident nearly everywhere we turn, and the irrigation industry is no exception.

During the 2000 year, Rain Bird International split its Australian operation into separate divisions. This has allowed the newly formed Golf Irrigation team to focus exclusively on golf course irrigation applications.

Rain Bird's Australian golf operation is led by Wayne Brown from his Queensland office. Wayne's team of golf irrigation professionals includes Greg Smith in NSW and Brad Fawcett in Victoria. Given the new structure, each person on the team is now able to focus on the golf industry in his territory.

Along with this new and more concentrated approach to the golf industry, Rain Bird's Australian team has capitalized upon the company's continued excellence in the manufacture and maintenance of the industry's most innovative irrigation equipment.



Golf Irrigation in Australia by Rain Bird

With 10 years of EAGLE[™] rotor success, the reliable PAR and PAR+ satellites, a two-wire decoder system that is second to none, and the industry's most powerful central control software, golf irrigation in Australia has never been better.

Maxi central control has enjoyed over 20 years of growth and development, and has included the most innovative map-based irrigation technology for the last three. With experience such as this, it's no surprise that Rain Bird's golf team tackles each new system or system upgrade with the confidence that they will provide the right product or service solution for every application. From smaller country courses with limited budgets to high-end championship courses, Rain Bird can provide a system that meets each individual course's needs.

Rain Bird is committed to its customers. We believe in a personal approach to business, and want to show our customers that buying Rain Bird irrigation products translates into a lifetime of service and support.

In support of this approach, the Australian team has organized the End User Club. This "club" is designed to provide all Rain Bird central control users with both recognition and information (via a quarterly newsletter). Rain Bird also offers "Rain Bird Golf Days" in conjunction with local superintendent associations, and extensive training programs taught by a team of Rain Bird professionals from all over the world.

We are excited to begin this millenium, knowing that Rain Bird offers the best irrigation solution for golf courses around the world. We look forward to working with new customers and maintaining good relationships with those who are already reaping the benefits of our irrigation products.

Enjoy the information regarding the Rain Bird customers featured in this Site Report. Please contact any member of Rain Bird Australia if we can be of service to you!



SITE REPORT

australia







Lake Karrinyup Country Club.

Having recently signed a five-year tournament agreement with internationally known IMG, the Lake Karrinyup Country Club plans to continue its tradition of excellence well into the future. In the past five years, Lake Karrinyup has played host to three Western Australian Opens, an Australian Amateur, and the inaugural Europe V Asia Pacific tournament. As such, it is viewed as one of the best courses in the West.

Established in 1927, the club has enjoyed success from both the professional and business classes during its tenure. During the Second World War, the Women's Auxiliary Australian Air Force used the club as a basic training facility. Though the club nearly collapsed as a result, it was revived at the end of the war and now boasts almost 2000 members and 45,000 rounds of golf each year.

Set on 200 acres of land, this 27-hole course is just 10 minutes from Perth's Central Business District. The 120 acres of irrigated land use water from five different locations throughout the course. The water is fed into a central irrigation lake where it is then pumped onto the Winter Green couch fairways and Penncross bent greens.

In 1998, Lake Karrinyup opted to replace its existing irrigation system with Rain Bird Nimbus[™] central control, PAR+ satellites, and EAGLE[™] rotors. Renovations began with the 9-hole short course where EAGLE 700 rotors were used on the fairways and tees and 900s on the greens. Shortly after these installations were complete, the main course followed, also using 700s on the fairways and tees and 900s on the greens.



Superintendent Wayne Miller has been with Lake Karrinyup for five years and is quite pleased with his Rain Bird Irrigation system

"With over 1100 EAGLE rotors on the course, it's great to find that in the time we've had them in the ground there have been very few problems. The PAR+ satellites have been extremely reliable and considering the amount of lightning activity we encounter their lightning protection is obviously doing what it's supposed to.

I find the software to be very easy to navigate. You only have to look at the pre 1998 aerial photo and compare it to the latest aerial to see how much the course has improved since the Rain Bird system went in."

Lake Karrinyup and Rain Bird can look forward to a bright future, with the State of Western Australia continuing to attract major golf tournaments, such as The Johnny Walker Classic.



