



North Turramurra Recreation Area

Concept Masterplan Report
Volume I

March 2007

Adopted by Council
November 2007



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Ku-ring-gai Council



VOLUME I- NTRA DRAFT CONCEPT MASTERPLAN REPORT

Introduction	3
Site Location and Context	4
Sub-Regional Context	
Local Government Area Context	
Site Overview	6
Site Analysis	8
Access, Traffic and Circulation	8
Topography and Aspect	10
Drainage and Creeks	10
Landfill and Slope Stability	10
Vegetation and Wildlife Habitat	13
Views, Visual & Scenic Quality	15
Water Use and Management	15
Existing Site Uses and Structure	16
Recreational Demand	17
Summary of Siting Opportunities	17
NTRA Concept Options	18
NTRA Preferred Option	37

VOLUME II- APPENDICES

Supporting Reports

- STORM Consulting
 - Constraints and Opportunities
 - Civil and Environmental Engineering
 - Summary of Water Management Options
- ARUP Transport Planning
 - Transport Issues
 - Review of Transport and Access and Parking
- Jeffery & Katauskas
 - Geotechnical Report
- HM Leisure Planning
 - The Demographics of the Kur-Ring-Gai and North Turramurra Community



Introduction

This report has been prepared for Ku-ring-gai Council, with the purpose of providing a brief summary of the constraints and opportunities with regard to the redevelopment potential of the North Turramurra Recreation Area (NTRA).

The NTRA is located off Bobbin Head and Curagul Road in North Turramurra and includes a Council-owned golf course (the North Turramurra Golf Course), as well as a former landfill site.

Spackman & Mossop Landscape Architects are the lead consultant engaged by Ku-ring-Gai Council to develop a concept masterplan and staging options for the redevelopment of the NTRA, with the aim of maximising the recreation potential of the site. The brief envisages that this would be achieved by relocating sections of the golf course to the former landfill site and identifying layout options for the development of multi-use sports facilities on the existing golf course land.

In order to gain a good understanding of the site and the issues affecting its redevelopment, the identification of constraints and opportunities has involved

- a number of site visits,
- ongoing liaison with Council staff,
- a review of existing information, including previous reports and redevelopment proposals prepared for the site,
- consultation with key stakeholder groups, and
- 2 presentations to Council’s Parks, Sports & Recreation Reference Group.

Further, in the preparation of this report, we have drawn on the expertise and knowledge of a range of specialist consultants on our study team. They are:

<i>ARUP Transport Planning</i>	Traffic and Access Planning
<i>Jeffery & Katauskas</i>	Geotechnical Advice, including landfill slope stability, settlement and methane hazards
<i>HM Leisure Planning</i>	Recreation Planning

<i>Scott Murray & Associates</i>	Golf Course Design
<i>STORM Consulting</i>	Environmental and Civil Engineering

This report presents a summary of the findings of the analysis undertaken by the study team members, it is followed by a brief overview of potential site development options and a summary of the preferred option and its staging potential.



Site Location and Context

- North Turramurra is located around the ridge of a narrow peninsula of land bounded by two north flowing creeks, Cowan and Cockle Creek. This creates a narrow strip of land confining development largely to the upper slopes and the ridge top.
- The NTRA is located off Bobbin Head and Curagul Roads in North Turramurra.
- The site is surrounded by largely residential development, including low-density and medium density housing and a number of retirement villages.
- It is isolated from the major population centres in the LGA, being located near the northern limit of development in the LGA and on a narrow ridge line between Cowan Creek and Lovers Jump reek. It is relatively isolated from areas with concentrations of people and activity which tend to be closer to or along the Pacific Highway and the North Shore Rail Line.
- Depending on the level of proposed redevelopment of the NTRA, this could attract potentially large numbers of additional people to this relatively isolated and 'peaceful' area.
- Options for the re-location of the NTRA, including access points, golf course design and the location of new sporting fields or other recreational facilities will need to consider the potential impacts on surrounding areas and the amenity of local residents.

