

Karratha Country Club
Green the Greens Project

**FINAL GOLF COURSE MASTER PLAN
&
IMPLEMENTATION REPORT**

May 12, 2014



Contents

1.0 - Executive Summary	4
1.1 Master Planning	4
1.2 Irrigation.....	5
1.3 Agronomy	5
1.4 Cost Summary.....	6
2.0 – Comments on Current Golf Course.....	8
3.0 - Completed Tasks of Design Brief.....	9
3.1 Initial Site visit and Project Initiation Meeting.....	9
3.2 Delivery of Return Brief	9
3.3 Initial Evaluation Report and Draft Master Plans	9
3.4 Final Golf Course Master Plan and Implementation Report.....	9
4.0 – Preferred Master Plan Option Summary.....	11
4.1 General Overview	11
4.2 Summary of Option 2A, 2B and 2C.....	12
5.0 – Preferred Master Plan Option – Hole By Hole Analysis.....	15
6.0 – Agronomy	22
6.1 Existing Topsoil	22
6.2 The Greens Mix (sand and amendments)	22
6.3 Water Quality	22
6.4 Grass Selection.....	23
6.5 Grass Planting During Construction	23
7.0 – Irrigation	25
7.1 Qualifications for Budget Estimates	25
7.2 Staging Irrigation works.....	27
8.0 – Landscaping	29
9.0 – Club Consultation.....	33
9.1 Questions and Answers	33
9.2 Additional Golf Holes	34
10.0 – Construction Methodology	36
10.1 Funding	36
10.2 The Choice of Construction Team	36
10.3 Irrigation System.....	38
10.4 The Growing and Cyclone Season	38
10.5 Possible Staging of Works	39
11.0 – Construction Costs.....	40

11.1 Part 1 – Pre Construction	40
11.2 Part 2 – Main Construction	42
12.0 – Maintenance Program and Costs	45
13.0 – Conclusion	46

1.0 - Executive Summary

Richard Chamberlain Golf Design (RCGD) was commissioned in December 2013 by The Shire of Roebourne (SOR) to review the current golf course layout of the Karratha Country Club (KCC). The technical team of RCGD was to include golf course designer, irrigation and agronomical assistance to design and establish cost effective grass greens to replace the current sand scrapes at the 18 hole golf course.

The project consultancy brief included the following stages of deliverables:

- a) An initial inspection of the golf course and preliminary meetings with the Project Control Group (PCG) which included representative from both the SOR and the KCC.
- b) An initial Evaluation Report based on initial thoughts on the golf course and preliminary design ideas and recommendations
- c) Three Draft Master Plans of the proposed golf course which involved various design scope change options to the current golf course hole layout.
- d) Discussion with the KCC members and PGC to determine which Master Plan option should be adopted for the ongoing design process.
- e) Approval to proceed by the KCC and SOR into the Detailed Design phase and finally the Construction Tendering process when funding was available.

1.1 Master Planning

The Master Planning process has been completed and four Draft Master Plans were prepared for consideration, being mindful that all four course layout options were kept clear of possible future other land development zones around the clubhouse precinct and also the wetland zone to the south. This process is effectively a conceptual process of how the future golf holes should fit within the confines of the entire site boundary.

Option 1 – Construction of the new grass greens in virtually the same locations as they are currently located. This option was to involve minimal change to the routing of golf holes.

Option 2 – Construction of new grass greens with provision to make intermediate changes to the overall routing of golf holes.

Option 3 – Construction of new grass greens with provision for an additional component of a future development zone to the east of the current clubhouse precinct. This routing option of golf holes could allow for major change to the routing of golf holes

Option 4 – This Draft Master Plan option was added to the additional brief by the golf course architect to provide an alternative attempt of golf holes (particularly the back nine holes) in an effort to unearth a radically different mix of golf holes. Whilst it did reveal some extremely different types of golf holes it was quickly acknowledged that the revised golf holes would not be any better than the previous golf hole layouts, and the additional cost of construction would not be cost effective. This draft option is not to be considered in the final options for consideration.

Discussions between RCGD and the PGC and the KCC golf club members have revealed that Option 2 should be adopted for the next phase of design and ultimately the end goal for the golf course. The blend of golf holes on the course (many of them is the same framework of the current golf holes) are very good and with the implementation of well-designed grass greens will ensure the Karratha Golf Course is highly regarded by all skill levels of golfers.

It should be emphasised at this point that the current layout of golf holes on the course is excellent and the gently rolling terrain and free draining sand profile beneath is perfect conditions for “links type” golfing.

Whilst Option 2B has been chosen for the future direction for the golf course there will still be an opportunity to release some land to the east of the clubhouse for future development. Careful consideration has been given to the design of the golf routing so that this transition (if required) will be as seamless as possible. There would of course be additional changes to the course required, to administer this land release however the transition to Option 2C would only require two new golf holes to be re-built. Many of the other Draft Plans considered would involve the recreation of 5 or 6 additional holes, and this was a major consideration in the final decision.

The release of this additional development zone may prove to be an incredible opportunity for revenue within the club and will certainly be a focal point on the ongoing strategic plans with the KCC and SOR.

1.2 Irrigation

The Irrigation specialist on this project (John Pryor – Hydrogold Pty Ltd) provided an initial site inspection of the current reticulation system and also looked at water supply and quality. It was quickly determined that the current system is in poor condition and its components design is not to required golf course standards.

It was recommended that the entire system needs full replacement which includes:

- Pump station
- Control system
- Mainlines
- Lateral supply lines
- Sprinkles

It was also revealed that the current effluent water supply is adequate in quality however the turf health will definitely be improved with the upgrade from “Class C” to “Class A” recycled water as being programmed by the Water Corporation.

At present one supply tank exists on site and holds approximately 0.6 Mega litre of effective water storage. When assessing the supply and distribution of water to a golf course the “worst case scenario” should be considered as to how much watering could be provided from this one tank as a result of the supply being stopped from the treatment plant.

If there was a significant problem with the supply of water to this tank the 18 grass greens could be watered, and kept alive for approximately one weeks. This would only include the watering of greens with no water supplied to water tees or fairways. In an effort to lengthen this time period for a “worst case scenario” there should be an additional tank provided on site.

The addition of a second storage tank could either extend the lifeline of the putting greens or share this emergency supply of water amongst the greens, tees and fairways.

1.3 Agronomy

Initial site inspections revealed the current golf fairways to be in excellent condition in such a harsh environment at Karratha. Both the older fairways of common couch grass and other various grass types were in good condition however the presentation and health of the newer Santa Ana Couch grass were of a very high standard. The agronomy consultant (Geoff Bennell –

Turfgreen Pty Ltd) was buoyed with enthusiasm for the future recommendations for the grass selection on the greens even with the high temperatures, use of effluent water and high salt content in the soils.

There are various types of grass types being considered for the putting greens however the final decision is recommended to be based on trial testing of grass options in strategic nursery areas within the course. In addition to the grass selection there are significant investigation required to the soils and sands currently on site. The fairways will be planted directly on top of the current native soils however there will certainly need to be additional soil amendments to maximise the grass root growth.

The “greens mix” is the growing medium directly below the surface of the putting greens (generally about 300-500mm deep). This sand is extremely important in the health of the playing surface and is often imported onto site. Importing sand from a distance would be an extremely expensive proposition in Karratha. However the Agronomist is very confident that some sort of manipulation mixture with the current native sand can be adopted for the “greens mix”.

1.4 Cost Summary

There are more detailed cost estimates provided later in this report however the table below provides the basic summary of cost to achieve the development of Master Plan Option 2B with grass greens. This table includes all costs to establish the construction site, build the new golf holes and putting greens, construct a new maintenance compound and purchase all necessary equipment.

There are also spreadsheets provided that outlines the anticipated ongoing annual maintenance budget and costs for the golf course once constructed.

Construction Summary			
Description	Unit		Cost
Phase 1	Pre-Construction Includes: <ul style="list-style-type: none"> - Establishments of turf nurseries and test plots for putting green possibilities - Construction of some tees - Clearing and preparation works for new fairways - Essential Irrigation works 		\$880,000
	Capital Costs Includes: <ul style="list-style-type: none"> - Construction of maintenance shed and offices - Construction of Soil Bins - Construction of Wash Down facility 		\$410,000
Phase 2	Main Construction Includes: <ul style="list-style-type: none"> - Construction of new putting greens, tees and fairways - Grassing of golf holes - Completion of Irrigation works 		\$1,571,000
	Capital Costs Includes: <u>Machinery and equipment</u> <ul style="list-style-type: none"> - Superintendent Work Utility - Tractor - Mechanic tools and box - Arc/Mig Welder - Radios - Turf tender - Trailer - Small hand equipment (whipper snipper, mowers etc.) - Hand tools <u>Security Fencing</u> <ul style="list-style-type: none"> - 1.2m Post and wire strand - \$20 per linear m. x 2000m - <u>Additional Water storage tank (\$140,000)</u>		\$324,000
Total			\$3,185,000

This report and Master Plans now requires consideration by the relevant stakeholders being the Shire of Roebourne and the Karratha Country Club to determine the preferred Master Plan and when and how design and construction staging can occur.

2.0 – Comments on Current Golf Course

It has been mentioned many times throughout this project that the RCGD team initial exposure to the golf site at Karratha was an amazing surprise. There were many aspects of the site that provide a fantastic canvas for its re-development. In saying that, the existing layout is excellent and its sand greens are “quirky” however the inclusion of well-designed grass greens, with first class playing surfaces will lift the quality of this golf course to a much higher level.

It should also be explained that there are various types of golf courses around the world. Much of the British Isles features “Links Golf” whereby the land is gently rolling and sits atop excellent free draining sand. Its vegetation is minimal on the site and it usually sits against the ocean and is greatly affected by the predominant winds. Its sandy subsoil is generally suited to a firm surface and subsequently produces finer grass types that allow for golf shots to be bounced in from around the golf course, often referred to as “the ground game”.

There are other types of courses throughout the world and many of them are Parkland type courses whereby they are heavily treed and often over-watered to create a very green look. This excessive watering often produces soft green where the players “dial in” the shot distance and fly all shot directly at the green. The ball does not bounce too far and this is often referred to as “the aerial game”, one which is regularly seen on the US PGA tour.

Many of the traditionalists still rate the ground game and Links Golf as the purest form of the game. You might often see the term Links Golf used throughout advertising material however it is often very odd to hear this term attached to inland courses on clay based sites with no water visible for miles. Accordingly it can then be assumed that the Karratha Golf Course is a Link site and the designs of these new putting greens need to reflect this “ground game”.

With the implementation of great putting greens and some minor adjustments to the routing of golf holes RCGD see no reasons why this course cannot find a place inside the Top 100 on the various ranking lists.

3.0 - Completed Tasks of Design Brief

The stages of works currently undertaken by RCGD include:

- a) Initial Site visit and Project Initiation Meeting
- b) Delivery of Return Brief
- c) Initial Evaluation Report and Draft Master Plans
- d) Final Golf Course Master Plan and Implementation Report

3.1 Initial Site visit and Project Initiation Meeting

The initial visit to Karratha (in early February 2014) included the full consultancy team of Richard Chamberlain (Golf Course Design), John Pryor (Irrigation) and Geoff Bennell (Agronomy). This initial visit included a thorough evaluation and analysis of the golf course, its irrigation system, water supply, soil conditions, grass types and also provided the opportunity to meet and clarify the Design Brief with members of the PCG and the KCC.