Hartfield Country Club

Established in 1970 when two neighboring clubs joined forces, The Hartfield Country Club is located just 20 minutes east of Perth at Forrestfield. A lease of 90 hectares of dense virgin bush was granted to the club, and by 1972 the course was open for play.



The clubhouse was built in 1975, and today we see a membership of approximately 850 golfers at Hartfield. Over the past ten years the club has been researching major upgrades. In 1998, consultants were commissioned to produce a course development plan to upgrade the architecture of the course. To date, five holes have been rebuilt and there are plans to complete the remaining holes in the future. As part of this renovation, course officials also decided to upgrade the existing irrigation system. Rain Bird's Nimbus II central control was selected to meet the challenges.

Hartfield has one of the more unique control system demands we have seen. With six different bores and pumps all pumping into a common main pipeline, providing a controlled smooth water supply onto the course was no easy task. Upgrading the existing stand-alone control of PAR+ satellites to the Nimbus II was the first step.

Initially, the unique pump control required provided some difficulty for Nimbus II. Working with Rain Bird software engineers to modify the software, however, the course was able to overcome the challenges associated with managing six pumps and supplying the needed amounts of water to particular locations. Superintendent Tim Chape couldn't be happier.

"It's great to see that one of the irrigation giants will listen to the concerns of their customers and actually modify their software to suit a situation they haven't had to deal with before."

Another area of concern that Rain Bird has been able to help address has been dry patches on greens. EAGLE 700s have been gradually installed to help combat this problem.

"The improvement to the turf on the greens has been amazing since installing the EAGLES. Hand watering of greens is now a thing of the past. We've also been slowly changing out the old rotors on the fairways and replacing them with Rain Bird heads."

As Hartfield Country Club's remodeling of the course continues over the years to come it will be done knowing that the industry's leading irrigation manufacturer is behind them all the way.





Founded in 1897 and located just six kilometres from Sydney's Central Business District, Bonnie Doon Golf Club is Sydney's third oldest golf club and one of the oldest in Australia. Over the past century Bonnie Doon has existed at three separate locations, and legendary American golfers Gene Sarazen and Babe Didrickson were the first to tee off at the current Pagewood course in 1935. Most of the best known names in Australian golf have honed their skills by battling the wind and sandhills of this course's par 71 championship layout.

Bonnie Doon Golf Club

water usage reporting have been addressed with the new system.

Bonnie Doon is located in an area with a very high lightning strike rate, and all it takes is one flash of lightning to damage the computer central control, field satellites, and pump-station. Rain Bird has been able to solve this major worry by installing the StormWatch[™] Lightning Detection and Protection System. In addition to StormWatch, there has been another "invisible" addition to the golf course by way of Rain Bird's new decoder system. such as Flo-Manager[™], Rain Bird's Nimbus II is able to balance irrigation requirements with the efficiencies of the three pump stations, reducing system wear and saving energy. In order to ensure that the course is complying with all local and state regulations, this activity is recorded within the software and reports are easily compiled.

For maximum flexibility, the crew at Bonnie Doon also uses the FREEDOM™ hand-held control. Using FREEDOM, maintenance crews are able to control the entire irrigation from any location on the course.



These Pagewood sandhills were revamped in 1995 by Australian golf course architect Ross Watson. With elevated tees and undulating elevated greens, the key features of this course design intended to emphasize the rugged natural beauty of the landscape. The sand base of the golf course boasts exceptional drainage capabilities. These capabilities are a terrific asset during wet periods, but challenge the irrigation system to provide continuous lush conditions during Sydney's dry, windy warm seasons.

Rain Bird is pleased to have been able to assist Bonnie Doon in its ongoing course development with a wide range of irrigation solutions. Solutions to golf course problems such as lightning, vandalism, multiple pump sites, flow management and Decoders provide excellent protection from that other unwanted visitor to the golf course - vandalism. As golf course superintendent Gary Smith says-

"Both of these new products give us the system security we need to continue to provide the year-round tournament conditions expected for our members and corporate guests".

Rain Bird's Nimbus[™] II central control, with it's ultimate combination of Et-based scheduling and advanced flow management, was selected to control Bonnie Doon's irrigation system.