Sub-regional Context

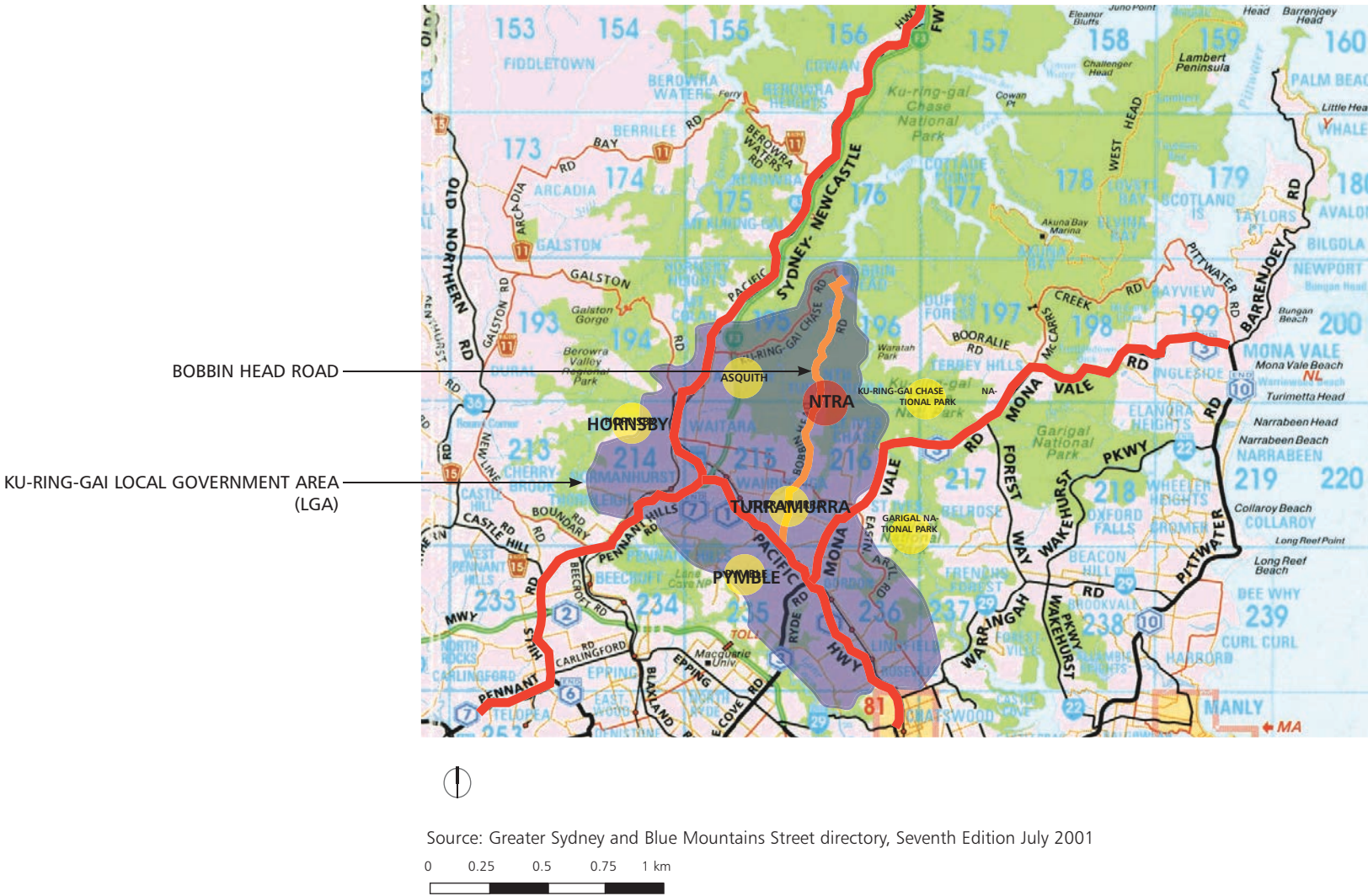


Figure 1- Context Map



Local Government Area Context

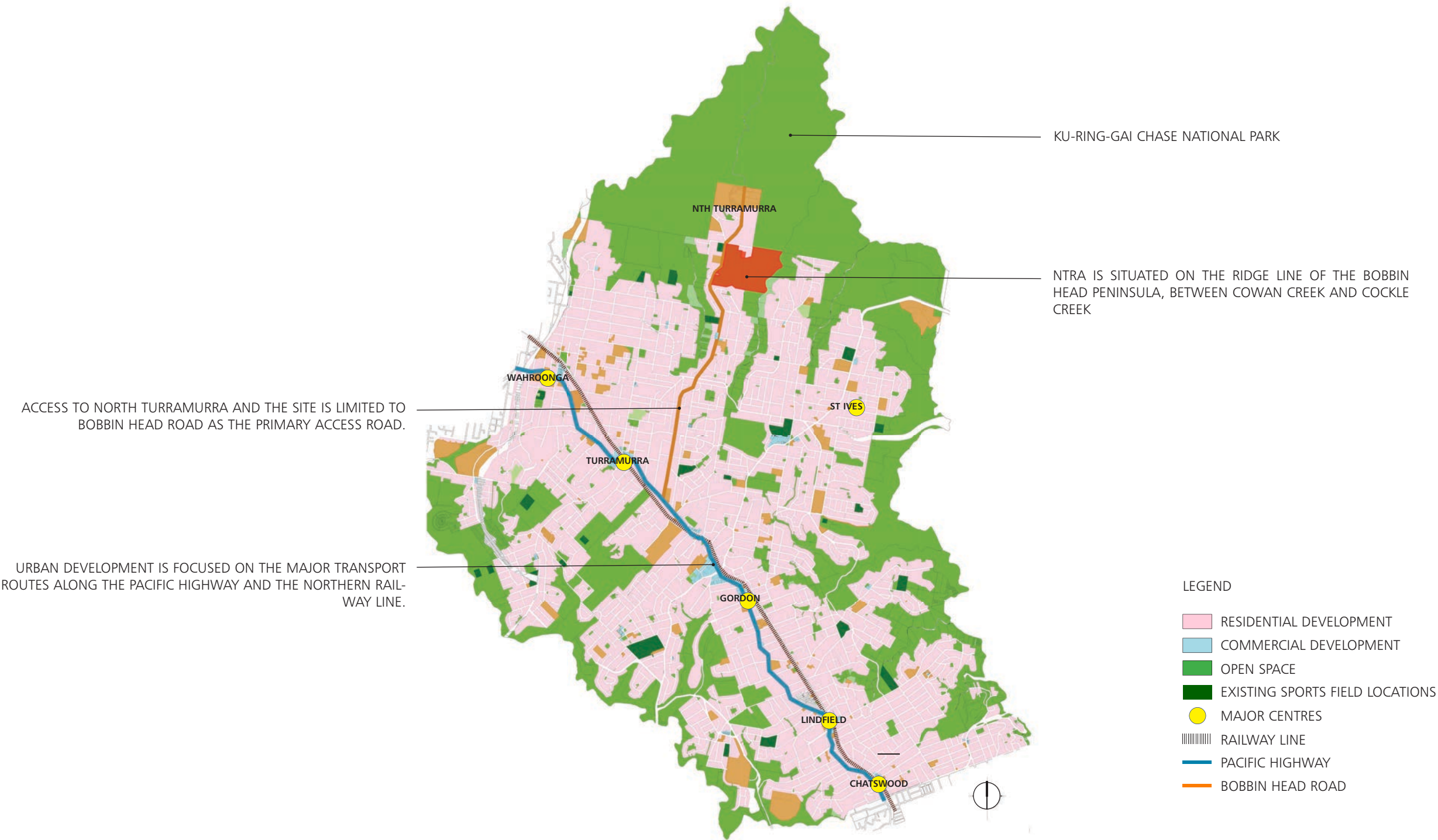


Figure 2- Map of LGA



Site Overview

- The North Turramurra Recreation Area is comprised of a series of publicly owned community lands, including the existing North Turramurra Golf Course, the former North Turramurra Landfill, two Council depots off Bertrand and Curagul Roads and Glengarry Camp Girl Guides Reserve (refer to figure 3). The total land area of the NTRA is about 81.5 hectares, representing a significant open space resource.
- In the Ku-ring-gai Local Government Area, there is a growing demand for recreation facilities in general and playing fields in particular. The NTRA offers the potential to contribute towards meeting this demand. This applies in particular to the former landfill areas which are currently not available for recreation activities and are expected to be able to support these, once remediation has been completed. As shown in the list below, development of this land would provide an approximate 5.2 hectares of additional public open space or recreation areas.
- Some of the major features and their respective areas are:
 - Crown Land (includes Glengarry Camp): 33.2 hectares
 - Glengarry Camp Girl Guides Reserve: 22.4 hectares
 - North Turramurra Golf Course: 28.2 hectares
 - Former North Turramurra Land Fill: 18.2 hectares (Note: the southern and eastern sections of the golf course are located on sections of the landfill)
 - Landfill area with redevelopment potential: 5.2 hectares
 - Golf Course Depot: approximately 0.48 hectares
 - Landfill Depot and compound: approximately 0.66 hectares
 - Bushland (largely on steep slopes and much of it on crown land): 41 hectares
- The focal area for any redevelopment of the NTRA will be the part of the site currently featuring the golf course and the former landfill to the west of it, which represents about half of the total NTRA area (the core study area). The other half consists of bushland on predominantly steep slopes adjoining Cowan Creek and Ku-ring-gai Chase National Park and is not suitable for development.
- Development would generally be excluded from bushland areas, however these areas offer opportunities to cater for some of the recreation demand, in the area such as the demand for more passive, informal or nature-based activities including (bush-) walking or wildlife observation.