The initial impressions of the golf course were a very positive surprise to all members of the team. Regional courses around the country often are never heard about in the Eastern states however it can be assured that the subtle rolling terrain, the excellent free draining sand subgrade and its proximity to the ocean provides a fantastic canvas for a golf course to exist. The current layout of golf holes is very good however with some minor modifications and the introduction of great grass greens this golf course has the capacity and potential to sit inside the Top 100 in Australian rankings.

3.2 Delivery of Return Brief

At the completion of this initial inspection period a Return Brief was undertaken by RCGD to ensure all parties understood the design brief and the expectations and deliverables for the remainder of the project.

3.3 Initial Evaluation Report and Draft Master Plans

The main focus of this portion of work was to produce a variety of options for the future golf course. Instructions were given to consider three Draft Concepts that each had their own constraints. As a result Four Routing Options were produced, as detailed in the following sections.

Given a better appreciation for the site, its conditions and the possible layout of golf holes this report was able to provide some preliminary cost estimates for construction. Obviously these initial costs would be refined as the detail in the design becomes clearer.

John Pryor also included a detailed report from his initial visit and inspection of the Irrigation System and this information is included in the Appendix 8..

3.4 Final Golf Course Master Plan and Implementation Report

Upon presentation of the Draft Master Plans and various meetings and discussions with the PCG and KCC members it was resolved to proceed with a variation of Option 2 Draft Plan. It was also advised that there may be some provision made in the future to remove a section of golf land to the east of the clubhouse precinct and utilise this zone for building development.

With this objective in mind, a slight modification was made to the Option 2B layout so that new golf holes could be constructed on the vacant flat land to the south of the existing wetland area

and incorporate these golf holes into a future golf layout. These amendments were made and Option 2C layout produced. The transition from Option 2B to 2C only requires the addition of two new golf holes whilst many of the other Master Plan options considered, involved the creation of 4 or 5 new golf holes.

The detailed analysis of these golf options is detailed later in this report in addition to detailed recommendations regarding construction costs and ongoing course maintenance aspects.

4.0 – Preferred Master Plan Option Summary.

The Master Planning process produced four Draft Concept Options:

Option 1 – Construction of the new grass greens in virtually the same locations as they are currently located. This option was to involve minimal change to the routing of golf holes.

Option 2 – Construction of new grass greens with provision to make intermediate changes to the overall routing of golf holes.

Option 3 – Construction of new grass greens with provision for an additional component of a future development zone to the east of the current clubhouse precinct. This routing option of golf holes could allow for major change to the routing of golf holes

Option 4 – This Draft Master Plan option was added to the additional brief by the golf course architect to provide an alternative attempt of golf holes (particularly the back nine holes) in an effort to unearth a radically different mix of golf holes. Whilst it did reveal some extremely different types of golf holes it was quickly acknowledged that the revised golf holes would not be any better than the previous golf hole layouts, and the additional cost of construction would not be cost effective. This Draft option is not being considered in the final options for consideration.

4.1 General Overview

As the RCGD team looked at the overall golf site it was revealed that the majority of the back nine (holes 11-18) are virtually common throughout all Concept Options in addition to holes 4 through 7. The main differences between the draft options were how the golf holes were routed on the front nine.

There was also some uncertainty as to whether or not the additional development zone would be required to the east of the clubhouse precinct so it was required to look at the pros and cons of Option 1 and 2.

Option 1 (Refer to Appendix 1) fundamentally kept the existing golf holes in the same locations although two changes needed to be made to this current layout. The current third hole is an odd golf hole that is hindered by trees and plays fairly weakly down the hill. There were also some requests to keep this teeing area clear for the anticipated extension of the clubhouse and also to make room for future practice putting green. This Par 3 needed to be replaced elsewhere on the layout somewhere.

The current 5th hole is also considered a badly designed Par 4 whereby the drives hit over the strong ridgeline and create an extremely dangerous situation where golfers may get hit whilst waiting to play second shots over the top of the ridge.

There is an opportunity to rectify both of these two poor golf holes and create two excellent golf holes. There is a fantastic green site that sits to the right of the current 5th fairway, above the current sand mining site, and by moving the tees back to the south this golf hole will be an extremely exciting Short Par 4, about 250m. From there the tees for the next hole will sit in the back side of the ridgeline and now present a beautiful downhill Par 3 with the ocean at the rear. No doubt this golf hole will be the most picturesque on the layout and also a terrific Par 3. These two changes have also been reflected in all Draft Layouts.

It was also identified that the 1st, 2nd, 4th and 9th holes, that play almost parallel to each other, were too tightly squeezed together. A more balanced result would only have three golf holes through this corridor instead of four. As a result of this the new 1st hole and 9th holes on Option 2 are far better golf holes than the 2nd, 4th and 9th on Option 1.

It was also noted that if Option 1 was to be adopted then five golf holes needed to be re-built to allow for the possible additional land development. However Option 2 only required two holes to be re-built.

In the Appendixes of this report the detailed analysis of each Draft Layout is provided.

4.2 Summary of Option 2A, 2B and 2C

Option 2A (refer Figure 1) was one of the first concept options presented to the PCG and KCC. This layout features the first hole hitting around the existing Eucalypts, as a Par 5 playing further right over the existing creek. After this the golf holes played virtually perpendicular to the right and down towards Sea Ripple Road. There had been some discussion from the PCG team about not being able to see any of the golf holes from this road and thought it might assist the exposure of the golf course. This vacant land is incredibly bland and flat, and significant earthworks would be required to create some interest in the shaping of the terrain. These two golf holes then play back towards the tees for the new 4th hole.

Holes 4, 5, 6 and 7 are common throughout all the draft options and then the 8th and 9th holes play across interesting terrain to the clubhouse.

After considering this grouping of golf holes on site it was decided to make a slight variation and label these changes on Option 2B. The 1st hole tees off in the same location however plays mainly along the existing fairway to a new green slightly up the hill to the left. It was deliberately made as a long par 5 over 500m so it plays as a genuine three shotter. This will allow players to hit their tee shots then quickly proceed with their second shot without the consideration of reaching the green in two. This will ensure the play flows smoothly on the first hole of the day and not create an immediate backlog of players.

After the 1st green the players walk to the right and tee off in behind the current 4th green and play back against itself across the existing creek. The re-alignment of the creek will create another excellent tempting opportunity for the longer hitters to carry the creek and get close to the green ensuring another high risk, high reward temptation. There are a number of well-established Eucalyptus trees in this location which will present an aesthetic green site.

The 3rd hole would still play along flat ground however the green site sits on higher ground that will allow to build an interesting green. From there a link closely to the new 4th tees. Option 2B also finishes with the same Par 3, 8th and Par 4, 9th.

The 10th hole on this layout effectively plays along the current 1st corridor. There was the choice to use either the 1st or 10th holes for this however the gentle dog-leg of the current 1st fairway was adopted. In addition to the better fairway the sand dune along the right side will provide more scope for a better golf hole.

As a result of this change the current 10th fairway now becomes obsolete but it can be used in a variety of options.

1. It could be maintained as a fairway from tee to green and used as a “spare hole”. A spare golf hole on courses are extremely useful in that another hole on the course can be taken out for repair, maintenance or re-construction and the spare hole used in its place. This will be particularly beneficial as the golfers will not need to play on a temporary green at any stage. As the construction proceeds throughout the golf course, the use of Santa Ana Couch grass can be sourced from this spare hole.
2. The fairway can be used as an additional turf nursery for Santa Ana.
3. It can be used as a short game practice fairway and possibly even a short pitch and putt course. This idea is also very tempting as a short course may be an opportunity to bring beginners and juniors to the club and give them a taste of golf. It could also be floodlit and used as an afterhours golfing option under lights.

If, at some point in the future the additional parcel of land is required for development then this layout can easily be altered to produce Option 2C. For this to occur the following changes need to be made:

- Close the 1st and 9th holes to make room for the development precinct.
- Build the new holes to the south of the wetland area that will become the new 8th and 9th holes. There is much scope to route these two holes through the existing vegetation and possibly flirt with the wetland area. In particular the Par 3 9th hole could be a very interesting hole over the wetlands to a new green somewhere near the current 3rd green.
- Utilise the Par 3 8th hole (on Layout 2B) as the new spare hole.
- Change the numbering system of the golf holes to re-route the front nine holes.
- Possibly use the existing 1st fairway (now directly in front of the new development) as the revised “short course”.