With three separate pump stations and a road that splits the course in half, Bonnie Doon posed some interesting challenges for the software. However, with features As Bonnie Doon knows, Rain Bird is committed to and welcomes the challenge of providing equipment, service and solutions to all golf course situations as they develop in Australia.



Total control, totally Rain Bird.



When a golf course is the oldest in the land, has hosted numerous national championships, and has had design input from legends of the game such as Carnegie Clark, Dr. Alister Mackenzie, Sloan Morpeth and Jack Nicklaus, it surely must rank as one of the most prestigious clubs in the world of golf.

The Australian Golf Club in Sydney is a landmark in this country. Formed in 1882,

Tour events such as the Greg Norman International.

The golf course is located on the Botany sand belt so the soil does not hold any water for any length of time unless the water table is high. During dry periods, filling of unlined lakes as well as irrigating the golf course imposes great and costly demands upon the bore water supply.

SITE REPORT

accuracy enabled the exact amount (to the nearest mm) of water to be applied to the greens. This also enabled programs to control water supply to the numerous adjacent bunkers, which enhanced their playability.

Using Rain Bird's built-in upgrade path, The Australian Golf Club transitioned from MaxiV to Cirrus[™]. Perfectly good 10-year-old satellites installed during the



The Australian Golf Club.

it represents the first club in Australia and the first to host the Australian Open Championship in 1904. Design changes by Jack Nicklaus have created another Australian first. Strategically placed mounding provides a stadium effect on most holes to accommodate the vast tournament crowds that flock to the course to watch the world's best golfers wrestle with this historic site.

Tournament preparation is something with which this golf course maintenance team has become accustomed. The challenging Kensington layout is frequently requested for Australian Open Championships as well as regular PGA Rain Bird has been involved with The Australian Golf Club since its hosting of the 1990 Australian Open, when the decision was made to upgrade the existing system. Using a Maxi V central control system, the course was able to utilize Rain Bird field satellites in an advanced scheduling package with innovative water conservation features. This optimized the club's water use on its sandy base.

To supplement the fine control available with the new Rain Bird system, two sets of part-circle Rain Bird EAGLE rotors were installed around each green. This allowed watering of the green independently of the surrounding areas. This new-found



lead-up to the 1990 Australian Open did not have to be changed out due to this upgraded system. Cirrus' multi-management central control system takes advantage of the newest Microsoft® Windows® operating system with advanced graphics and 32-bit architecture.

Every tournament at The Australian since 1990 has been a promoter's dream, with big crowds and television audiences watching excellent scoring executed on exceptional surfaces by the world's best golfers.

The course superintendent responsible for all of this tournament success, Robert Ashes, explains that –

"without Rain Bird we probably could not have achieved the goals we set out to achieve".

The Rain Bird Golf Division looks forward to continuing to assist Australia's oldest golf club with the latest golf course irrigation technology available.



Lakelands Golf Club on Queensland's Gold Coast is the first Jack Nicklaus signature design in Australia. Playing 6489 metres off the Nicklaus tees, Lakelands is a thinking player's championship resort layout located just 10 minutes from Surfers Paradise.

The course is a Par 72 that was opened in February 1997. As testament to its class and the great work of superintendent Steve Marsden and his team, Lakelands debuted in Golf Australia's January 2001 top 25 Resort Course ranking at No.7. and is considered one of the most enjoyable, diverse resort-style courses in Australia.

Lakelands Golf Club

during construction, Marsden is quick to note the sand blow problems.

"The site can be windy at certain times of the year and the course was capped with 300mm of sand. One million cubic metres of material were moved during construction. This is where the Rain Bird irrigation system immediately eased construction problems of wind blown sand. The course is watered with EAGLE 700E and 750E VIH rotors and their innovative closed-case design allowed trouble free operation under these testing conditions."



The Rain Bird irrigation system consists of over 1,000 EAGLE 700E/750E VIH rotors, PAR satellite controllers and a weather station. At the time of construction, a Maxi V central control was installed. This control system has since been upgraded to the Windows® based Nimbus system. The system's ability to continue to be upgraded without major expense provides the club a high level of comfort.