Figure 3- Study Area



Site Analysis

Access, Traffic and Circulation

Regional Access

- Bobbin Head is a regional road and primary north-south transport route providing access to North Turrumurra and the site Refer to figure 1 and 2.
- The site is surrounded by a low and medium density residential developments, as well as other institutions such as Nazareth House Retirement Village and the Knox Grammar playing fields, all of which contribute to traffic on the road. Overall, Bobbin Head Road retains presumably low volumes of traffic (refer to Arup- Traffic Report in Volume II- Appendix)
- In recent years there has been a significant increase in the level of traffic north of Curagul Road which can be attributed to significant medium- density residential development in the area.
- Knox Playing Fields generate significant weekend traffic and parking demand, spilling over into Bobbin Head and Curagul Roads.
- With the proposed addition of sporting facilities to the site, traffic levels are expected to increase. Potential traffic management should be implemented for safety and also to avoid traffic conflicts.

Site Access

- Currently, access to the site is possible in three locations: two entrances off Bobbin Head Road and one off Curagul Road., as described below:
 - The main site entrance and access to the golf course is located approximately midway between Curagul Road and Hartley Close. In its current configuration this entrance is not safe to cater for a large increase in traffic movement such as would result from the development of sporting fields. An upgrade of the entrance would be needed to improve visibility as well as control both vehicular and pedestrian movements.
 - A locked driveway at the end of Curagul Road permits staff access only to Council’s landfill depot.



NTRA is fenced along Bobbin Head Road, there are no path systems or pedestrian crossing along or into the site



Entrance to Golf Course

Noise and privacy concerns of residents in Curagul Road would make this entrance unsuitable for public use or larger numbers of traffic movement.

- Bertrand Road provides access to Council’s golf course maintenance depots as well as to the beekeepers’ hives located adjacent to it. The beginning of this road is sealed, turning into an unsealed track close towards the depot. Similarly to the main entrance, the configuration of the Bobbin Head Road intersection is currently not

safe enough to support an increase in vehicle movements. If required, this access could be retained and upgraded to provide public access to the site.

- Access to the site by public transport is limited and any new development is therefore likely to generate an increase in vehicular traffic in the area, particularly on the weekends when playing field demand/ use is greatest.

Parking

- Parking for any new development should be located on-site to reduce the impact on the local neighbourhood and road system as well as limit potential conflict with Knox users.
- The existing golf course carpark (approximately 80 parking spaces) is generally sufficient to meet demand from golf users. However, there is little spare capacity on the weekends to accommodate additional users.

Pedestrian Access and Circulation

- Much of the NTRA is currently fenced, limiting pedestrian access to the vehicular entrance points. Entrances are unsafe for pedestrians however, as they lack dedicated footpaths. Further, there is a lack of safe pedestrian crossing facilities across Bobbin Head Road.
- The golf course site does not feature any formalised paths, and many of the existing maintenance tracks on the landfill site are unsuitable or unsafe for general public pedestrian use.
- Safety considerations severely limit opportunities for general community access to or walking tracks around, the golf course. However, there maybe opportunities for walking tracks around any proposed sporting fields and for new path linkages from the site to existing bush walking trails around Cowan Creek and in surrounding National Parks, including the Darri and Warrimoo Track.

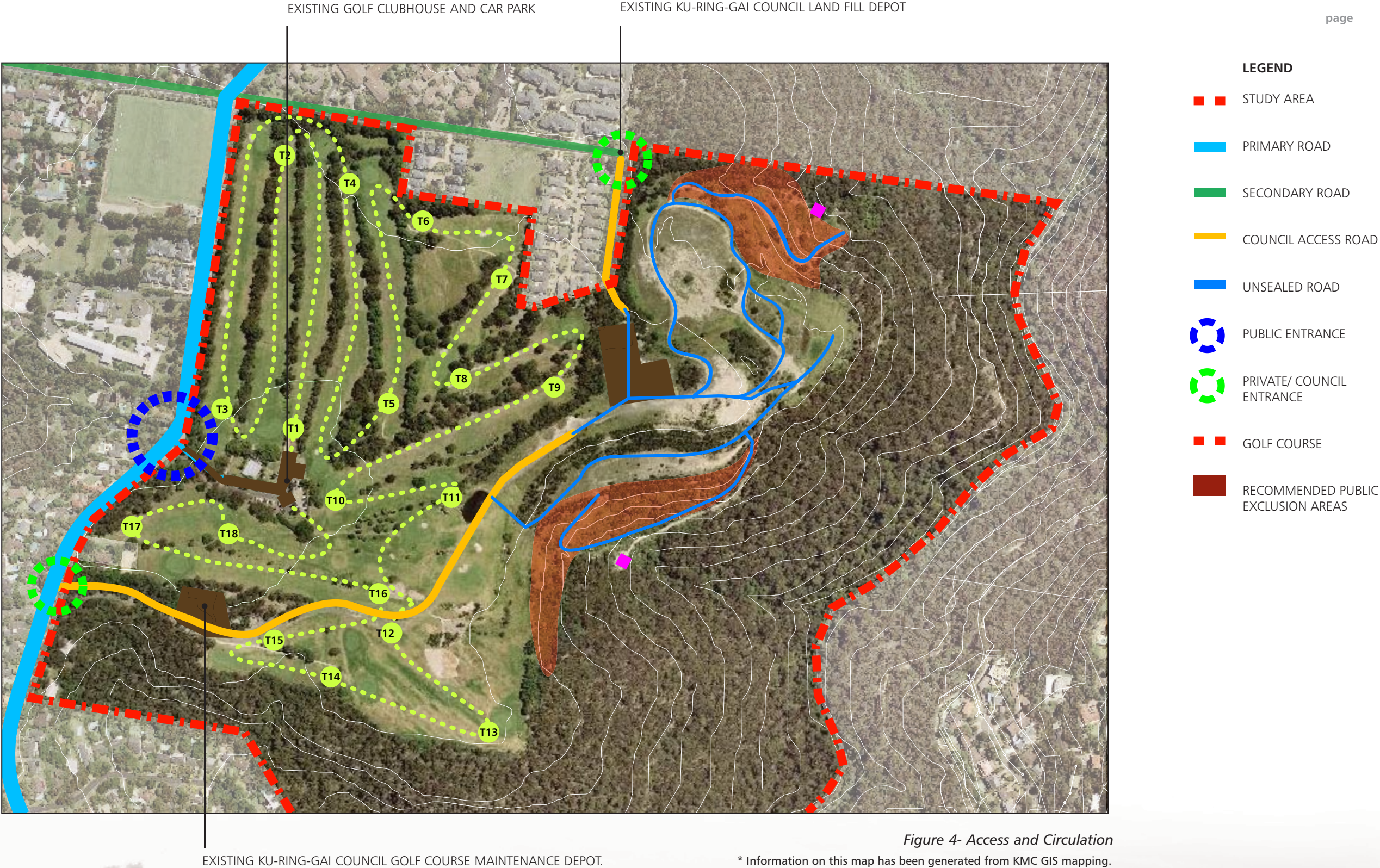


Bertrand Road access to Southern KMC Depot site.