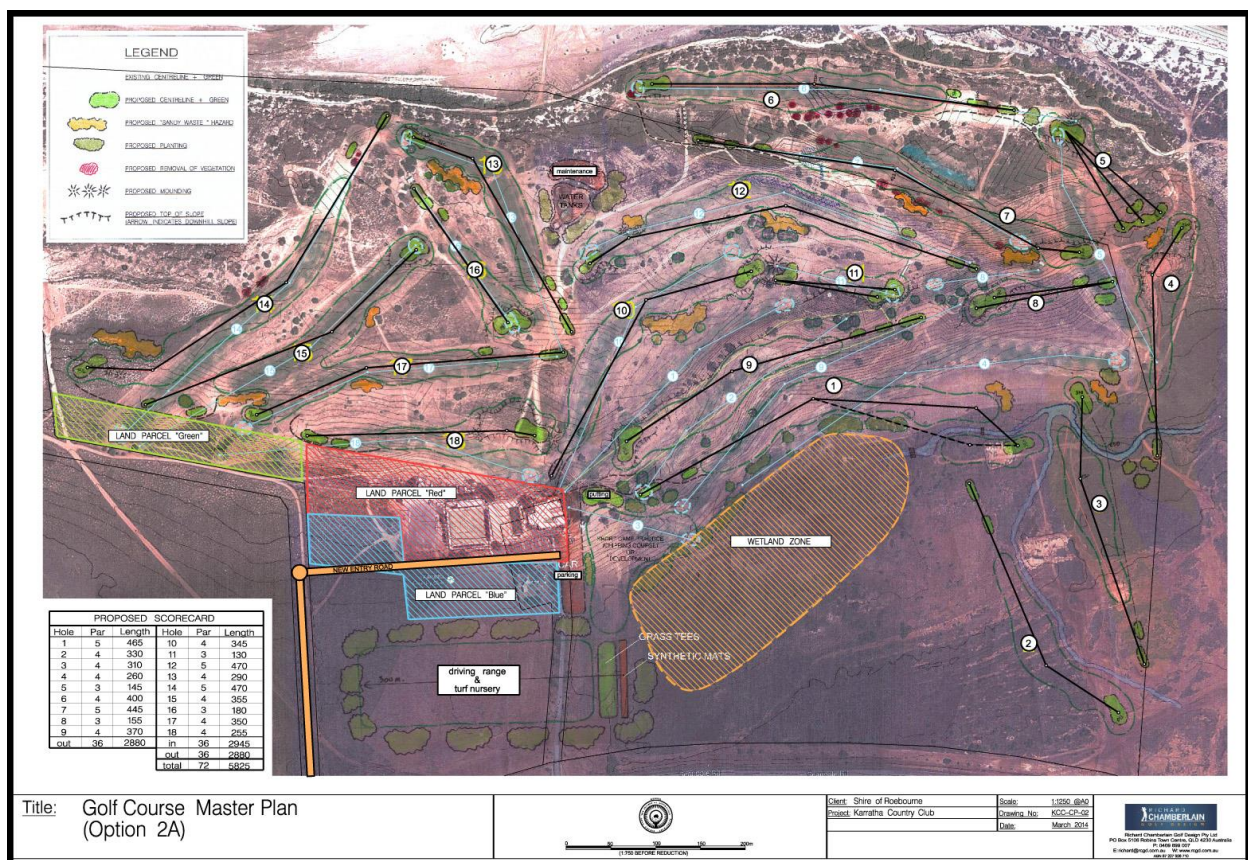


Figure 1: Option 2A

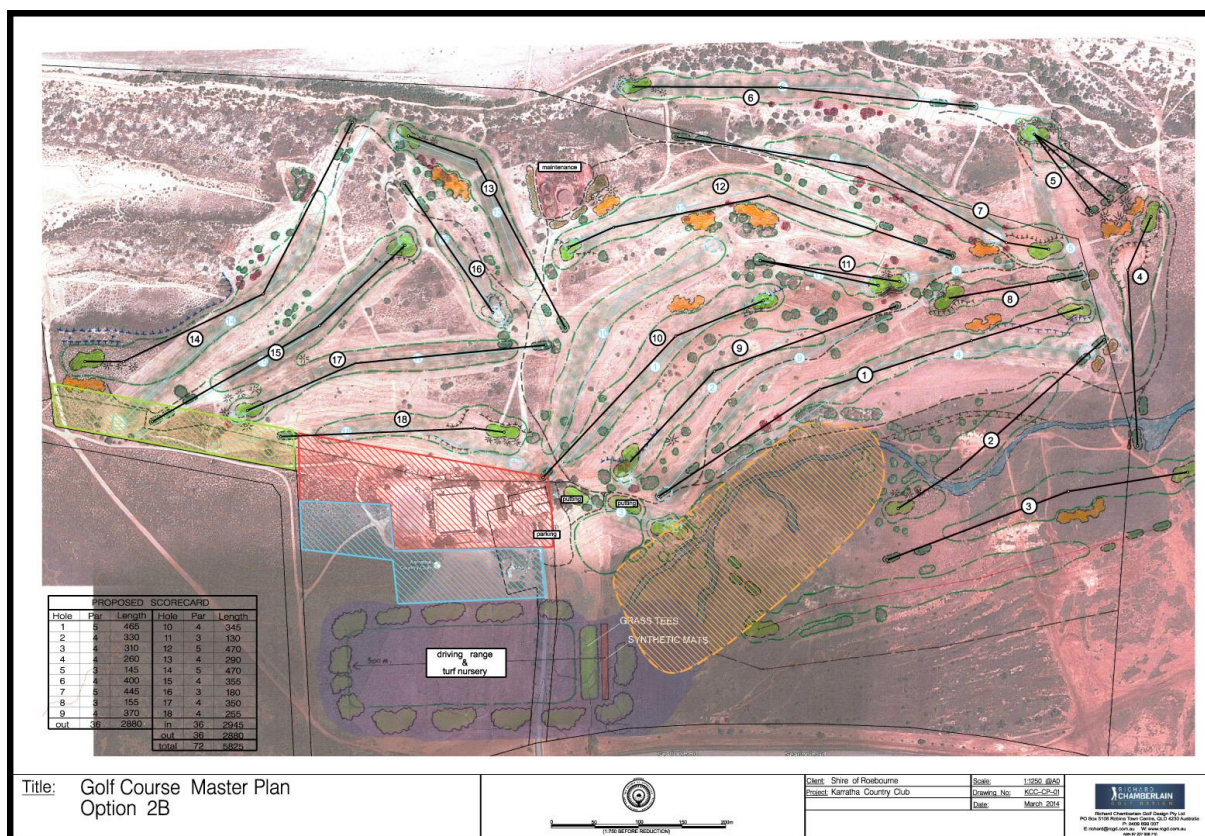


Figure 2: Option 2B

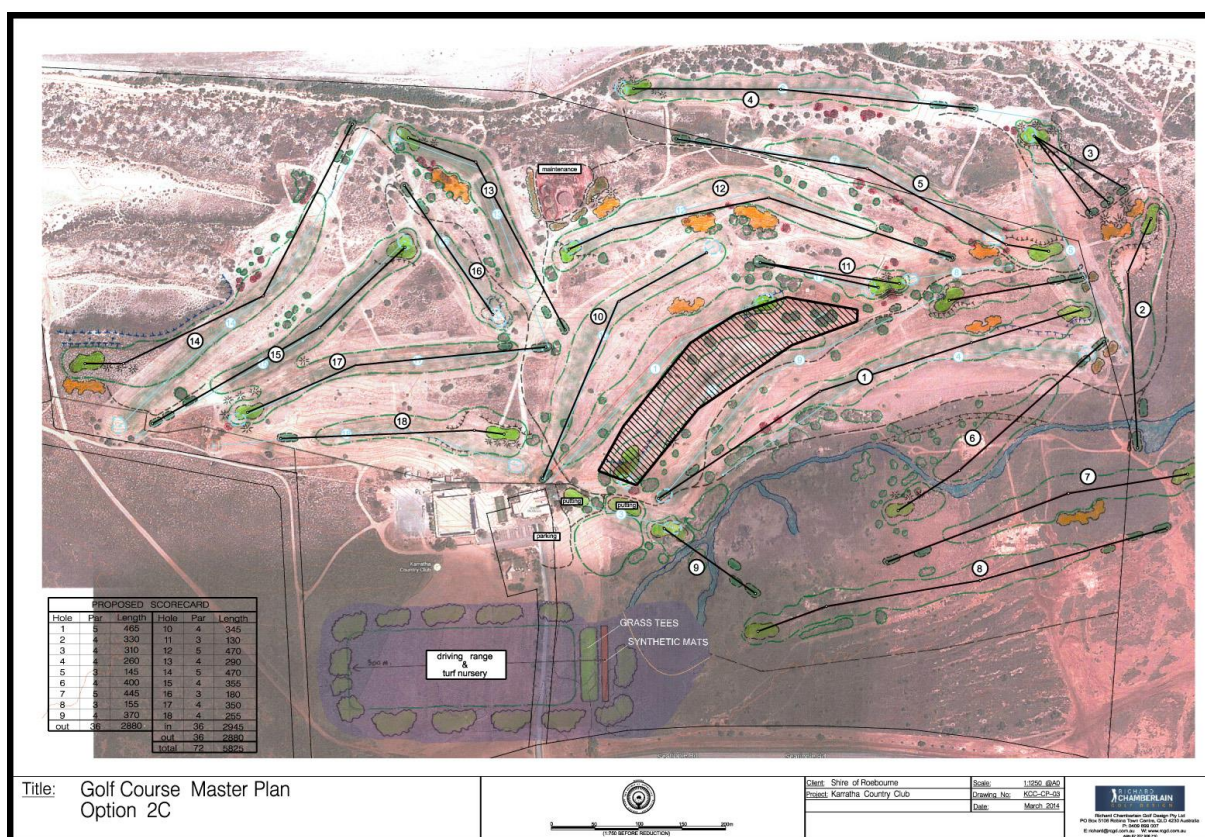


Figure 3: Option 2C

5.0 – Preferred Master Plan Option – Hole By Hole Analysis.

The recommendation is to design and build Option 2B and if the additional residential component is required to the east of the clubhouse, at some later date, then changes will be made to convert to Option 2C.

Hole 1 – Par 5

The new 1st tees can be built where the current 9th green sits. The hole can be directed towards the current 4th fairway however kept to the left of the group of existing Eucalypts on the lower side of the land. These trees are very beautiful and with the fairway kept to the left virtually all of the trees can be kept and will provide a great aesthetic feature of the golf hole.

This now sets up with the point of the dog-leg at 220m at the point of the tree encroachment before the fairway swings straightens and runs along the current fairway.

Earthworks are kept to a minimum and retain the next 200m of fairway before the last shot plays a little left of the current green. There is much scope to slide the tees and green forward or back to adjust the playing distance however as this is the 1st hole of the round it is intended to keep this over 500m and play as a genuine three-shotter. This will eliminate many golfers waiting at their tee shot for the green to clear and attack it in two.

This will be a long, strong start to the round and the green is likely to be one of the largest on the course due to the wide open spaces and gentle slopes at the green site.

Hole 2 – Par 4

The players will walk to the right of this new green and play virtually behind the current 4th green and hit back towards the creek and the vegetation in the lowlands. The creek will be manipulated so that it runs across the fairway at about 250m so the very long hitters may even try to hit over the creek.

Beyond the landing area is another group of Eucalypts that would make an excellent setting for the new green. This will make the new Par 4 a little over 300m.

Hole 3 – Par 4

Walking left off the 2nd green to another brand new hole that plays back in an easterly direction. This land is fairly flat and some earthworks will be required to make some subtle fairway shapes and to also provide good drainage.

This hole will play at about 360m and the green site sits on slightly higher ground while the waterway will guard the left side and the rear of the green.

Hole 4 – Par 4

This brand new golf hole was identified very early in the planning process and it will be one of the most exciting on the golf course.

The existing hole (5th) played up the hill with a fairly unsafe situation with a blind landing zone. This new 4th tee will be moved back so that a very enticing 250m target up on top of the hill just

beyond the current quarry site. The quarry has already generated some interesting shapes atop the hill and the temptation here will be to lay up at about 200m for a flick-in approach or attack the green in one mighty hit. Those taking the risk and reaching the green will putt for eagle however if the ball is sprayed left or right the recovery will be very challenging.

The objective for this hole is to move the tees forward or back to ensure to tempt the longer hitting players to attack the green from the tee depending on the daily wind conditions.

Hole 5 – Par 3

As a result of re-building the new short Par 4, 4th the 5th now becomes a beautiful downhill Par 3 with the fantastic ocean view water backdrop. This hole will likely be used as the “postcard hole” for marketing purposes.

Initially the green was considered to fit in the same space the current 5th green is located, however with the low point in the front the space is constrained. The decision was made to move the tees forward on the locally named “Moose Hole” and use the entire space, including the 6th tees for a large expansive Par 3 target.

Many pin positions will be presented on this new green and it will be a terrific golf hole with a magnificent view. It should play about 130-140m with the tees perched on the edge of the ridge at the top of the hill.

As a result the very weak and dangerous 5th hole on the current layout has now been replaced by two world class golf holes that will be the favourites of many golfers.

Hole 6 – Par 4

The 6th hole, or “Moose hole” as it is affectionately known, is to be shortened to be a long, strong Par 4. This should still remain the Index 2 hole on the course layout.

