

Environmental Issues for Golf Course Architecture Kooindah Waters Golf Club

By Dean Scullion

Introduction

Kooindah Waters golf and residential resort is located on the New South Wales Central Coast is 80 minutes drive north of Sydney and 1km east of the Wyong city centre.

Clarendon Resort Housing (CRH) has developed a Ross Watson designed 18 hole golf course which is surrounded by 252 dwellings, 5 star resort, clubhouse, leisure club and 108 accommodation apartments currently under construction.

Kooindah is managed by Troon Golf and maintenance managed by Turnpoint Maintenance.

Construction began in February 2004 with practical completion being granted in February 2006.

Bulk and civil earth works were completed by Robson Civil Engineering while Turnpoint completed the golf course & landscape construction, shaping, finishing on the golf course.

Prior to construction the site had been described in the Environment Impact Statement (EIS) as highly degraded.

On the site extensive earth works and the removal of vegetation had occurred, dense weed infestations had colonized the earth works areas and actual and potential acid sulphates had been placed at the surface following the excavation of lakes.

Large amounts of fill material had been spread across the site some containing coal chitter which was considered contamination.

Additional challenges were faced where a Drum dump had been declared over what would be holes 10 & 11. The drum dump was due to a fire of stored paints onsite in 1987. Soils contained heavy metals and extensive remediation was required.



Site Description

The site is located within the flood plain catchment to the Wyong River and is bounded in the west and south east by two protected Sepp 14 Wetlands (Coastal Wetlands).

A drain system to the east, (Zairs Drain) flows through the Sepp 14 wetlands and is also a declared sensitive site by Wyong Council.

The southern edge of the site is located 100 metres from the Wyong River which is a main artery into the sensitive Tuggerah lake system approximately 2 Km to the south east.

All water that leaves the site naturally migrates to the Wyong River after filtering through Kooindah's extensive wetland system.

The topography of the site was characterised as flat to gently undulating terrain with low relief, with the average site level being 1m AHD.

Groundwater is located between 0.5m and 1.3m below ground surface with samples tested showing high acidity levels and concentrations of some heavy metals.

The history of the site showed the local community had been using the area as a dumping ground for all kinds of waste. Car bodies, steel, household rubbish, garden waste and in particular drums of old paint had been dumped on site creating a significant environmental hazard for the wetlands and community.

Design

Ross C Watson Pty Ltd was appointed by CRH to provide comprehensive Golf Course Design services for the Kooindah Resort.

Ross is renowned for designing golf courses that build on environmental qualities and do not compete with the local environment.

Ross brought with him a team that included David Hanby (Irrigation) and John Neylan (Agronomy).

Kooindah is 6083 metre Par 72. The design offers three distinct character precincts:

- Residential Golf
- Parkland Golf
- Open Wetlands (OW)

The routing of the course is structured to entwine the three experiences as much as possible. Hole layouts are summarized as follows:

- | | | | |
|--------------------|-------------|----------|-------------|
| • 1, 2 | OW | • 14 | OW |
| • 3, 4, 5, 6, 7, 8 | Parklands | • 15 | Residential |
| • 9, 10, 11 | OW | • 16, 17 | OW |
| • 12, 13 | Residential | • 18 | Residential |

A key element of the golf course design and landscape strategy has been the incorporation of existing strands of regenerating Swamp Forest Complex and existing areas of SEPP 14 wetland, together with the artificial wetland system.

Individual stands of Swamp Mahogany Forrest have been linked to form corridors between the two SEPP 14 wetlands, creating physical links between these two features.

Landscape plants have been established in an onsite nursery with over 300,000 plants being added to the golf course during construction.

80% of these plants had been harvested from the surrounding wetlands providing Kooindah with a fast growing site specific indigenous species.

Trees include: Swamp Mahogany , Sydney Blue Gum, Turpentine ,Rough Apple Bark Melaluccas, Casurnas, Banksias, Christmas bush and Bottle brush have been planted. The design has been responsive to revegetation of cleared and degraded areas of the site. Landscape species associated with the Alluvial Flood plain have been used to provide habitat and corridors for wildlife.