View of access road to Northern KMC Depot from Curagul Road





Topography and Aspect

- North Turrumurra sits on a high point that gradually slopes down to the north, west and south boundaries of the site (refer to Figure 5).
- The site has a predominantly easterly aspect with views to the National Park St Ives Chase.
- Site slopes vary and greatly; from gentle in the eastern of the site around Bobbin Head Road to steep in the western and southern portion of the site towards natural gullies.
- The steep topography around the perimeter of the site limits development opportunities for level sporting fields and associated facilities to relatively few locations.
- Steeper slopes may still be suitable to accommodate some of the more challenging golf fairways.



Steep slopes on the north-western edge of the landfill site



Slopes of the restricted zone area

Drainage and Creeks

- The majority of the site drains towards bushland slopes and gullies to the south and west which form part of the Cowan Creek Catchment, which in turn flows into the Hawkesbury River.
- Untreated site run-off may pose a threat to surrounding bushland and the water catchment, due to the potential for leachate/ landfill pollution and the use of fertilisers on the golf course. Which could promote weed growth. However opportunities exist to either treat stormwater before release into the catchment tributaries, or to collect stormwater for re-use on the site (refer to "Water Use and Management").

Landfill and Slope Stability

- Continuous monitoring of landfill slopes has been undertaken on the site since 1988, with a focus on slopes A, B and C (refer to Figure 5).
- A number of serious issues have been identified that limit the redevelopment potential of former landfill areas (refer to J&F Geotechnical Report in Volume II-Appendix):
 - The landfill has been neither well designed nor constructed.
 - Settlement of land fill areas is uneven, ongoing and expected to continue for several years, making it unsuitable for uses that require a level and stable surface such as buildings or car parks or sports fields.
 - Landfill slopes A and C in particular are unstable and show evidence of previous slope failure/ landslides. They are unsafe and public use must be excluded from these areas.
 - Landfill areas seem to lack an adequate capping layer. The lack of adequate drainage and surface runoff control contributes to slope instability problems
 - The poor health of vegetation (turf and trees) suggests ongoing landfill gas emissions such as methane which may pose health risks.

In order to ensure the stability of the landfill and the safety of users in existing and new recreation areas, the following measures are recommended:

- Improve slope stability by controlling drainage (ground and surface water), reducing the gradients of fill slope batters and by providing stabilising berms. Particular measures include:
 - Surface grading of the open areas behind Slopes A, B and C to promote surface water runoff instead of infiltration into the landfill.



Northern area of the landfill site



Current condition of Landfill Area



- Provision of flexible lined drains behind the mounds which run along the crests of Slopes A, B and C. The drains should be directed/ piped away from the slopes to discharge into the existing nearby creeks and gullies, or fed into other water management re-use systems (refer section "Water Use and Management")
- Any site levelling should be achieved through the placement of an engineered fill material. There should be no cutting or excavation of the existing capping layer.
- Provide a capping layer in line with current EPA standards, including both water and gas drainage layers. Typically, such a capping layer would be about 2.1m thick and include the following:
 - Seal-bearing surface
 - Gas Drainage layer 300 mm thick
 - Sealing clay layer
 - Drainage layer
 - Revegetation layer
- For developments on the landfill site, the following measures may be required:
 - Gas drainage provisions along buried service trenches to eliminate emissions.
 - Fully ventilated floor slabs to limit impacts to sealed structures such as buildings and slabs.
 - Flexible segmental block paving to parking facilities above the landfill.

For more detailed information and a full discussion of landfill issues refer to J&K Geotechnical report in Volume II- Appendix.



Slope A, viewing to the Northern Pump Station



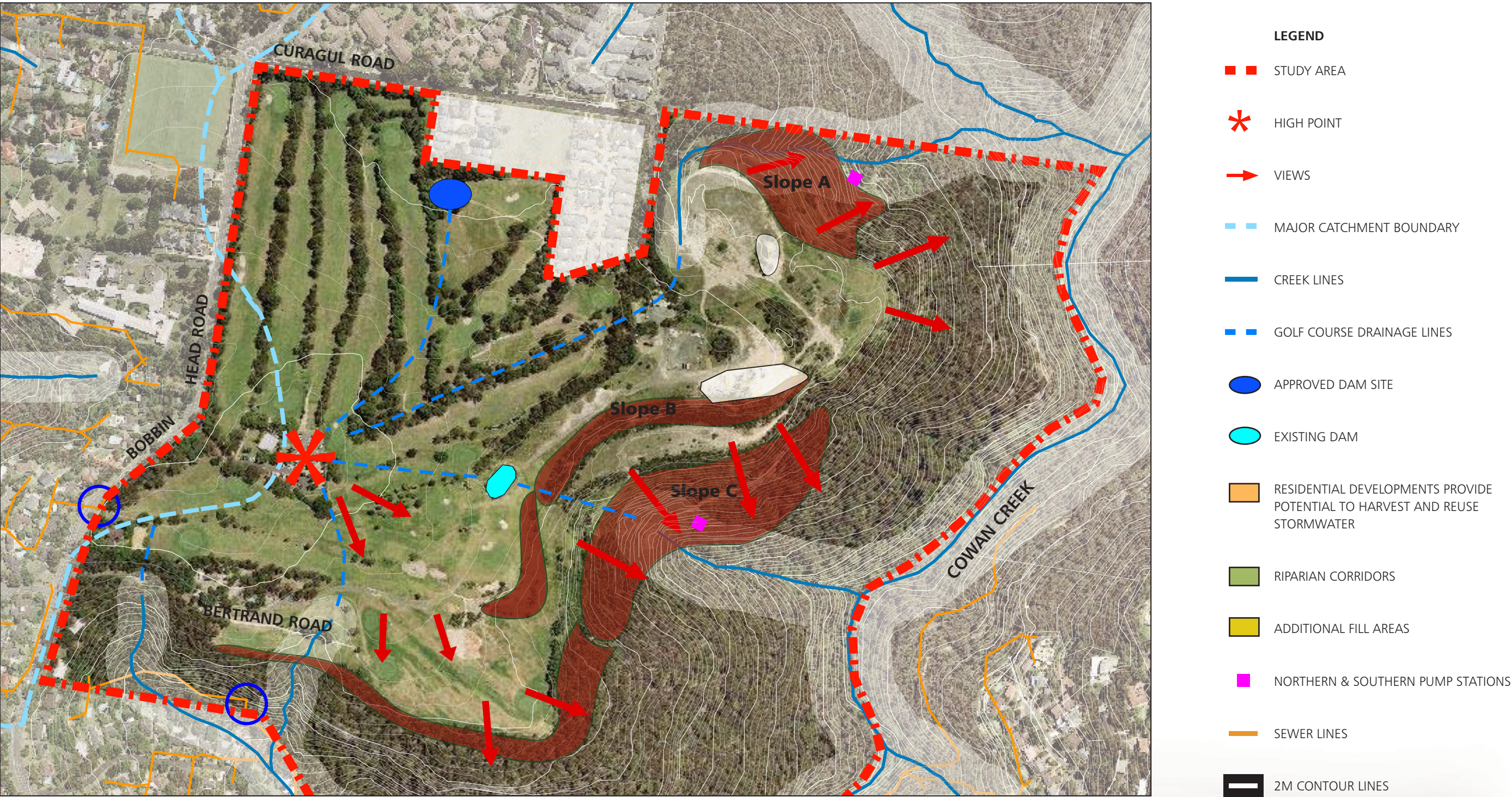


Figure 5- Landform and Drainage

* Information on this map has been generated from KMC GIS mapping.