The current tee location, as a Par 5, makes the landing zone quite awkward as the terrain runs away to the edges of the fairway, and often under bushes. The fairway has a “dome” effect and is extremely difficult (and unfair) to land on. The movement of the tees forward reduce this “unfairness” however the landing area still requires some re-shaping works to provide a more receptive feel.

The left edge of vegetation should be removed so that players are not “dead under a tree” for a tee shot only slightly missing the fairway. The vegetation along the right side of the golf hole should remain intact to abide with the Coastal Dune environmental management requirements.

The second shot will still be a narrow difficult approach however the green should be moved forward slightly and raised to bring above the tidal height. This current green is one of the lowest points on the property and effected by storm surges and salt issues.

Hole 7 – Par 5

The reduction to a Par 4 on the 6th hole is replaced by the extension to a Par 5 hole on the 7th hole.

Some work needs to be considered in front of the 7th tees so that the carry distance over the water hazard is not too severe for the shorter hitters. This land is quite low and also affected by salt issues with the rising water table and lying water from flooding. There is a thick bush that also blocks visibility to the left side of the fairway and it is recommended to be removed.

It is also recommended for some vegetation removal along the right side of the tee shot to provide a little more reprieve on a very difficult driving hole.

As the hole now moves past the current green site it climbs slightly up the hill to a spare area of land in the middle of the current 5th fairway. This land has been made available with the re-adjustment of the current 5th hole.

In an effort to create as much variety as possible with the green sites the high ridge must be utilised and it works brilliantly here on this Par 5. The Par 5 will not be overly long, about 460m, but the approach to the green will feature some really interesting and tricky terrain.

There is a natural indentation of the terrain to the right of the current 7th green that would be ideal to introduce an expanse of sandy waste, and this will work beautifully with the angle of the green on top of the ridge. Those attempting to hit the green in two shots will need to carry this sandy waste zone and those laying up will need to position their ball close to this area for the best line into the green.

The left side of the green will be mown short and if the golfers hit the approach shot slightly left it will run the ball some distance from the green. The right side of the green will be less severe and definitely the side to “miss” the green target.

It is suggested that this new green site will make a far better Par 5 than the current 6th hole.

Hole 8 – Par 3

With the extension of the 7th hole the 8th will need to move to the southern side of the ridge line for safety. The golfers will walk back down the current 5th fairway to a new tee that plays towards the current 9th tees. There is certainly some interesting and subtle movement in the land there that will allow the creating of an interesting green site.

The lay of the land will slope down from right to left and this will create an opportunity to bounce the ball in from the right while some testing “carry points” can be injected into the left side of the new green.

This green can be built long and narrow and will present lengths between 130-150m.

Hole 9 – Par 4

On the surface this new 9th hole will not look too intimidating but it will be played over some of the most interesting land on the site.

The new tees will sit in front of the current 9th tees however the golfers will aim at the 2nd fairway. The new green will effectively sit where the current 2nd green resides.

The undulations on the fairway here are fantastic and depending on where the pin is located there will be varying times to aim left or right on the fairway for the best approach.

The green will sit on top of a little high point however there might even be some scope to add a separate pin location on the lower platform on the right and have a huge step in the green. The positioning of this green will now be much closer to the clubhouse.

Hole 10 – Par 4

With the reconfiguration of the new 1st hole there is was a choice to use either the current 1st or 10th fairways in the new layout. The existing 1st fairway was preferred as it provides a much softer dog-leg to the right and works very well up against the strong dune on the right side. There is also more scope for movement in the green with the contours in terrain near the ridge line.

This hole will still remain as a short-mid Par 4 but a new green and some fairway sandy waste bunkering will ensure it is very interesting to play.

It should be noted that the current 10th fairway would continue to be mown and maintained as it presents a fantastic opportunity to be utilised for short game practice, a short course and possible even floodlit at night for practice.

There is also an unusual possibility to create a space on the first level of the proposed clubhouse so that an artificial tee can be built. This tee can act as a Tiger tee on the new 10th hole for special events and possibly a chipping tee to the 18th green, as a really fun sideline competition as the end of the day. A risk assessment would be required.

Hole 11 – Par 3

The 11th hole fundamentally plays in the same location with some slight variations to the new green.

As you look at this green site there is now the opportunity to extend the green beyond the ridgeline and towards the current 8th green (now no longer used). This could be one of the “funkiest” greens on the layout as it can be a long green with a flat front and rear section but divided by a strong ridgeline “hump”.

The rear pin positions may also be slightly blind which will add some uncertainty to the club selection.

Hole 12 – Par 5

The 12th tees can be extended about 10-15m and provide a little more challenge to reach the corner.

The irrigation needs to be extended here to ensure the shorter hitters land on grass and not sand. The left side of this tee shot can be sandy waste which will be the tempting line for the longer hitters to take a shortcut. They will need to hit it close to the sandy waste area to give any chance of reaching the green in two.

The green will be moved very slightly to the left and the lower half of the green could slope away as this is how the natural ground sits.

A bunker should be placed on the right side of the fairway about 100m out and heavily planted at the rear to hide the maintenance and water storage area.

Hole 13 – Par 4

With the 10th hole now out of play these tees can be moved forward and to the right to straighten out the dog-leg a little.

It's not a terribly long hole and long hitters will still be tempted to place the drive near the green. The new planned sandy waste bunkering along the left will ensure a penalty for those not hitting their long drives straight enough.

There will still be the very simple and straightforward option of relocating the tee shot to the corner and hitting a short iron into the green.

The new green will angle from left to right so those straying too far right off the tee will face the more difficult approach shot.

Hole 14 – Par 5

This Par 5 plays through the same fairway corridor however restrictions near the green for future development mean the new green needs to be relocated to the right into the spare land. This change is certainly not a negative factor as it will create a more strategic shot into the green.

The tee shot actually lines up better from the ladies tee so it is recommended moving the men's tee behind the ladies as far as the tree clearing and coastal management provisions will allow.

The aim will be to hit the tee shot to the right side of the fairway and some tree removal in this location will improve the landing zone. At the corner, where the salt area edges towards the fairway the distance and angle to the new green will be very tempting. The golfer might have less than 200m to clear the edge however balls straying too far right will be virtually dead (out of bounds).

The green sits to the right towards the property boundary and will actually sit in a lower section of land. Once again an easier option will be to hit a short iron to the corner and come in from there but hopefully many golfers will be tempted to reach the green in two shots. This will be a far better golf hole with some strategic angles in the fairway inviting the heroic shots.

Hole 15 – Par 4

With the restrictions imposed for the possible future development this hole has been shortened by about 40m. It would be ideal if there can be space provided during the land planning phase to retain as much length as possible.

The hole will play as a solid mid-length Par 4 into a predominant prevailing wind.

The green will feature subtle terrain movement in front and to the sides to receptively receive a golf shot. The tee shot should probably remain hazard-free from bunkering to give the golfers a fair chance to play the golf hole, often into a prevailing wind. It is proposed that this green be a fairly large green with subtle undulations.

Hole 16 – Par 3

The current 16th hole is possibly one of the more mundane and least impressive on the current layout. There are some unusual plantings of small trees on the fairway that do not appear to add much by way of aesthetics or strategy. These types of landscaping have been mentioned in the Landscaping section of this report as not being appropriate for the course design.

A new green will be produced that is fairly expansive and will feature a variety of pin locations. This Par 3 should still remain as the longest and strongest however with a far more interesting target.

Hole 17 – Par 4

The subtle movement in the fairway terrain is definitely one of the features of this golf hole. The subtleties in the terrain movement typifies true links golf where little bounces here and there can send a golf ball into the best playing line or away from it. These inconsistencies are part of the game, some call it “rub of the green”, and it is why Links golf is so popular throughout the world.

Unfortunately the hole must also be shortened due to the future proposed land development area however as with the 15th every effort should be made to maintain a space for the green and maximise the distance of the golf hole.

The hole will still gently bend to the left and there might be an addition of a sandy waste zone on the left side off the tee. This will force many to the right however with a green shaped from left to right the angle of approach will be much more daunting.

This hole currently features some Palm trees at the rear of the hole and generally do not suit the openness and links nature of the golf course. The palette of tree species and vegetation chosen should be native types and proven to thrive in the area. There may be other opportunity to move these Palms to other areas, possibly near the clubhouse precinct.

Hole 18 – Par 4

The 18th hole is one of the more difficult to adjust with the new development restrictions in force. The tees immediately need to be moved down the hill however the most care should be directed towards the safety on the right side of the hole.

Whilst there are no definitive regulations regarding the proximity of housing/roads and golf holes there is a general consensus amongst reputable golf course architects that the centreline of a golf hole should be no closer than 60m from the property boundary. Whilst this may appear to be a “safe” distance on paper, it is realised that golf balls can be hit in some extremely erratic directions and the safety distance would need to be much further than 60m to be 100% safe. This future building line needs to be clear during the design and construction process to ensure the golf and development zones are very safe.

As a result of this constraint the golf hole needs to be moved further to the north to ensure adequate distance on the right side. The resulting space will present a fascinating short Par 4 that should provide terrific climax to the round at Karratha. The golf hole may only be 240-260m however it will possess the same enticement and excitement levels as the new 4th and 13th holes.

With the last tee shot of the day the golfer will have the opportunity to hit a narrow “landing pad” in front of the fairway that will allow the ball to chase up on the green. A well-executed shot will result in many birdies, eagles and possible even some aces. It is likely to leave the golfer with a very positive feeling at the end of the round.

Of course, in the tradition of all great short Par 4’s there needs to be significant penalty for missing the target. There is already a low hollow in between the clubhouse and the 18th green and whilst the green is moved further away for safety this hollow should be retained and emphasised. The natural land suggest some mounds are built on the right side of the green and these may even have some of the more rugged Buffel Grass on top to add further penalty. The left side of the green naturally falls into a depression and this slope will also demand excellent recovery shots.

This may only be a short finishing hole but one that will provide a wide range in scores, perfect for significant events at the club and also very exciting for the spectators in the clubhouse looking out.

6.0 – Agronomy

The key aspects related to the agronomy issues on the site are:

- The existing sand/topsoil.
- The “Greens Mix” (sand and amendments/additives) for the new base-course of grass putting greens.
- The water quality, volume and reliability from the effluent treatment plant
- The selection of grass for the new greens.

6.1 Existing Topsoil

The existing topsoil is generally good, free draining sand with a fine particle size. The existing Santa Ana fairways are thriving in this native soil and should be encouraged to expand to other fairway areas. It should be noted that the main areas where the Santa Ana is struggling and under stress is where the irrigation system is lacking.

6.2 The Greens Mix (sand and amendments)

Sand samples have been tested for particle size and further testing needs to be done for nutrients. In the particle size analysis it seems there is only a small percentage of particles that need to be removed to obtain sand that is very close to USGA specifications. The USGA specification is a universally agreed blend that will allow the correct infiltration rates for the water. If the particle size is too large then the water and nutrient will be flushed through the growing profile too quickly to obtain maximum growing effect. If the particle size is too small then the water will be retained longer in the profile and possibly create diseases in the grass.