- A family of 5 Squirrel Gliders, listed as a vulnerable species have taken up residence in 1 of 11 nest boxes set up for this purpose.
- 69 bird species has also been recorded on the site.
- Frogs have taken to the constructed wetlands although the exact species still have to be identified.

Extensive arrays of grass swales and water bodies have been constructed over the golf course.

The approximate areas are as follows

- Existing Wetlands 80000m²
- Constructed Wetlands 82000m²
- Lakes 48000m²

Constructed Wetlands (Grass Swales) are shallow between 0.3m and 0.6m planted with indigenous macrophytes .eg Juncus ,Eleocharis, Shoenus & Isolepis. These wetlands (Grass Swales) provide filtering and nutrient stripping points for improving water quality.

All golf course water drains to the constructed grassed swales and water is tested every 3 months for nutrient content and loads. This testing is reported to council on an annual basis.

The majority of drainage has falls of 0.5% making the shaping and design of the site critical to removing surface water.

This aspect is considered one of the strengths of the site. The site can confidently manage heavy rainfall of +50mm exceeding construction expectations.

Constraints of the Development Approval.

Approval from regulatory bodies included:

- Wyong Shire Council
- Planning NSW
- Department of Land & Water Conservation
- Environment Protection Authority
- NSW Agriculture
- RTA
- National Parks & Wildlife Services
- NSW Fisheries
- Coastal Council of NSW
- Tuggerah Lakes Estuary & Coastal Management Committee
- Rural Fire Services

Technical Studies required for DA included:

- Kooindah Master Plan Golf Course Design Report
- Environmental Impact Statement
- Vegetation Management Plan
- Wildlife Management Plan
- Flora & Fauna Assessment
- Stormwater Management Plan
- Wetlands Management Plan
- Acid Sulphate Soil and Environment Site Investigations
- Acid Sulphate Soils Management Plan
- Kooindah Golf Residential & Resort Master Plan
- Flood Impact Assessment
- Aboriginal Archaeological Assessment
- Bushfire Threat Assessment

Ross will elaborate more on the process and challenges during the presentation.

Maintenance Program

Fertiliser

In 2003 John Neylan supplied a detailed Fertilizer Management Plan that is strictly adhered to at all times.

A FMP is required as part of the Wyong Shire Councils Development Approval. The council approved the plan which allows the following loads of Nitrogen and Phosphorous per annum.

- Nitrogen 172 Kg/Hectare and Phosphorous 50 Kg/Hectare for Tees and Fairways per annum
- Nitrogen 150-200 Kg/Hectare and Phosphorous 50-80 Kg/Hectare for Greens

A nutrient register is kept onsite recording all annual fertiliser applied and the actual N:P:K in kilograms/ 100m². This confirms the FMP is being followed.

Light frequent leaf applications are made to Greens, Tees & Fairways with no fertilisers being applied to the Roughs. Spoon feeding in this manner reduces the risk of nutrient leaching and maximizes nutrient uptake.

The Roughs provide the buffer between the Wetlands and the Fairways. No fertilising occurs within 5 metres of the Sepp 14 wetland boundary.

Soil samples are taken on a 6 monthly basis of Greens, Tees & Fairways so to monitor nutrient and to only apply the elements that may be deficient. Sampling also helps us amend the Fertiliser program as required.

Fertiliser storage is kept to a minimum to reduce the risk of storing a dangerous goods, the onus is put on the supplier to supply and deliver the fertiliser a day or two before the planned application.

Chemicals

Pesticides are applied only when critically needed.

Although a fungicide preventative program is applied to all greens throughout summer to protect the clubs greatest asset.

Insecticide is only applied if damage to the plant is considered to affect or disrupt play. Herbicides are applied via a Controlled Droplet Applicator (CDA) or via Knapsack spot spraying this has reduced the amount of herbicides applied conventionally by 50%.

Chemical storage is kept to a minimum to reduce the risk of storing a dangerous goods, the onus is put on the supplier to supply and deliver the product a day or two before the planned application.