Vegetation, Wildlife and Habitat

- The site is surrounded by dense bushland. This provides an aesthetic backdrop to the NTRA and restricts any unauthorised user activity on these slopes.
- Bushland is protected under *State Environmental Planning Policy (SEPP) 19 - Bushland in Urban Areas and SEPP 44 - Koala Habitat Protection*. It provides habitat for a number of threatened or endangered species, including the following wildlife;

Green and Golden Bell Frog	Yellow-bellied Glider
Cotton Pygmy- Goose	Common Bent-wing Bat
Shy Albatross	Heath Monitor
Grey Falcon	Koala
Pied Oystercatcher	Southern Brown Bandicoot
Glossy Black-Cockatoo	Tiger Quoll
Regent Honeyeater	Masked Owl
Swift Parrot	Powerful Owl
Supurb Parrot	Turquoise Parrot

- The presence of wildlife and natural bushland provides opportunities for conservation, nature study and educational uses of the NTRA.
- The site also contains sections of endangered ecological community known as Duffy's Forest located to the North of Bobbin Head Road, Curragul Road and areas of the Golf Course.
- Bush fires are a significant threat to residential areas in North Turrumurra. New open areas/ sporting fields within the Recreation Area would make a valuable contribution towards bush fire management by providing potential marshalling areas should evacuation of the local area be required.
- Future landscape works should incorporate native species to provide additional food and nesting opportunities for native animals.
- The proximity of bushland provides the opportunity to conduct nature education tours, bush regeneration



Existing Bushland in surrounding National Park



Existing fairway vegetation in the north-eastern portion of the site consists of exotic species

classes or similar activities from the site, or establish regular bush care or “friends” groups that assist Council in the management of the site.

- Weed infested slopes on some landfill areas present a threat to bushland and should be controlled to prevent further spread of weeds.
- Lighting and noise may disturb native animals even though they are able to adapt to the day and night time urban activity to a degree. The NSW National Parks and Wildlife Service has previously advised that some mitigation measures might be required, to reduce potential negative impacts such as the use of directional lighting or louvres to floodlights.
- Established corridors of vegetation exist along golf fairways 17,18,1,2,3,5,6 and 7 and are complemented by sporadic plantings of gums and pine trees throughout the remainder of the course.
- Existing fairway trees should be kept to retain the sites character, as features of more challenging fairways, and for the protection of golfers from stray balls.
- Vegetation is limited on the landfill area due to the more recent development of this area, as well as growth being inhabited by the release of poisonous methane gas. The introduction of a capping layer to current EPA standards would provide the opportunity to introduce new vegetation species. Selection of appropriate small trees, shrubs, and grass species will be required to avoid root penetration through the capping layer.



Vegetation on landfill area is not healthy due to poor environmental conditions



Environmental control measures will be required to prevent the further spread of weeds.





Figure 6- Existing Vegetation
* Information on this map has been generated from KMC GIS mapping.

Views and Visual and Scenic Quality

- Pleasant views towards the National Park and bush suburbs such as St. Ives Chase can be enjoyed from the site, particularly from its high point around the existing golf course car park and from above the rim of the landfill slopes.
- The treed outlook from Bobbin Head Road and adjoining residencies into the golf course provides high visual amenity to the area, as well as a pleasant landmark experience along Bobbin Head Road. These views should be retained where possible and redevelopment should consider the visual impact of any works on the Bobbin Head Road frontage.
- The established golf course has a high visual character and value which should be retained.
- Newer sections of the golf course and other landfill areas have lesser visual quality, due mainly to the difficulty of establishing vegetation in these areas. From a visual point of view, these are preferred areas for redevelopment as work would have a lesser visual impact by not affecting the existing tree cover.



Monitor on the landfill



View from NTRA south west towards St. Ives Chase



Views into the NTRA from Bobbin Head Road

Water Use and Management

- Currently, North Turrumurra Golf Course only waters its greens and tees but not its fairways. Clubhouse water use is limited to toilet facilities and minor kitchen facilities. Nevertheless current mains water consumption is already significant, with an average 30.4kL/ day.
- Additional facilities on the site may significantly increase water demand, mainly as a result of the need to irrigate sporting fields.
- The majority of water is currently sourced from town water, supplemented by stored site run-off. An additional water storage dam with a 10ML capacity has been approved for construction, on the northern part of the site, in order to further increase site storm water re-use and recycling.
- In view of ongoing drought conditions, a series of potential water sources were identified to meet the existing and additional water demand while minimising the use of portable townwater. These include:
 - Roof Water
 - Stormwater/ Surface water runoff (from across the NTRA and/ or residential development North of Curagul Road)
 - Stormwater Harvesting from surrounding residential developments
 - Ground water extraction and Sewer mining
 - Leachate and sewer mining
- In particular, opportunities include:
 - collection of stormwater runoff from the site through the installation of swales, underground collection systems and the use of porous paving. Treatment maybe required prior to re-use on site.
 - stormwater harvesting from local residential housing (existing or future developments) along Curagul Road, such as through the use of water retention/ storage tanks.
 - harvested water would be suitable for toilet flushing, washing down golf buggies.
 - the landfill generates varying amounts of leachate which may be able to supplement the water



Leachate collection pond on the landfill site



The existing water storage dam on the golf course site

supply. However, leachate would require treatment and amounts fluctuate too greatly to provide a reliable water supply.

- the proximity of a sewer main would make sewer mining a technically feasible need option that would deliver a reliable water supply to the site, for use in irrigation and toilet flushing. However, a small treatment works would be required, with a relatively high initial capital cost. Other small issues to consider would be its location (access to sewer main, maintenance access) as well as community concerns regarding plant operation noise and odour emissions.

For a more detailed discussion of water use and management issues, the Storm Consulting Civil and Environmental Engineering report in Volume II- Appendix should be referred to.