Steve summarizes with-"The level of service provided by Rain Bird has been first class well after the installation period. The reliability of the rotors and the ability of the central to fine tune areas with easily written specialized programs to address "hot spots" at certain times of the year are some of the great Rain Bird features that come to mind,"



Another highlight of Steve's involvement with Rain Bird has been his participation in a Select Superintendents Advisory Council. Superintendents from all over the world come together to discuss the future needs of the industry in relation to irrigation. This has provided Rain Bird with significant insights and has helped the company to continue to develop the highest quality trouble-free irrigation products and water resource management solutions in the industry.



Lakelands' signature hole is the breathtaking 117-metre par-3 14th, where the green flanks a waterfall and pond.

"Although the 14th is our signature hole my favorite hole has got to be the Par 5 eleventh," comments Steve.

One of Lakelands' great achievements is turning a featureless piece of floodplain ground into the wonderful golf course it is today. Asked what was one of the challenges Irrigation water is tertiary treated effluent supplied into a 65,000,000-litre irrigation lake connected to some 43 kilometres of pipe. It irrigates both the golf course and extensive landscaping. The irrigation was designed by Paul Jones and Associates and installed by Golf Course Irrigation.

"The system provides great serviceability and flexibility, with the Rain Bird equipment trouble-free from day one," adds Steve.




Royal Queensland Golf Club

The Royal Queensland Golf Club was founded in 1920 by a group of prominent citizens who obtained a lease of 420 acres of land. It has since reduced to about 240 acres fronting the Brisbane River in an area known as Parker Island. The present course was formed by dredging sand from the Brisbane River.

The original course was designed by Carnegie Clark, the National Open Champion of the day. It was opened in 1921 by Governor-General, Lord Forster. The services of the eminent Scottish golf architect Dr. Alistair Mackenzie were retained during his visit to Australia in 1926. His major focus was on the greens and bunkers. The short 8th hole provides an excellent example of his work and design philosophy.

In 1923 the Club was granted its Royal Charter and in the same year there followed an exchange of gifts with the Royal and Ancient Golf Club of St. Andrews. Royal Queensland presented to St. Andrews a silver boomerang which is currently played for annually by St. Andrews as the "Queensland Silver Boomerang".



In return, Royal Queensland received a replica of the famous "St. Andrews Silver Club". A prized trophy played for annually by the Royal Queensland Members.

As Royal Queensland grew, so too did its need for an expanded irrigation system. Facing continual water supply issues, the club opted for the features and control offered by Rain Bird's Nimbus central control system.

Until 1997, Royal Queensland irrigated

using Brisbane City Council potable water. This proved to be both a technical (low water pressures) and financial limitation. During the investigation of new irrigation options, consulting engineers suggested that the Club use Council Treated Effluent water. With this option, however, came the massive task of placing a pipeline under the Brisbane river.

In conjunction with this change, pump stations were upgraded, EAGLE rotors replaced older, less efficient heads, PAR+ field satellites with the Aquagator Hydraulic Converter were installed, and Rain Bird's Nimbus central control software brought irrigation control to its height.

Superintendent Kelly Hyland explains "Features like Dry run[™] give me the ability to calculate how long I need to run my injection pumps when injecting calcium or lime into the system. The Cycle and Soak[™] feature also helps me maintain an even watering on different soil types."







Sanctuary Lakes Golf Club

How appropriate a name for a resort that boasts a unique wetland area that is in fact a sanctuary for migrating birds from all corners of the globe. With its network of wetlands and lakes that are kept at specific water levels to ensure the success of plant and insect life crucial to these migrating birds, the resort is a true stop over for our feathered friends from Chile, Russia and China.

With such a sensitive ecosystem surrounding the course it is no wonder that Sanctuary Lakes chose a Rain Bird Cirrus control system. With flexibility down to individual valve control and features such as Smart Weather, [™] which can turn off programs or schedules affected by high wind, the Cirrus decoder system is living up to it's reputation as the industry's leading water management software.