It is anticipated that the sand from the course site will be able to be adopted for the “greens mix” as it will be far more cost effective than importing the required sand from suppliers located away from Karratha. For example an early quote for sand supplied from Port Hedland is of order of \$120 a tonne which is extremely high and not considered cost effective to pursue.

Other sands from nearby local sources are also being tested with the aim to provide another supply option but a much more cost effective price.

Another reason to try to use a variation of the sand on site is that the ongoing top dressing, dusting and maintenance of the greens needs to be undertaken using the same type of sand. If a small quarry site can be found on site it can be utilised for the long term life of the greens. If the nutrient testing is acceptable then it is expected that the required amount for the greens construction (approx. 4000 cubic m.) can be obtained from the existing quarry site near the existing 5th fairway.

6.3 Water Quality

From site investigations it was found that the existing groundwater is extremely saline (not suitable for golf greens watering). However the current course water supply of Class C treated effluent is providing excellent growth to the current Santa Ana grassed fairways. This quality of fairway grass should only improve once the treatment plant is upgraded to Class A as proposed by the Water Corporation.

It remains to be seen if the Santa Ana grass is chosen for the putting greens, which is put under far more stress than the fairway grass due to its closer mowing height, can also thrive under these conditions. It is strongly recommended that trial plots of the grass types selected are activated throughout the golf course to see how the grass types respond over a period of time.

With regard to water volume there is additional information provided in the detailed Irrigation Report. With only one storage tank available at present it is recommended to extend the “worst case scenario” for an additional storage tank be added on site. At present it is estimated that in the event of the water supply being stopped, for whatever reason, there would only be approximately one weeks supply to water the greens only. This time frame should be extended.

6.4 Grass Selection

The choice of grass for the new putting greens is an extremely important decision and a very complex task. The testing of soils is continuing and the options for grass types are being reduced to a “short list”.

The recommended grass types for consideration are:

- Santa Ana Couch grass
- TifDwarf Couch grass
- Saltene Couch grass (a very salt tolerant variety)
- Various types of Seaside Paspalum (a very salt tolerant variety)

There are definitely pros and cons for each grass type. Some of these types are being used in similar climates and conditions however cannot be totally convinced until they are trialled in Karratha conditions.

The Santa Ana may be the preferred option at the moment based on---

- It is already thriving under the weather, water and soil conditions on site however it is not clear if it will also thrive when cut to putting green height of about 4-5mm.
- The stolons for planting are readily available on site
- If the Santa Ana is adopted it will be used on tees, fairways and greens which will make for a very simple process of fertilising and dealing with any turf disease problems.
- There will also be no encroachment problems with one species growing into another's zone.

The TifDwarf is also a possible option as it is used on the nearby bowling green site. This grass is watered with town water and it needs to also maintain a healthy profile when watered with Effluent water.

Saltene Couch grass is a very high salt tolerant grass and there are some excellent examples of this on the golf courses in Geraldton. It will definitely be one of the grasses trialled.

Seaside Paspalum is also a very high salt tolerant species and whilst it often requires more labour intensive maintenance it provides an excellent putting surface.

If the “pre-construction” method is adopted, as explained later in this report, then this time period should be used to create controlled test plots throughout the course site. This will allow time to view and observe the progress of all potential grass and “greens mix” types and allow to make a better judgement on the optimum grass green configuration.

6.5 Grass Planting During Construction

The most economical solution for the construction of the golf course is to use Santa Ana throughout on tees, greens and fairways. Of course the continued analysis and on site testing

will still need to be finalise, however there are several reasons why it should prove the best solution.

Firstly, there is already very good coverage of this grass on the current 13th, 15th and 17th fairways. This will be the initial source of grass for establishment. The suggested new practice fairway is another opportunity to create a large turf nursery in the target zone.

Initially the 13th fairway can be scarified and the stolons of grass used to build the practice fairway. There is over 5000 m² of available turf that can be stripped off the 13th fairway and in reality only about half of this amount would be required to replant as stolons on the practice fairway. Once this fairway is established there will be a very large area of grass that could be used to stolonise the entire new works area during construction. It should be stressed though that this new fairway needs at least one season to mature and be effective enough to harvest fresh grass stolons.

During construction the tee's greens and flatter fairway zones will be stolonised however some of the steeper slopes and the perimeters of putting greens should be solid turfed. It is envisaged that the solid turf will be removed from the practice range for planting of the golf course and the remainder of the Santa Ana stolons can predominantly be gained from the same location.

It should be made clear that during the construction phase the only areas that will be grassed are the tees, greens and the fairways that require earthworks. Many of the existing fairways will remain as common couch however should be transplanted with Santa Ana over time. This is why the spare golf hole (mentioned earlier in this report) will be extremely useful. Also during construction, with possibly many volunteers on hand, more of these fairways could be re-furbished with Santa Ana while the golf course is closed. This can be determined during the construction phase.

With the Santa Ana grass being readily available on site the only equipment required will be the hire of a Row Planting Machine. An allowance of \$20,000 for this unit has been made in the current estimates. In fact as the construction crew continue their process across the golf course it is anticipated that the new Course Superintendent, one or two SOR staff and club volunteers will be able to complete the entire grassing task on their own.

7.0 – Irrigation

The following hydraulics information has been extracted from the detailed report provided by John Prior of Hydrogold Pty. Ltd.

The detail of Irrigation preliminaries, weather data, estimated mainline location and the estimated Bill of Quantities is supplied in “Appendix 8”.

As a result of these detailed calculations and assumptions the following estimated budget is provided.

7.1 Qualifications for Budget Estimates

7.1.1 The Estimates Includes the Supply and Installation of:

- Pump Station and Ancillaries
- Pipes, Valves, Fittings & Sprinklers
- Irrigation Control System with Central Controller
- Decoders & Cables

7.1.2 Excludes:

- Pump House (the Building) Structure
- Power Supply from Electrical Sub-Station to Pumps

7.1.3 Budget Variation

The actual budget may vary by 25% (perhaps more) depending on a wide range of factors:

- Individual items can vary significantly depending on Contractor loading
- Quality of Products
- Quality of Installation
- Currency Fluctuations - Product Price Increases - Oil & Copper Prices
- Level of Competition between Contractors and/or Suppliers - Commercial considerations
- Contractual conditions - Payment terms - Risks (Real or Perceived), Liquidated Damages.
- Local Labour Costs - Conditions - Availability of skilled and unskilled labour
- Construction Schedule - Climate, Rainy Days, Wet Season
- Soil - Rocks or Hard Digging - Stability of ground

OVERALL IRRIGATION BUDGET SUMMARY			
Item	Description	Amount	%
1	Preamble	0.00	0%
2	Irrigation Pump Station	244,500.00	17%
3	Irrigation Mainline Pipework	245,137.80	17%
4	Irrigation Mainline Isolation Valves	27,705.00	2%
5	Irrigation Mainline Tapping	33,234.00	2%
6	Air Valves	12,150.00	1%
7	Quick Coupling Valves	16,815.00	1%
8	50 mm (2") Remote Control Valve	40,812.00	3%
9	40 mm (1.5") Remote Control Valve	8,775.00	1%
10	Lateral Pipework & Fittings	226,478.70	16%
11	Sprinklers	198,562.50	14%
12	Irrigation Control System - Decoder	186,390.15	13%
13	Contractor's Items	165,000.00	12%
	Grand Total	1,405,560.15	100%

If the Irrigation Pump Station is in reasonable condition (which may be possible), then the existing Irrigation Pump Station could be used as an interim measure.

There are about 9 holes on which the existing fairway laterals and sprinklers could be re-used. This may add some extra cost of re-work but is possible. With the re-alignment on the other 9 Holes, this is impractical and a new system is recommended..

It is impractical to defer the irrigation mainline and its associated fittings. The existing mainline is in poor condition and is not a compliant pressure pipeline being only PN 9 pressure pipe (the pipe should be PN 12 pressure pipe). There were at least 5 mainline failures in 2013. The normal expectation for failures is 1 in 10 years (i.e. Mount Lawley Golf Club - 0 in 19 years).

Tees and Greens need to have new irrigation systems for their new configurations. From the above detailed reticulation budget, the minimal works recommended initially include as follows:

MINIMUM ESSENTIAL WORKS		
Item	Description	Amount
1	Irrigation Mainline Pipework	245,137.80
2	Irrigation Mainline Isolation Valves	27,705.00
3	Irrigation Mainline Tapping	33,234.00
4	Air Valves	12,150.00
5	Quick Coupling Valves	16,815.00
6	50 mm (2") Remote Control Valve (9	20,406.00
7	40 mm (1.5") Remote Control Valve (Tees)	8,775.00
8	Lateral Pipework & Fittings (Tees, Grns)	75,656.70
9	Lateral Pipework & Fittings (9 Holes)	75,411.00
10	Sprinklers (Tees and Grns)	63,112.50
11	Sprinklers (9 Holes)	67,725.00
12	Irrigation Control System - Decoder	186,390.15
13	Contractor's Items	132,000.00
	Grand Total	964,518.15

The works that could be deferred include:

DEFERRED WORKS		
Item	Description	Amount
1	Irrigation Pump Station	244,500.00
2	50 mm (2") Remote Control Valve	20,406.00
3	Lateral Pipework & Fittings (9 Holes)	75,411.00
4	Sprinklers (9 Holes)	67,725.00
5	Contractor's Items	33,000.00
	Grand Total	441,042.00

Extra cost of re-work associated with a deferral strategy for implementation is not factored in, but an estimate of this extra work would be approximately \$ 50,000.

7.2 Staging Irrigation Works

The staging of Irrigation works could be separated into “Minimal Essential Works” and “Deferred Works” and outlined in the above tables. There are a few factors in the decision to stage the construction works for irrigation with one of the prime items being the current pump station.

This replacement of the pump station is a considerable cost (\$244,500) however the current station could be utilised in the initial phase.

By visual assessment and anecdotal evidence, the pumps themselves appear to be in reasonable condition and serviceable. The pressure vessel does not seem operational but would be a relatively low cost item to rectify.

To determine the condition of the Irrigation Pump Station would require a flow test on each of the pumps and an assessment of the Pump Control System (electrical and mechanical control systems). The condition of the filter should also be assessed. Once that is done, then there is a need to look at its suitability (primarily pressure and flow) for the revamped irrigation system.

To further cut the budget to (say) \$ 500,000 (as an initial stage of works) requires some real micro management of the works. Due to compatibility issues, the Irrigation Control System need to be completely replaced (the existing one is not functionally acceptable). It May be then possible to investigate at re-using the mainline and Remote Control Valves for the 9 holes whose alignment remains relatively unchanged. Even so, achieving the \$ 500,000 would be really difficult. Also, the irrigation system would be severely compromised in terms of effectiveness and efficiency, particularly the fairways. Overall costs due to temporary works and unavoidable re-working will also increase.

The other factor here is that the current budget estimate is based on existing projects and the "Karratha Factor". The next step is deciding what is to be the scope of the new course construction (mainly area of coverage) and putting it out to Contractors for indicative pricing. It may then be possible to modify the design and scope of work to suit the \$ 500,000 budget. Additionally there would also need to be further design works undertaken with Hydrogold if this reduced capacity option is chosen. As usual, there is always more work involved in designing to low budgets due to this need for micro management and consideration of more options. While there are design considerations, mostly the issues are the micro management of project implementation.