Existing Site Uses and Structures

North Turramurra Golf Course

- The North Turramurra Golf Course is owned by Council and managed by the private contractor “Tee Tops”, under lease from Council. It is a popular and highly valued recreation asset in the area.
- The current golf course layout is unbalanced, in particular with regard to the length, strength, visual character/ interest and amenity (shade) between the first and second 9 holes.
- The “best” holes are holes 1, 2, 3, 17 and 18, located around the club house and along Bobbin Head Road. They feature fairways lined with established trees, providing protection from stray balls.
- Site redevelopment may provide the opportunity to enhance the layout and aesthetics of the course and make it more technically challenging and balanced overall.
- The majority of greens and tees are worn out or have reached the end of their life. NTRA development should consider refurbishment or re-building of tees and greens to improve the quality of the course.
- Council’s resolution requires any redevelopment to be able to be staged to ensure the ongoing operation of the golf course with an 18 hole capacity.
- Some golf players have identified the potential to reduce the course to a 9 hole course of high quality, complemented by additional practice facilities such as a driving range, chip and putt area, putt-putt facilities or similar. This would also render the course more suitable for local school use and teaching activities.



Tree lined golf fairways



Existing green in need of refurbishment

Existing Buildings and Structures

- The existing Golf club house an is an old building that may require refurbishing or renovations to better meet the need of golfers
- There is an opportunity to replace the existing golf club house with a new purpose-built building consolidating golf facilities with new facilities required for sporting use, such as change rooms, match rooms, toilets, etc. Additional support buildings may still be needed, such as for maintenance equipment, buggy storage and the like.
- In order to minimise potential user conflict, functional separation between golf and sporting users/ facilities should be maintained.
- There is currently no community building provided for on-site. The opportunity to provide any new facilities including buildings should be flexible enough to allow for a range of community uses and activities, including community meetings or indoor activities such as yoga classes.



The existing Golf club house

Other Uses

- Ku-ring-gai Council currently operates to independent depots in the NTRA: the “landfill depot” off Curagul Road and the golf course maintenance depot accessed from Bertrand Road. It maybe possible to consolidate these in a single location in order to free up additional areas for recreational use.
- Beehives are located in a compound near Council’s golf course depot and provide an interesting and unusual education opportunity in urban areas. The potential impact of redevelopment on the beehives will need to be considered. If necessary for safety or other considerations, it may be possible to relocate the hives to another location on the site. This possibility has been provided for in Council’s license with the Bee Keepers.
- Girl Guides and Scouts Group Halls are located off Bobbin Head Road in the south-western portion of the NTRA. These bushland areas are protected and beyond the extent of any redevelopment proposals. The use and function of these buildings has therefore not been reviewed as part of this study and would remain independent of any redevelopment proposals.



Council’s golf course depot, located off Bertrand Road



Recreation Demand

- The Ku-ring-gai Local Government Area (LGA) currently houses numerous sports fields and recreational facilities, however there is a need for more due to the continually growing population and increasing recreation demands from all age groups.
- It is estimated that the acquisition of a further 4.84 ha of open space is required to meet the recreation demand. Yet, opportunities for the expansion of the open space system are limited. The North-Eastern portion of the LGA in particular has a shortage of recreation and sporting facilities.
- The NTRA is a large area of open space and represents a singularly important opportunity for Council to increase open space resources in the LGA without negatively impacting existing users.
- A number of recreation facilities could be accommodated at the NTRA, providing recreation opportunities for various groups and for children and teenagers in particular.
- In addition to maintaining the current eighteen-hole golf course, recreation opportunities would need to include sporting fields and facilities for competitive and noncompetitive sports, social facilities or educational activities and playgrounds.
- Recreation opportunities to be provided for older residents could include a range of informal activities, walking tracks and cycling paths, nature observation opportunities and involvement in environmental conservation, seating and shelter, indoor social or educational creative arts programs and golf.
- Recreation options should be flexible and allow for different types of use at different times, in particular with regard to the use of the sporting fields.
- There is also a need for the site to accommodate for people with disability. Activity and accessibility on site should be encouraged for their use.

Summary of Constraints and Opportunities

- Redevelopment of the NTRA should aim for the creation of a good multi-purpose/ multi-field space which permits a variety of different configurations, so that use of the facility can be adapted over time to meet changing demands.
- In addition to the unsuitability of land fill areas for the development of sporting facilities, a number of factors influence their potential location, including topography, existing tree cover and vehicular access and parking considerations.
- Possible sporting field locations include;
 - In the North of the site, at the corner of Bobbin Head Road and Curaxgul Road.

While there would be no negative impact on native bushland, extensive shortening of fairways would be required, as well as the removal of significant fairway vegetation. It would also increase traffic around the Bobbin Head and Curagul Road intersection and may lead to conflict with traffic to and from the Knox playing fields. In this location, a separate road entrance may be required and fields would be close to adjoining residents. Noise and activity on the weekends may impact negatively on the amenity of this currently quiet neighbourhood. There is also a perceived risk that fields in this location could become dominated by private school use/ demand, to the disadvantage of the needs of the wider community.
 - South of the existing golf club house, off Bobbin Head Road.

Depending on the final size of the playing fields this option may have some impacts on bushland to the south of Bertrand Road. However it benefits from the relatively gentle slopes in this area and the proximity to the existing main entrance which would be able to be used as long as some upgrading to improve safety and cope with increased traffic flows is undertaken. It also provides

the opportunity to provide a new purpose- built building which would house both golf club and other sporting facilities. The impact on existing golf fairways would be limited to the ones south of the existing club house, which are generally of lower quality from those of further north.

- Immediately east of the golf course ‘clubhouse’

This location would be ideal in the sense that it provides the largest naturally flat area on the site which would significantly reduce the amount of earthworks required to construct sporting fields. The existing club house could be retained and upgraded to accommodate sporting uses, or a new building could be proposed- designed to suit sporting requirements. The existing main entrance would be able to be re-used, but would require some upgrading to improve safety and cater for larger traffic numbers. However, in this location it would not be possible to functionally and physically separate golf from other sporting uses which is likely to generate more user conflicts and may also increase safety risks.



NTRA Concept Options

Based on the identified constraints and opportunities, three re-development concept options were developed and presented to Ku-Ring-Gai Council and the Parks, Sports and Recreation Reference Group. The options showed varied golf, sporting and recreational opportunities. A description and a plan of each along with a series of diagrams showing potential sporting field configurations were presented. They are summarised in following section.

Each option is complemented by a preliminary cost indication that provides a rough estimate, as well as a staging plan. The staging plan identifies the most effective sequence of construction activities which ensures that 18 golf holes will be available for play at all times during the different redevelopment stages.

Outcome

The presentation of the three design options was well received. Feedback from the group was positive, and the members were supportive of the projects direction. They were also most appealed by the flexibility in the design of the schemes accommodating a range of recreation users.

The group would further like to see a preferred design option derived from Option 1 and 2 that explores more space for organised sporting purposes as there is a great need in the area.