The resort has come a long way since the days when a group of Malaysian businessmen purchased 467 hectares of land that was once the Cheetham Salt Works. Originally purchased with the concept of a 4500 lot residential project, the group's vision turned towards a more resort-oriented project. Together with the vision of Stephen Head of Asset Solutions, a golf style resort living environment was conceived. Greg Norman was contracted to create Victoria's first Norman designed golf course, and the rest as we say is history.



With 2200 residential lots and various town-house areas scattered throughout Sanctuary Lakes, it is truly a unique place in which live. With a health and recreation club, a café, and a huge man-made salt-water lake, there is no shortage of activity and beautiful landscape. In addition to the golf course itself, Cirrus also controls all of these landscaped areas.

The golf course is a challenging Par 72 links-style course. With over 1200 EAGLE 700s connected to Cirrus via a two-wire decoder network, the system provides Superintendent Peter Jans a high degree of flexibility in watering his course. "Features such as Dry-run, individual station run time adjustments, the FREEDOM' remote control system and multiple schedule starts give me all the flexibility I need. Having true "instantaneous" two-way communication gives me confidence in the system, knowing as soon as I switch something on that it is working in the field. It's also nice to know you have Rain Bird back-up just down the road. If I ever have an issue, support is usually on-site the same day."

With 25-30% of the 2200 lots sold already, 700 golf members, plans for a sailing club, a hotel with serviced apartments, and a planned conference center, the resort is shaping up as a world class destination. Plans are also well under way for an Australian PGA Tour Event in the coming 4 to 5 years.

Looking forward to the coming years and the resort's continued expansion, Rain Bird is proud to be able to provide a system that can not only cope with a championship golf courses needs, but be flexible enough to manage the watering of the entire resort's landscape. This truly is a unique installation!



You have found the ideal piece of land for a golf course just 30 minutes from the Melbourne CBD. A group of Melbourne businessmen have a dream that will be known as "The Heritage Golf and Country



Club." What do you do next? Why not employ the man known as Mr. Golf to put together a golf course design to realize 165m hole features a tee shot across a lake to a green set back into a quarry face. It is both beautiful and daunting.

Environmental issues are becoming increasingly more important in the construction of golf courses. This was no exception at "The Heritage". A man-made wetland area had to be constructed to fulfill government requirements. Rain Bird takes great pride in knowing that its irrigation system will fit into the strictest of environmentalist requirements. With the Cirrus control software, superintendent Sam Myott knows he has the ability to turn programs off or on depending on climatic conditions. This is particularly important in environmentally sensitive areas.

Already familiar with Rain Bird central

have on the Cirrus software straight away has also been very much appreciated."

A combination of over 1,200 EAGLE rotors provides the quality of coverage required on such a prestigious course.

Coming early in 2002, is the Sebel Lodge, a 102 bed hotel complete with conference facilities. Together with a



The Heritage Golf and Country Club.



your visions. That's exactly what Yarra Valley Golf Pty. Ltd. has done by commissioning the one and only Jack Nicklaus to design its masterpiece.

Set on 400 hectares of prime Yarra Valley land, The Heritage Golf and Country Club is set to make a dramatic impression on golf in Australia. Built into some of the most beautiful countryside in Melbourne, "The Heritage" shows exactly what can be done with the right site and the right architect. At 6667 meters from the back tees, the course has something to challenge every golfer. Perhaps the greatest test can be found on the Par 3 11th hole. This control from his time in the Philippines, Sam has well and truly landed on his feet by inheriting Rain Bird's premier software package.

"The Rain Bird Cirrus software is another great progression from the Nimbus software I had previously used. It's great to see how Rain Bird upgrades and enhances field-proven equipment. The flexibility I have with Cirrus is fantastic. Being able to work off of a map of the golf course and knowing sprinklers are working the moment I turn them on makes my life easier. Rain Bird's back up and support answering any questions I recreation center due to start construction later this year, the facilities will be second to none in the area.

With another 18 holes planned for late 2001, we look forward to being able to provide the answers for "The Heritage". Since Cirrus can handle up to 54 holes, whether that includes decoder control, a combination of decoder and satellite control, or even decoder, satellite hard wire and satellite radio control, we at Rain Bird are ready for anything they will send our way!