8.0 – Landscaping

As mentioned earlier in this report, the site at Karratha is located on excellent free draining sand and has gently rolling dune terrain which is ideal for a “Links” golf course. Fundamentally links golf courses have an open feel and only have minimal vegetation, whilst the prevailing winds play a significant role in the difficulty and playability of playing the course.

The golf course at Karratha is certainly not over-vegetated at the moment however there are some species of tree out on the golf course that has branches extending down to the ground and this makes it very difficult to find golf balls and also play the necessary recovery shots. With a conscious intent to keep the golfers flowing around the layout items like this should be removed, or at least minimised to reduce slow play.

The extreme heat on the golf course required there to be some reprieve by planting some native shade trees, mainly around the teeing areas. Some golf holes already achieve this however the choice of tree needs to be carefully considered with respect to the major cyclonic storms that cross Karratha. This can be discussed during the detailed design phase of the project.

A golf course should be a very natural parcel of land and should only include artificial items when absolutely necessary. There are some remnants of bricks and concrete around the bases of some trees and these should be removed. There are also some efforts of landscaping smaller plants around the bases of some trees and these items are not relevant to the natural site and probably add to the unfairness to the golfer when balls go into these areas. An example of this was at the base of the trees in front of the tees on the 1st hole.

No doubt there are many enthusiastic and well-meaning members at the KCC golf club that are intent on beautifying the golf course however they must stay within the confines of an overall plan and strategy. With no on site course superintendent some of these new plantings seem to have been added with no thought to the big picture and they need to be ceased immediately. There are also many other trees planted along the edges of golf holes and these really do not add to the character and appeal of a links golf course.

Enthusiasm and volunteered assistance should always been encouraged at a golf club, particularly when green keeping staff numbers are limited. Volunteers and enthusiastic clubmen and women are the backbone of many golf clubs throughout Australia however it must be driven by one common overall plan. The introduction of a Course Superintendent will definitely remedy this situation and working together will surely improve the overall appearance and playability of the golf course.

The native Buffel Grass is predominant throughout the rough zones and realistically will be extremely difficult to remove. It may not be a perfect type of grass for the heavy rough zones but it is certainly not the worst. From an aesthetic point of view the grass looks very good, particularly when blended against the edges of the deep green coloured Santa Ana fairways. A negative aspect of the grass, particularly as witnessed, was that after the cyclones come though the site some of the topsoil around the base is washed away and the tough root structure of the plant makes it difficult to hit a club through. Of course, missing a fairway deserves some form of shot penalty however we also need to be aware of golfer’s health. Other sources of wild but more subtle native grasses may be obtained for use in some of the Rough areas.

There is intent to introduce some bunkering throughout the golf course however in reality they will act more like “Sandy Waste Zones”. There is absolutely no reason to import fine white sand to this golf course for both an economic and aesthetic point of view. It will be best to make do with the native reddish sand already there. Areas along the edges of fairways will be cleared of the Buffel grass and replace by open areas of the red sand. There will not be large high difficult faces of these zones however there should be some trial and error experimentation to acquire the right level of “fluffiness” in the sand texture.

At times the sand might pack down fairly hard and not provide too much difficulty for the recovery shot, however if a mechanical Bunker Rake is purchased this sand can be dragged to produce a much softer result, and subsequently a more difficult shot. Over time with experimentation the correct balance can be obtained, however these Sandy Wastes will require very little maintenance and produce the best result with the sand already there on site.

As the edges of the Sandy Waste areas evolve over time it may simply have the Buffel Grass and the smaller bushes around its edges however there should also be some experimentation with finer, less penal types of long native grass.

The palette of trees and bushes does not need to be complicated and there is a need to achieve a common theme around the golf course. Then will have the ability to improve the aesthetics of this golf course with very minimal effort with regard to the landscaping.



Figure 4" Excellent types of trees throughout the golf course



Figure 5: These types of new plantings need to be ceased until a full landscaping strategy is determined.



Figure 6: Artificial additions like this need to be removed.



Figure 7: Additional Plantings like this need to be ceased (particularly Palm Trees)

9.0 – Club Consultation

During the Planning and Concept phases of this project the Project Control Group and the representatives of the Karratha Country Club have been included in a number of design option discussions.

On April 2014 the final draft course Master Plans and a summary of the process leading up to these decisions were presented to the members of the Golf Club. Subsequent to this some feedback has been relayed back to the club representatives and also via discussion on the Club Website and Facebook page.

In general the responses were extremely positive, in particular the fact that many of the golf holes maintain their same structure, simply enhanced with much better strategic merit with the introduction of new grass greens.

Whilst none of the feedback was really detrimental to the designs some minor concerns were raised.

9.1 Questions and Answers

Q - Should the driving range be adjusted so that it does not run in an east-west orientation to avoid late afternoon sun issues?

A – Yes this will be adjusted to align with the new entry road and revised clubhouse and accommodation precinct.

Q - Can the dog-leg angle be retained for the 18th hole?

A – Not really. The proposed space for future development encompasses much of the high ground along the ridge to the west of the clubhouse. As a result the new 18th tees move forward but present a very exciting and tempting drivable Par 4. This new hole will provide much excitement to the finale of the round and will definitely be a highlight of the revised layout.

Q - The flat ground between the 4th hole and Sea Ripple Road acts as a floodplain and holds significant water during major rain events. Will these new golf holes provide adequate drainage and will they be inundated for many weeks?

A - The low lying land has been considered all the way through the planning process. It is clear that this area is a basin for the floodwater that flows from the nearby housing to the south. The water remains there at a depth of about half a metre because the average RL ranges between 4.0-5.0m above sea level. There is also a very narrow exit corridor as the water heads firstly east, then north to the sea.

Every effort will be made to raise fairway heights in this area and widen the drainage flows to the sea in an effort to get the water away faster. Earthworks and additional drainage works have been considered in the pricing estimates.

Q - Is there room to the south and the east of the property for an additional nine or eighteen holes?

A – This question will be answered in the next section of this report.

9.2 Additional Golf Holes

There is a considerable amount of adjoining “vacant land” to the east and the south of the current golf course and the question was asked if this land could contain an additional 9 or 18-hole course. Some preliminary investigations were undertaken to answer these questions.

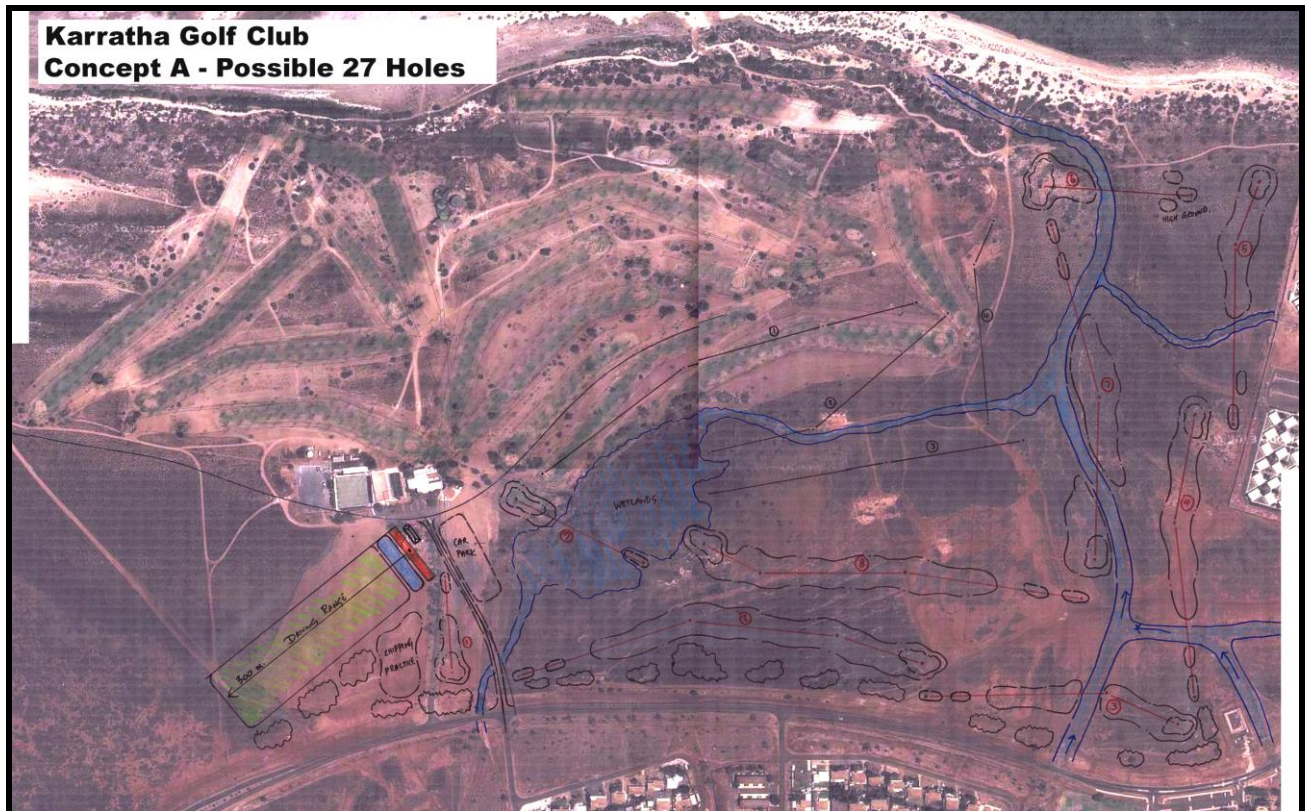


Figure 8: Concept A - 27 holes

If Master Plan Option 2B is adopted for the main golf course then there is the ability to fit in an additional nine “full length” golf holes in this spare land to complete a 27 hole layout. The first hole of the new nine could run south alongside the revised practice fairway then there is enough room for a loop of golf holes to head out and back between the wetland area and Sea Ripple Road. Whilst the land is generally flat and devoid of interest the golf holes can definitely fit in the space allocated.

If the club reclaims the land for development to the east of the clubhouse precinct then Master Plan Option 2C will be adopted. If this is the case then it dramatically squeezes the parcel of land to the south of the wetland area (for holes 8 and 9) and therefore not really enough room for the “full length” golf holes to run out and back to create a loop (as per Figure 8).

Another option to consider for additional golf holes is a much shorter course (predominantly Par 3's). These types of shorter course often prove to be far more appealing, particularly to the golfers that don't play regularly and after generally looking for a fun game. Par 3 golf holes will make it

easier to squeeze into the thin space between the wetlands and Sea Ripple Road, thus if Master Plan Option 2C is eventually adopted then the Par 3 layout could be built. There might also be the option to construct nine short holes first to test the market and then complete a further nine holes if there is a demand for it (refer Figure 9).