Major Design Considerations

During the site analysis process of the design development certain restrictions were identified (Refer to Figure 7 and 8). Those of which limited flexibility and the space available for a variety of design configurations. These include:

- Topographically challenging site and the limited availability of flat land.
- Restricted use of the land on the former landfill site due to dangerous slopes. These are the exclusion zones on the northern and western edges of the site and insufficient heavy-load capacity.
- Restricted redevelopment opportunities on the site edges along Bobbin Head Road and Curagul Road due to conflict with surrounding residents.
- Sensitivity of the surrounding bushlands and national parklands.
- Existing matured trees and shrubs are present across the site in various groups and alignments. Some of which create a characteristic frontage along Bobbin Head Road and pleasant golfing fairways. Redevelopment of site should have minimal disturbance to this vegetation.
- Clear separation of users. Golf course, sports field users and the general public should be separated, firstly due to safety reasons and also to distinguish the users experience on site.
- Entrance/ Exit to the site is to be retained via Bobbin Head Road. Public access to the site via Curagul Road is restricted to avoid disturbance to residential developments along this road.



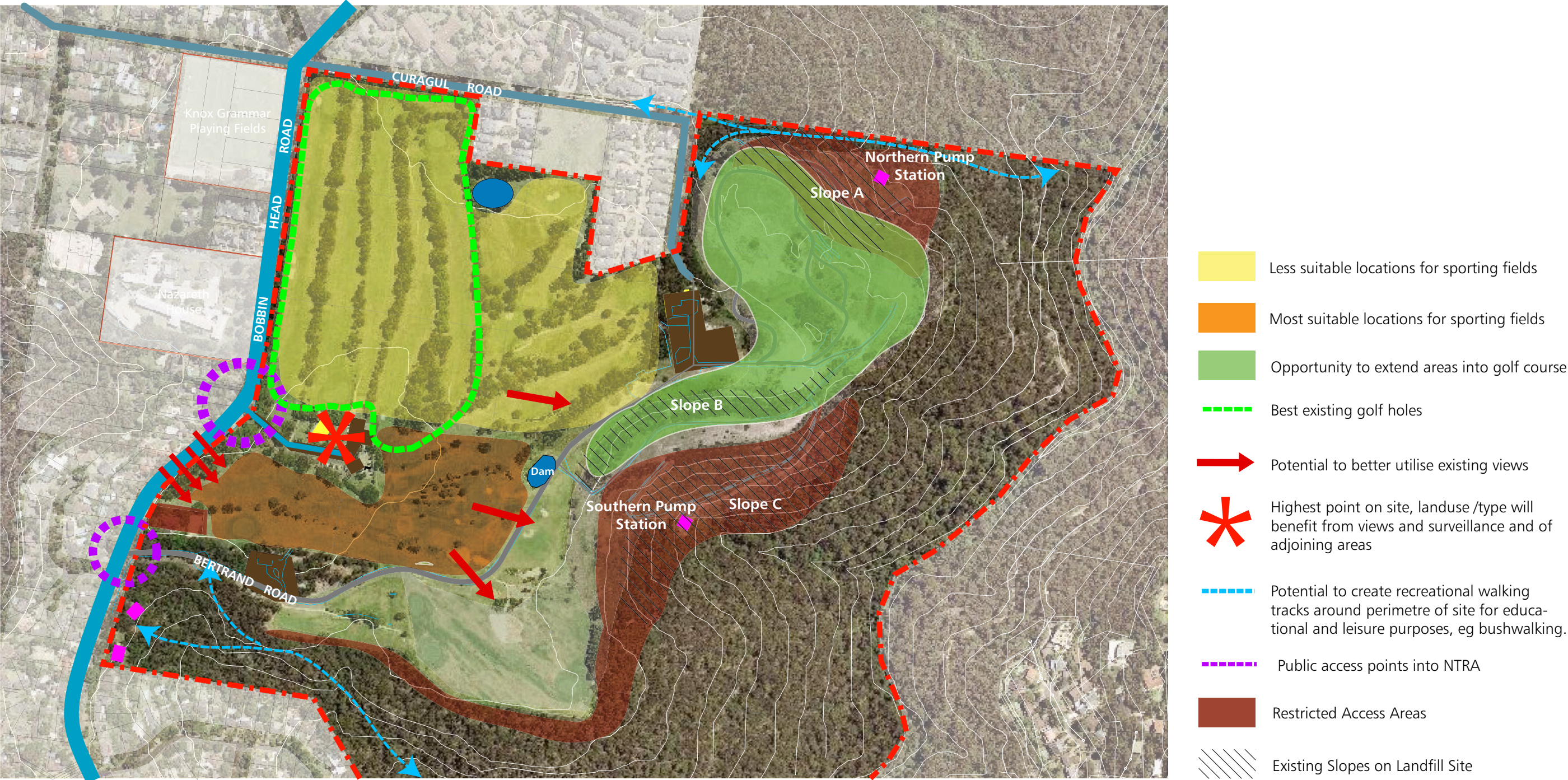


Figure 7- Opportunities analysis diagram

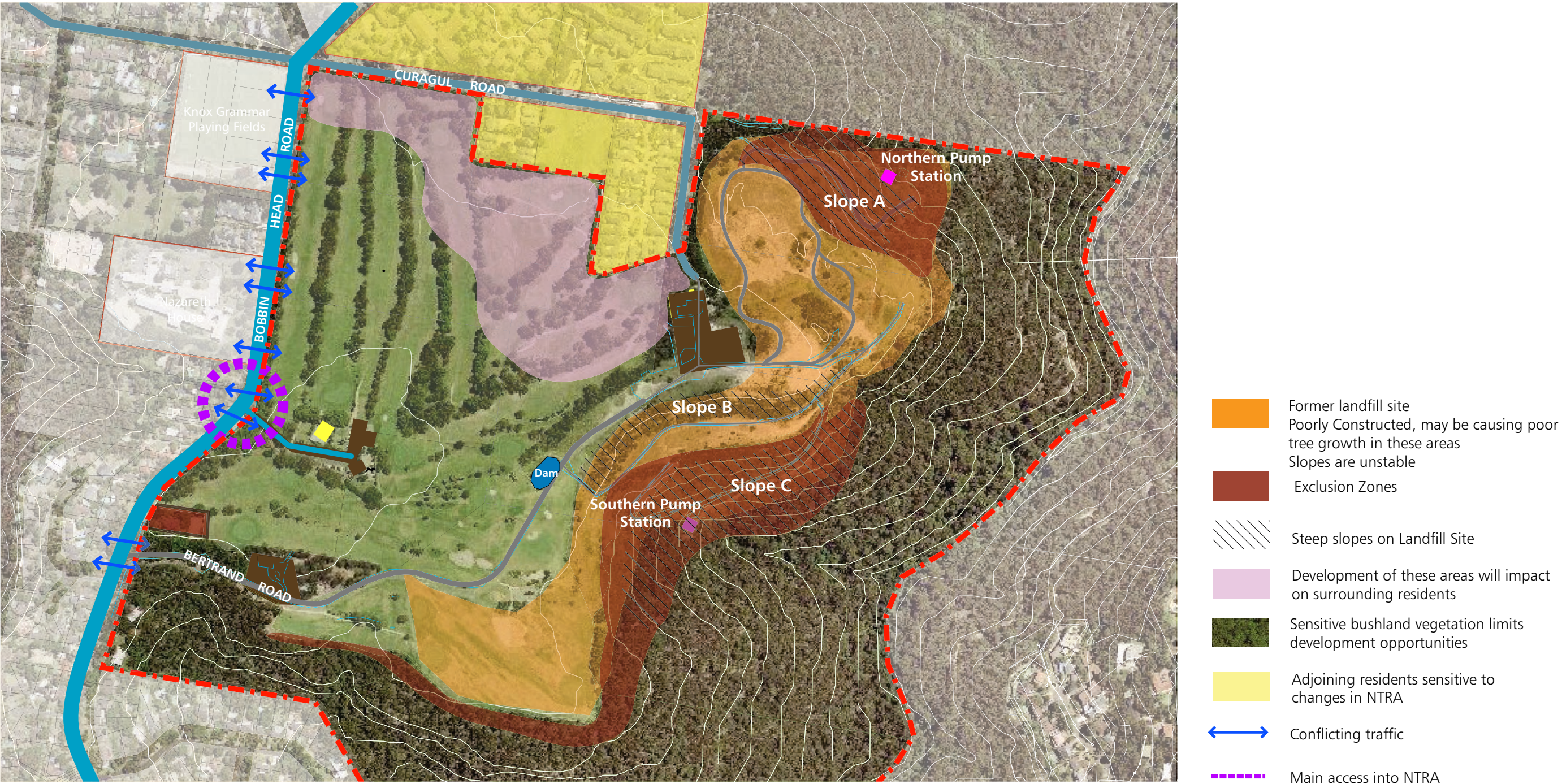


Figure 8- Constraints analysis diagram

Integration of Council Requirements

Our design ideas for this site, together with these limitation, followed a series of criteria set out by Ku-Ring-Gai Council. The criteria was implemented in all the three options. They include:

- An eighteen-hole golf course of equal or improved quality
- Upgrading the golf club house and facilities (ie. car park)
- Sporting fields that can cater for a variety of organised sporting games
- Club house facility for the proposed sporting fields
- A two-hundred space car park for the new sporting facilities.
- Passive recreational open space and the potential to introduce walking tracks in and around the site.

These factors were considered during the development of options and as a result the three options illustrated in this section unavoidably share some common design features.

Common Features of Concept Options

- The golf course is stronger and more interesting than the existing layout, by providing a greater range of hole types and overall par value.
- Combination of new and existing tees and greens used.
- Golf course utilises land-fill area for new golf holes.
- New vegetation through the golf course to increase visual interest and amenity.

- Existing golf course car parking (65 spaces) retained.
- Upgrading works proposed on the existing golf course club house.
- Existing golf practise nets retained.
- Dedicated area for sports grounds proposed on the site with a clearly separation to the golf course. Field configurations are varied.
- 30 metre safety buffer zone between golf greens and playing fields. This is to provide safety of users on the sporting fields and passive recreational areas.
- Minimal clearing required for sporting fields.
- The length of the sports grounds will create a surface embankment to the south of the fields in order to create a level surface. The length of the embankment will vary with each sporting configuration option.
- 6m fencing required around sporting grounds for safety of users.
- New sports grounds car park to possibly include golf course overflow parking.
- Potential to locate hard courts in car park (ie netball, basketball, handball etc), when maximum car parking capacity is not required.