The Thirteenth Beach Golf Links at Barwon Heads is a course that architect Tony Cashmore has been dreaming of building since 1990 when he first saw the piece of land that was once an asparagus farm.

The land's owners, the McNaughton brothers, and several Asian investors made plans to build a golf course under Tony's direction. However, economic difficulties in Asia caused this deal to fall through, and plans were stalled. Persistence finally paid off when Tony convinced Duncan Andrews, owner of the Dunes Golf Links at Rye, to form an alliance with the brothers. Construction began in September 1999. Par 4 holes that tempt you to drive the green, several stunning Par 3 holes set beautifully into the natural surroundings, and the 14th hole with its massive 612 meter length will have you back to this course time and again.

Located along the sea with high winds and a sandy profile, Thirteenth Beach Golf Links provides some interesting irrigation challenges. To combat the effects of the wind, Rain Bird EAGLE 700 rotors with dual spreader nozzles were used. These dual spreader rear nozzles are industryleading for both distribution and performance at coastal locations. They are used at such

Thirteenth Beach Golf Links



Given that the land was once used for farming, there are now some amazing contrasts for golfers to enjoy. Remnants of the farm can still be seen at the 5th tee, where the original irrigation pump has been restored. On the 14th fairway, the furrows used for growing asparagus remain in view.

There is something for every golfer on this course. Extremely challenging short

high profile courses as Pebble Beach Golf Links® and Cypress Point in California. Construction superintendent, Mark Gahan, required the use of part circle rotors along the edges of fairways so as to minimize the water that is thrown on the native grasses making up the rough.

Water is supplied from an 8" pipeline from the Black Rock Sewage Treatment Plant. Because this course will eventually include residential areas and the use of recycled water is prevalent, course designers chose the advanced control of Rain Bird's



Original irrigation pump from Asparagus Farm

Nimbus II central control to ensure that the right amount of water is being used at the right locations. Nimbus II offers users the ability to turn programs and schedules on or off depending on climatic conditions. As such, superintendent Steven Hewitt knows that he can create reaction programs for high winds using either a central weather station or a remotely located wind-sensing device.

"Knowing my system will pause if there is a power failure at the pump station and automatically resume when the power comes back on is another neat feature of the Nimbus II software. I've found the Nimbus II software to be extremely user friendly and have picked up all I really need to know in just a few weeks since coming on board at Thirteenth Beach."

Construction superintendent Mark Gahan adds,

"The irrigation system has gone in smoothly right from the word go. Irrigation contractor Rain Link has done a great job following in behind my construction giving me access to automated irrigation the moment a hole is finished. The Nimbus II decoder system really has been everything I have asked for."

With Rain Bird's network of preferred golf contractors around the country, you can rest assured that the system will be supported throughout the installation as well as through the life of the system.



Mount Osmond Golf Club

In 1925, land on a mountain that overlooked the City of Adelaide was purchased for a golf course.



In 1927 the Mount Osmond Golf Club occupied 98 acres of prime real estate some 1350 feet above sea level. Given its mountain top location, the club has always had problems with water. Initial supplies land and bore from the suppliers of this water for \$25,000 and subsequently sunk an additional bore in the same area.

The course was closed during World War II, and the clubhouse was used as a convalescent hospital for servicemen. With the exceptional efforts of Mr. Cliff Ramsay, the club was re-established after the war.

Ash Wednesday of 1983 was another setback for the club, with considerable damage being done to the course and infrastructure such as the maintenance shed, the pump shed and all associated equipment.

During the club's Annual General Meeting in 1996, a recommendation was made to employ an architect to design a master plan for the golf course. The motion was passed the next year, and



came from a well at Waterfall Gully. In 1963 a 4 million gallon concrete reservoir was built on the course, and the club purchased water at 20 cents per 1000 gallons. In 1975 the club was able to purchase the in 1998 Tony Cashmore was appointed the golf course architect. In 1999, Rain Link became the irrigation contractor and a 5-year renovation plan began.

By the end of 1999, four greens were

rebuilt. By the following year, two more greens, a practice area, and a spare green were also constructed. Construction on four additional greens and work on several fairways is currently underway.