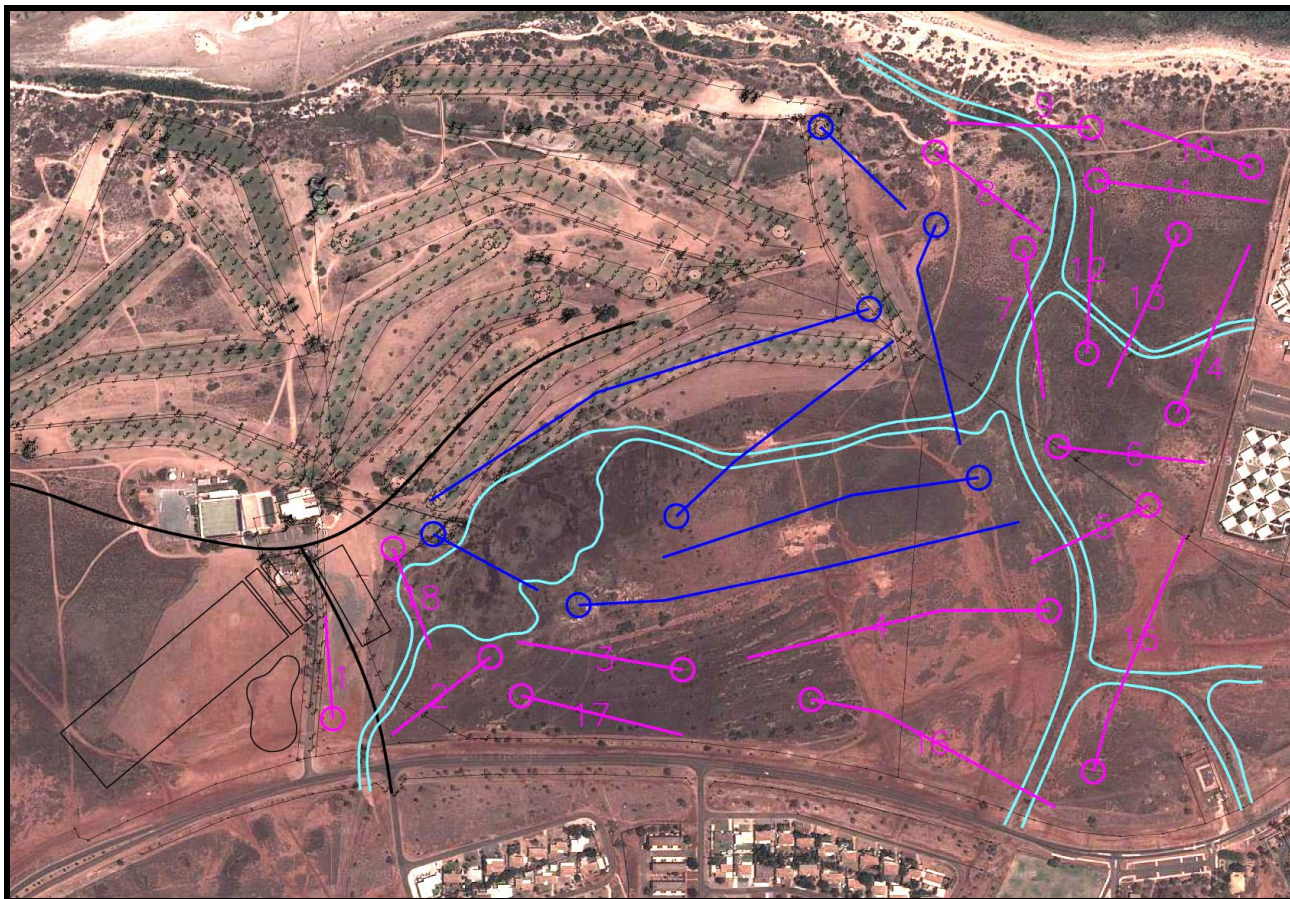


Figure 9: Short Course Option (Pink centrelines – Short course)

It should be emphasised that these investigations for extra golf holes have been done in a preliminary fashion and no costs have been considered. It is simply an effort to see how many golf holes could fit into the vacant land.

It needs to be noted that the portion of this vacant reserve land to the east of the current 5th golf hole would be outside the current golf club reserve and therefore would be required to be re-vested for recreational purposes. This process could be combined as part of the planned overall precinct land planning strategy that is currently being undertaken by another consultancy on behalf of the SOR and should align with this Golf Course Master Plan adopted outcomes.

10.0 – Construction Methodology

The choice of construction methodology for the new golf course is based on several factors:

- When funding is available
- The appointment of a Course Superintendent (and subsequent support staff)
- The irrigation system
- The growing season and the cyclone season
- The possible staging or works and its relationship to the time the golf course is closed

10.1 Funding

The consultancy team will remain focussed on the best golf course that can be designed and built and ensuring it can be built in the most economical fashion possible without sacrificing quality. Options and strategies for funding are not part of this report.

Initial estimates from an earlier previous consultant's report produced in 2011 suggested that an amount of under \$1.0M would achieve the goals of the construction of new grass greens. However with this far more thorough design and investigation process this revised estimated project cost is now considerably higher. The replacement cost of the entire Irrigation system alone incorporates a large portion of this cost (\$1.4 M.). However the lifeblood of a great golf course is water and any reductions in quality for this item will only produce grounds maintenance problems in the future.

Additionally the scope of works from this previous study has also expanded to include the re-build of all tees plus some new golf holes to improve the course layout.

There are a number of different options available for the re-construction of this golf course however the plan outlined below is considered the preferred cost effective option.

10.2 The Choice of Construction Team

The most important decision to make in this entire process is the selection of grass type for the putting green surfaces. Any fantastic new golf holes designed on the layout will be pointless if the condition of the putting surface is poor and difficult to maintain.

There has been much investigation and analysis on the site, the soil and the potential grass types to ensure the best decision is made. Unfortunately, as history proves, no matter how much technical analysis is provided, nothing beats trial and testing in a real world environment.

Based on this issue alone it is recommended the most important phase of this construction methodology must be to perform a "Pre-Construction" phase.

Whilst there are several SOR staff working hard on the golf course and also many volunteer hands made available from the golf club, regrettably none of these personnel have professional green keeping skills. For this reason a Course Superintendent is recommended to be employed as soon as possible to not only implement effective maintenance systems on the golf course but also to undertake the very important "Pre-Construction" phase for the new course works. If the correct choice is made with this initial appointment then many of the construction tasks could be effectively completed in this initial phase.

With a professional Course Superintendent engaged the backup staff and volunteer assistance will be provided with clearer direction on required maintenance programs which will result in immediate optimum use of resources reflecting in improved course conditions. In club situations where maintenance staff numbers are limited then the volunteer assistance is critical. Any items mentioned in this report are not meant to criticise any of the current maintenance practices but to demonstrate how much more productive it can be with an experienced turf management expert leading the team.

An extremely important issue to consider when constructing a new golf course is that the Irrigation system is working at its maximum efficiency when new grasses are planted. As golf holes are constructed, and grass planted, the adequate amount of water needs to be available, with the utmost reliability, to not only grow-in the new grass but to also continue the watering of the remainder of the golf course. For this reason it seems plausible that the Irrigation System (or part of it) be installed in this initial “Pre Construction” phase so that “bugs” can be ironed out before the main construction commences.

There is also ongoing analysis into the selection of the “greens mix” for the construction of the putting greens and remain hopeful that the current sand on site sand can be manipulated and blended to provide the specification required. The manipulation of this sand will probably involve a sieving process on site and also the delivery of this sand to each green site, a task that can also be included in this first “pre-construction” phase. The project requires about 4000 m³ of growing medium or “greens mix” as it is often referred and should be able to achieve this amount from the current quarry site near the 5th fairway.

As mentioned earlier, there is likely to be a recommended “short list” for putting green grass types and in addition to soil examples. There needs to be an establishment of well controlled test plots around the golf site so that these grasses can be viewed in their natural state to evaluate how they perform. This will be another task that should be included for Pre-Construction.

In effect, if a Course Superintendent is employed his/her initial tasks will include:

- a) Establish and implement Course Maintenance systems and procedures for the existing golf course.
- b) Overview and control the installation of the Irrigation system (where this new system can be built as part of the final golf course routing). Ensure irrigation “bugs are fixed prior to the commencement of construction.
- c) Sieve on-site sand as greens growing medium and deliver stockpiles to relevant green sites.
- d) Establish and evaluate grass types for new putting greens.
- e) Train support staff
- f) Establishment of turf nurseries for grassing requirements. Planned to utilise the existing 10th, 13th And 17th fairways for Santa Ana, which may in fact be the only grass type required). This “establishment” may be a thorough regime of fertilising and weed eradication to ensure maximum health of the grass. To enable this there will be a need to establish the new irrigation systems on these golf holes.

If a Superintendent is chosen with sufficient construction skills then the following items can also be added to his/her scope of works:

- g) Construct new tees.
- h) Construct bunkers / Sandy wastes.

- i) Clear and prepare land for new golf holes (2nd, 3rd and 4th holes on Option 2B)

When the time arises for formal construction to commence, the new fairway sites should be cleared and prepared for earthworks, the growing mix will be available in their required green sites, and some bunkers and tees may be constructed. Of course some of the proposed tee locations may impede the playability of the existing course so each parcel of construction works should be assessed individually.

A motto for this project based on staged methodology should be that “No Capital Works be re-worked: i.e. no wastage”.

10.3 Irrigation System

The Irrigation will need a complete replacement which includes:

- Pump Station
- Control system
- Mainlines
- Laterals
- Sprinkler heads
- Various other valves and items.

The overall golf layout (Options 2B and 2C) have been provided to John Pryor and he has completed preliminary design strategies.

As some golf fairways are remaining the same, with no need for earth working, these holes can be included in the initial irrigation works as they will not hinder the final construction method. Holes where new mainlines can be initially installed are all except the 2nd, 3rd and 4th.

John Pryor will advise on the need for initial replacement of the pump station and control system however much of this system can be installed in the Pre-Construction phase. It is anticipated that as these works are undertaken the majority of the golf course can remain open for play.

Once the main construction works are commenced then the remaining mainlines and laterals can be completed around each green site.

Of an estimated total cost of the irrigation system (\$1.4 Mil) approximately \$960,000 has been estimated for “essential works” whilst \$460,000 could be deferred until a second phase.

10.4 The Growing and Cyclone Season

It has been advised that the best growing season in Karratha is in the hotter months which also coincide with the cyclone season. With this in mind the golf course should be constructed in the spring months so that the grass is seeded and stolonised ready for the warm growing season.

Realistically construction needs to be aimed between August- November with the grow-in likely to be between October –March when Karratha encounters extremely hard and hot conditions. This further enforces the need for the irrigation system to be operating at its maximum capacity as the grasses grow-in during times of extreme heat.

10.5 Possible Staging of Works

If the Pre Construction phase is implemented then hopefully the new Course Superintendent will be able to complete some of the tees and fairway works in this initial program. The question will then remain as to building the remainder of the golf course on one stage of works or split it into two sets of nine holes.

One x 18 hole construction stage.