Irrigation

- The water is drawn from a subterranean aquifer via 5 Bores
- The water quality is very poor with the Ph dropping to 2.9 during summer.
- The water also contains elevated iron, aluminum, sodium and chloride levels.
- This is due to the Lake level dropping to a point where acid sulphates affect water Ph. This happens during the heat of summer when the system is under pressure.

The lake is actually constructed in a sand lense and it was decided for cost reasons not to have it sealed, the lake will also recharge during rainfall as the aquifer rises and water leaches through the sand without the help of the bores.

If the lake level is pumped below RL -0.5 saline water from the Wyong River could enter the irrigation storage lake and make it unusable.

As the water table drops during dry periods so does the lake regardless of the fact we are pumping in 1 Meg a night from the bores.

The bores are programmed to transfer water leading up to the night's irrigation so we can make use of the 1 Meg pumped in. We estimate we lose 120,000 litres to the aquifer via the sand lense during dry periods. Irrigation is scheduled to coincide with the lake being at its highest point during any one day.

We have had extended dry spells where no irrigation was applied to fairways.

Water Samples are being taken from the Bores and the Irrigation storage lake on a 6 monthly basis to monitor water quality. In addition monthly water samples are taken from the 5 Bores and the storage lake to monitor TDS (Total dissolved salts) and Ph this is done via a small Hannah Hand Meter.

The storage lake is constantly monitored to ensure the TDS levels remain stable and to keep an eye on Ph.

The monthly sampling is recorded and kept onsite.

Greens Tees & Fairways are irrigated surfaces.

All irrigation & rainfall run off is designed to drain back to the drainage swales.

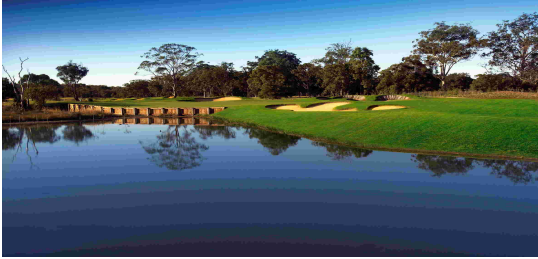
Most swales also have a sand lense that we located at RL 0.3, the water in the swales leaches through the sand lense and find its way back to the aquifer technically to be re-pumped to the golf course, a natural recycling process.



THE E-PAR ENVIRONMENTAL MANAGEMENT SYSTEM AT KOOINDAH WATERS GOLF COURSE

History

The Kooindah Waters Golf Course is located at Wyong on the NSW Central Coast. Bounded by SEPP 14 wetlands and in close proximity to Tuggerah Lakes our course is part of a very sensitive environmental zone.



With a firm commitment to environmental stewardship, a decision was made to develop an environmental management system. We wanted an easy to follow system, one that met international standards, was golf specific and importantly cost effective.

The system we chose was e-par. This is an EMS designed by Terry Muir. It has won environmental and innovation awards and was designed specifically for golf course superintendents and their clubs.

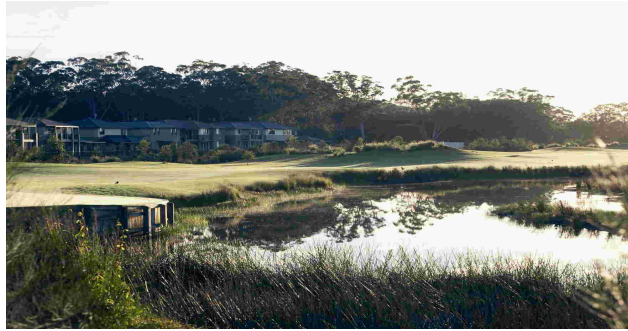
EMS DEVELOPMENT AND IMPLEMENTATION

The development of our EMS commenced in February 2006. We had two options – the first was to build the system ourselves using the e-par system or we could engage Terry to build the system for us.