Prior to these renovations, a standard residential style irrigation controller of 8 stations was used to automatically charge sections of mainline around the course. Staff would plug impact type sprinklers into the mains that were to be charged each night. It was a time-consuming and inefficient method of irrigating.

Due to the nature of the step-by-step improvements to the course, a Rain Bird Nimbus Decoder system was chosen. Due to a high calcium content in the water superintendent Bryan Cooper decided to test sprinklers from 3 different golf rotor manufacturers. The Rain Bird heads quickly proved that they were able to handle this water type better than those of other manufacturers and the decision was made to go with a combination of 700B, 750B and 700E EAGLE rotors.

"Being such a windy site the dual spreader nozzles on the EAGLES are performing beautifully. We have had the hottest January in 80-90 years so it has been critical that our sprinkler performance on new greens be perfect. The EAGLES have not let us down. The Nimbus software has been very easy to get used to and having control of both my fertilizer injection and acid dosing pump through the software is great," comments Bryan.

The course, located on the ridges of Mt Osmond, is understandably in a difficult location for an irrigation system installation. A near solid rock profile under the top soil has required rock breakers to do most of the trenching. Sand bedding was also required prior to pipe / cable laying. Add to that the routing of the Telecoms, main fiber optic trunking cable from Adelaide to Melbourne passing through the course and you have a very difficult irrigation installation environment. All credit to Rain Link for the smooth installation.



Launceston Casino Country Club



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Tasmania's country retreat, the Launceston Country Club Casino Golf Course is a public access course that offers some of the best golfing facilities available in our southern-most state. An 18 hole Par 71 championship layout, the course really does offer a challenge to even the best of golfers. Set amongst a beautiful Tasmanian bush backdrop, the course offers a true resort-style atmosphere. Hopefully what you lose on the golf course you can pick up later in the casino.

Construction of this Thompson Wolveridge-designed golf course began in 1980. Initially, a nine-hole layout was to be built along with the construction of the Casino and Hotel. During construction, planners decided to extend the course to a full 18-hole facility. Water for the irrigation system is pumped from the Trevallyn Dam into the main lake on the course. From here it gravity feeds down to the irrigation lake where it is then pumped onto the golf course.

Much of the original Rain Bird irrigation system is still in operation today. Rain Bird 51DR impact rotors are still being used on the course today as they were some 20 years ago when the system was installed. An original electromechanical Rain Bird control system was replaced in the late 90's by a custom-built control system. As we have seen on many occasions on many courses, custom built systems by non-irrigation companies are not always the answer to your control system needs. It was only a few years later that a Rain Bird Stratus[™] II Decoder system was researched and installed during 2000.

Installed by The Pump Shed in Launceston, the system really does illustrate the ease of upgrading ANY control system to the latest in Rain Bird irrigation technology. Superintendent Steve Wilson, who hadn't spent a lot of time on computers, was understandably wary of the system after it was installed. It's great to talk to Steve, less than 12 months later, and see how his way of thinking has changed.

"The software has been a lot easier for me to learn than I first thought. Writing programs is extremely easy and having the Dry run facility to show me how they will run during the night is great. We used to have at least one pipe break every couple of weeks with the old control system. The Flo-Manager in Stratus II has virtually eliminated that. The ability



to run banks of sprinklers manually in the field through FREEDOM is also fantastic. The support from Rain Bird on this new system, which is the first of its type in Tasmania, has also been great." I don't know how we got by before the Stratus II was installed!"

There are a lot of golf courses out there in the same situation as the Casino course in Launceston. It's good to know that we at Rain Bird have the answers to their needs.

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Why choose Rain Bird rotors? Because we have been providing golf courses around the world with exceptional performance for 10 years, proving that advanced technology can have practical applications:

- Superior uniformity of water distribution in all head to head spacings: Continued nozzle innovation and high nozzle pop-up height contribute to even coverage in all turf types.
- Outstanding quality and consistent reliability: Superior debris resistance with proven quality features such as the closed case design, self-flushing action and water lubricated gear drive.
- Easy "Top Serviceability" access for use and maintenance: Exclusive top serviceable parts like the Top-Serviceable Rock Screen™ provide easy access without digging up the rotor.

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