If the 19 putting greens (including practice green) and the new 2nd, 3rd and 4th holes remain then it is anticipated a total construction period of about 16 weeks. Adding to this the 12 week period for effective grow-in of the greens the entire golf course would need to be closed for 28 weeks if all 18 golf holes are included in the construction phase. Effectively the course would be closed between August and March however as some golf holes are seeded earlier in the program, some golf holes may come on-line in January.

Two x 9 hole construction stages.

If the construction phase was split into two nine holes sections then the time to build each set of holes would be approximately 8 weeks plus the 12 week grow-in period making a total of 20 weeks. If this method was adopted then nine golf holes would always be available for play and revenue would be gained during this construction period. It also means that the final construction phase would extend the opening for a second year and there would be additional establishment costs for the construction team.

There will need to be further investigations undertaken to assess the amount of green fee revenue for the closure of 28 weeks however it will be counter balanced by the additional establishment costs for the second construction phase.

Apart from the financial impact it would definitely be a much more fluent operation if the entire course was built in one stage.

11.0 – Construction Costs

11.1 Part 1 – Pre Construction

This initial table outlines cost to perform the Pre-Construction phase. It is assumed that the Course Superintendent will be hired by the SOR and this salary/wages have been omitted from the cost estimates.

Effectively this Pre-Construction mode is to hire the course superintendent and have him/her perform as many preliminary tasks as possible before the main construction phase commences. If the successful applicant has good construction experience then possibly many of the tees, bunkers and fairway preliminaries can be incorporated into his/her scope of works. The only additional costs for these preliminaries will be the hire of equipment.

The costs for Pre-Construction include:

- Course Superintendent
- Set-up of Maintenance Compound
- Purchase of initial equipment
- Installation of Immediate Irrigation requirements

At the conclusion of the Pre-Construction phase the following tasks will have been completed:

- Course Superintendent hired (for general green keeping duties, selected construction works and grow-in of new fairways and greens)
- Maintenance Shed constructed
- Initial equipment purchased (or leased)
- Some tees built
- Some bunkers constructed
- Clearing of holes 2, 3 and 4 and prepared for earthworks
- Test plots completed and analysed for possible putting green selections
- Turf nursery areas prepared
- Tree clearing and re-planting commenced
- Irrigation installed to selected areas of golf course where not effected by future earthworks

The summary of these pre-construction works are as follows:

LAYOUT OPTION 2B – Cost Estimate Pre-Construction (October 2014 to July 2015)			
Description	Unit	Rate	Cost
<u>Engagement of Course Superintendent</u> (assuming this salary immediately forms part of the maintenance budget) Salary \$10,000 p.m. (estimate) <ul style="list-style-type: none"> - Provide and implement maintenance strategies for existing golf course - Build some new tees and bunkers - Strip and clear land for golf holes 2,3,4 - Sieve sand on site for growing medium and deliver to each green site - Prepare test plots for various grass types - Prepare turf nursery - Supervise irrigation installation - Commence tree clearing and planting - SOR staff and club volunteers to assist with course maintenance 			Not included. Considered part of SOR Operational costs.
<u>Construction of Tees</u> <ul style="list-style-type: none"> - Labour by Course Superintendent - Hire Sieve machine (\$5,000) - Hire dozer for Tee construction (\$1,000 per day) - Hire Bobcat for bunker construction and finer shaping (\$500 per day) 			n/a \$10,000 \$15,000 \$5,000
Preparation of test plots possible grass types. <ul style="list-style-type: none"> - Chemicals, amendments, seed etc. 			\$5000
Preparation of Turf Nursery <ul style="list-style-type: none"> - Use existing 10th, 13th, 17th fairways - Labour by Course Superintendent - Chemicals for weed eradication and fertilisers 			n/a \$5,000
Essential Irrigation Installation Items (part of \$1.4 Mil irrigation budget) <ul style="list-style-type: none"> - Irrigation Mainline Pipework (9 holes) - Irrigation Mainline Isolation Valves - Lateral Pipework & Fittings (Tees, Greens) - Lateral Pipework & Fittings (9 Holes) - Sprinklers (9 Holes) - Irrigation Control System – Decoder - Contractor's Items 			\$840,000
Total			\$880,000

Additional Capital Costs Pre-Construction (October 2014 to July 2015)			
Description	Unit	Rate	Cost
<u>Construction of maintenance shed and offices</u>			\$350,000
<u>Construction of Soil Bins</u>			\$10,000
<u>Construction of Wash Down facility</u>			\$50,000
Total			\$410,000

11.2 Part 2 – Main Construction

This table is a summary of costs to construct the following:

- Remainder of tees and bunkers
- 19 grass greens and surrounds (including practice putting)
- New fairway works
- Completion of irrigation installation

The summary of these main construction works are as follows:

Main Construction – Cost Estimate			
Description	Unit	Rate	Cost
<u>Preliminaries</u>			
- Site set-up, fencing, storage, survey, insurances \$20,000			\$100,000
- Haulage of equipment \$20,000			
- Accommodation, airfares and living expenses for staff (\$20,000 per person x 3) \$60,000			
<u>Construction of Greens and surrounds.</u> (includes 18 new greens, practice putting, nursery green) (Average putting surface 450 m ²) (Average 500 m ³ earthworks per green site) (Average works area for greens + surrounds 3000 m ²)			
1. Shaping (strip 100mm, bulk shape and fine trim)	10,000 m ³	\$10 per m ³	\$100,000
2. Utilise existing sand on site for “Greens mix” – additional cost for soil amendments and organics	3,000 m ³		\$40,000
3. Grassing – Stolonise Greens	8,000 m ²	\$1.5 per m ²	\$12,000
4. Grassing – Solid turf perimeters and steep areas	20,000 m ²	\$1.5 per m ²	\$30,000
5. Grassing – Stolonise remaining surrounds	30,000 m ²	\$1.5 per m ²	\$45,000
<u>Construction of Tees and surrounds.</u> (includes 18 new tees and practice tee) (Average teeing surface 300 m ²) (average 150 m ³ earthworks per tee) (Average works area for each tees + surrounds 1000 m ²)			
1. Shaping (strip 100mm, bulk shape, fine trim and level tees)	3,000 m ³	\$10 per m ³	\$30,000
2. Grassing – Stolonise Tees	5,400 m ²	\$1.5 per m ²	\$8,100
3. Grassing – Stolonise remaining surrounds	12,600 m ²	\$1.5 per m ²	\$18,900
<u>Construction of Fairway Contouring.</u> (reshaped fairways on 3, 4, 6, 7, 12 and 18)			
1. Shaping (strip, bulk shape, fine shape and add amendments)	40,000 m ³	\$10 per m ³	\$400,000
2. Grassing (stolonise fairway surfaces)	34,000 m ²	\$1.5 per m ²	\$51,000
Construction of Bunkers and “Sandy Waste” areas	5,000 m ²	\$3 per m ²	\$15,000
Landscaping (performed in-house)			\$45,000
Irrigation (remaining works after Pre-Construction) (part of \$1.4 MIL irrigation budget)			\$560,000
- Irrigation Pump Station			
- Remote Control Valve			
- Lateral Pipework & Fittings			
- Sprinklers			
- Contractor's Items			
Consultants Fees during construction			\$116,000
Total			\$1,571,000

Additional Capital Costs Main-Construction (October 2014 to July 2015)			
Description	Unit	Rate	Cost
<u>Machinery and equipment includes</u> - Superintendent Work Utility - Tractor - Mechanic tools and box - Arc/Mig Welder - Radios - Turf tender - Trailer - Small hand equipment (whipper snipper, mowers etc) - Hand tools			\$144,000
<u>Additional water storage tank</u>			\$140,000
<u>Security Fencing</u> - 1.2m Post and wire strand - \$20 per lin.m. x 2000m			\$40,000
Total			\$324,000

Summary of Parts 1 and 2 of Construction.

Construction Summary			
Description	Unit		Cost
Phase 1	Pre-Construction Capital Costs		\$880,000
			\$410,000
Phase 2	Main Construction Capital Costs		\$1,571,000
			\$324,000
Total			\$3,185,000

12.0 – Maintenance Program and Costs

Appendix 5 outlines principles for the Maintenance regime of this golf course after the greens are built.

The anticipated annual budget is approximately \$680,200 which includes all wages, operational expenses and the leasing costs of all the machinery and equipment. A spreadsheet is supplied which provides more detail in these costs.

Summary of Annual Maintenance Budget			
Description	Unit		Cost
Payroll	<ul style="list-style-type: none"> - Course Superintendent - Two assistant staff - Staff benefits 		\$330,000 \$61,000
Repair and Maintenance	<ul style="list-style-type: none"> - Irrigation repairs - Sand and gravel - Small tools - See and mulch - Drainage repairs 		\$139,800
Chemicals	<ul style="list-style-type: none"> - Fertilisers - Fungicides - insecticides 		\$45,000
Utilities	<ul style="list-style-type: none"> - water - electricity - waste removal 		\$12,000
Equipment Leases	<ul style="list-style-type: none"> - Roughts Mower - Heavy Duty Spray Unit - Workman - Coring Machine - Tee and Collar Mower - Fairway Mower - Surrounds Mower - Greens Roller - Blowing machine - Walk Behind Mower (approximate Lease repayments per month \$6700)		\$80,400
Total			\$668,200

13.0 – Conclusion

It has been said many times during the design process that the Karratha Golf Course resides on a wonderful natural site. The addition of grass greens will not only lift this layout to be just a good regional layout, it really should generate significant interest throughout the Australian golfing industry.

Golf courses in obscure and remote areas are proving to thrive throughout the world with the most recent additions at Barnbougle Dunes in Tasmania proving to be the new benchmark in golf. Building on great golf land and on modest budgets has proven that these types of courses can reach high levels on course ranking lists and successful business models.

Another golf course worth mentioning in Victoria is a place called Port Fairy. It was built amongst the natural dunal landforms on a modest budget and yet only has two or three staff involved with course maintenance yet is sits highly ranked in Australia's latest golf rankings. Whilst golf magazine rating can also be convoluted affair the real proof will be the volume of players that will eventually come to the site time and time again.

It is hoped that both golfers and non-golfers will realise how this project will not only lift the profile of the golfing fraternity, but the city of Karratha itself. If the ambitious strategic plans are also followed through with the clubhouse precinct and on-site accommodation then this golf course should provide the heart of the city's recreational precinct with an abundance of activity there, both day and night.

With respect to the golf course itself it requires almost \$3.0M to evolve into an excellent standard. \$1.4M of that for Irrigation, \$1.0M to construct the new greens and relevant changes to the course and the remainder to build a new maintenance shed and fill it full of the necessary machinery.

Consider that other golf clubs spend many times that amount to improve their golf courses and still fall well short of the quality that Karratha provides. The process to provide excellent putting greens and some wonderful changes to the layout will ensure that this golf course escalates its reputation and will become a fresh new talking point for golfers in this country.

One last and important point to add is that whilst the money spent on this golf course project might only directly affect a small percentage of the Karratha golfing population it will open up many new opportunities for other areas of the city as a Tourism and recreational feature.

This is an extremely important facility for the city of Karratha and one which is paramount in the continued development.

Prepared by:



Richard Chamberlain

Director

15th May 2014