The risk of an environmental event in our line of work is simply too great to ignore. I needed to provide myself and the club reasonable protection in the event of an environmental incident and wanted to get our EMS up and running. I chose to engage Terry Muir to build our EMS using the e-par system.

To begin the process of developing and implementing our e-par EMS an initial review of our operations was conducted by me under the instruction of Terry. This provided me with a broad snapshot of our current environmental status. It took about 2 hours and whilst we had all the best infrastructure with new washing, chemical, storage and fuelling areas we lacked operational procedures, training and induction and evidence of a commitment to the environment.

An environmental policy statement was developed using the templates and examples in the epar program which was completed in a timely manner. Our environmental policy outlines our commitment to the environment and is signed by senior management.



Environmental risk assessments.

The site provided an exceptionally challenging situation to complete an environmental risk assessment. The worksheets in the e-par program provided a clear and systematic procedure which offered a smooth and timely completion of the assessment.

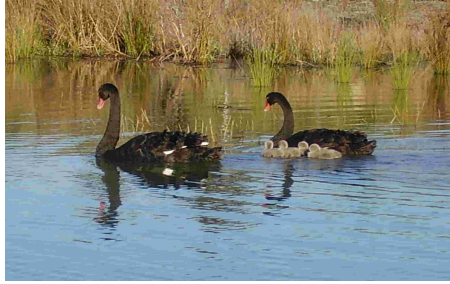
All the activities we would undertake are listed in the worksheet together with their potential impact on the environment. All I had to do was score each activity. This assessment showed a number of areas where we needed improvement but it also showed over 21 positive environmental risks which I was able to document.

This risk assessment process then drove the rest of the EMS process where strategies were put in place to manage the identified risks. For example, it was identified that the lack of staff environmental induction/awareness was a significant issue. We quickly addressed this by writing out an action plan stating we would run an awareness seminar. We ran the seminar as part of our EMS training and effectively demonstrated we were managing the risk.

Another example was fuel delivery in which we had no procedure in place. We had a new facility but no procedure. We downloaded the fuel delivery procedure from the epar program and managed that risk as well. All the documents we needed were in the program. We have now implemented standard procedures for all of our significant activities using the e-par program.

The epar program then took us through the process of building an organisation chart following the templates supplied. Then a Matrix showing our communication protocols with stakeholders was also built using the e-par examples and templates.

In case we have an environmental emergency we are also prepared at Koindah as the epar program provides us with an emergency preparedness and response matrix. One feature of e-par that I really like is the daily and weekly checks. These are just simple checklists of important parameters that are checked off every day. For example we have a fuel tank visual inspection procedure and the checklist requires a visual check of the tank and the bund daily. Recently during one inspection I found the emergency shut off was faulty. I was able to rectify it immediately before any emergency situation developed.



CONTINUAL IMPROVEMENT AND REPORTING

At Kooindah we are committed to continual improvement in environmental performance and Terry is always advising us to communicate and educate how well we are performing environmentally.

We have now used the e-par program and have conducted a Community Forum on 28 September 2006 to communicate our innovative program of environmental stewardship to 60 of our neighbors and local regulatory agencies.

Having the e-par EMS we are confident that everyone working for or on behalf of Kooindah is competent to meet their environmental responsibilities. We use the e-par program environmental induction booklet to induct all staff and we use the contractor's procedure to induct contractors.

Using the e-par program I can develop environmental action plans that lay out actions I want to achieve within timelines that we set. Not only do we set action plans but we monitor performance in the e-par EMS Register. Using our EMS we can document 300,000 native plantings, the return of squirrel gliders to the site, nutrient testing and performance.

Learning Outcome

I found there are many benefits of having an EMS including improved management of environmental issues related to the operations and maintenance of our golf facility. There is increased staff awareness, everyone is accountable for their actions and I am confident we are prepared in the event of an environmental incident.

The e-par EMS was flexible and specific to golf and what superintendents need and I particularly like the programs user-friendliness. I found it a straightforward and affordable system that helps me move towards compliance at my pace

The benefits that can be gained from the e-par environmental management system make its use at Kooindah good business sense.