- Additional open space areas available for development of other facilities such as, children’s playground or possible alternative recreational area.
- Potential for recreational walking tracks around the site and linking to existing bush tracks.

- Sites boundary to be fenced with a 3m/ 6m fence where appropriate. This is to enable safety and protection of users from exclusion zones and safety of residential developments from golf course activity.
- Main entrance to the site is via Bobbin Head Road. A proposed roundabout required to improve existing traffic conditions. Exit point across the three options vary.
- To manage traffic going to the golf and sporting facilities, a second roundabout is required for ease of traffic flow within the site.
- Relocation of existing golf maintenance depot and consolidation with land fill depot in the northern part of the site.
- Access for maintenance vehicles to the new consolidated depot would be retained as the existing private access from Curagul Road.
- Potential to construct a dam on site for collection and reuse of water on site. Development approval for the dam has been granted.

Each of these features responds to the opportunities and constraints identified in the analysis stage of the project.

Supplementary to these elements, the three concept option possess additional features and varied configurations to provide flexibility and to show maximum potential of the site for users. The distinctive features of each concept option is identified in the following section accompanied with drawings and details.



Concept Option 1
Eighteen-Hole Golf Course with 155m x 156m Sporting
Grounds

Main Features

- Residential property in Bobbin Head Road retained
- Existing golf Clubhouse retained to facilitate the golf course users only.
- Eighteen-hole golf course with 4904m length and Par value of 67.
- Sports grounds (155m x 156m). See pg 34 for configuration of fields
- Independent clubhouse for sports field users, including change rooms (4 sets for teams and 1 set for umpires), toilets (2 sets of 8 and 1 disabled) canteen, equipment storage and possibly club or multi-purpose room in a second storey.
- A two-way sporting facility car park with the use of current access point for entry and exit.

Staging of Construction Works

It is anticipated, that the redevelopment of the NTRA for option 1 would take a minimum of 3-5 years or longer depending on the availability of funds. Construction would need to be undertaken in the following stages.

Stage 1: - Construct holes on landfill area

- build holes 11-16 inclusive, and part hole 6
- existing hole 11 to play to a temporary green, to allow new 15th green to be built
- existing hole 15 to play from a temporary tee, to allow new 16th green to be built

Stage 2: - Construct holes adjacent to proposed sporting grounds

Can only progress once stage 1 works are ready for play: ie one growing season minimum is required before play moves to new holes.

- take existing holes 6-11 inclusive out of play
- build new holes 6-10 inclusive

Stage 3: - Remove existing holes on proposed sporting fields and construct fields

Can only progress once stage 2 works are ready for play: ie one growing season minimum is required before play moves to new holes

- take existing holes 10, 13-16 inclusive out of play
- build sports facilities

Stage 4: - Future Upgrading Works

Existing golf holes 17, 18, 1, 2, 3, 4, and 5 to the north of the golf club house site are to be retained as part of the proposed golf course. Future upgrade works, such as repair or reconstruction may be required in the long term period.



OPTION 1				
NORTH TURRAMURRA GOLF COURSE				
EXISTING			PROPOSED	
HOLE	LENGTH	PAR	LENGTH	PAR
1	375	4	✓	4
2	330	4	✓	4
3	313	4	✓	4
4	114	3	✓	3
5	150	3	✓	3
6	150	3	324	4
7	320	4	123	3
8	114	3	152	3
9	148	3	365	4
OUT	2014	31	2246	32
10	297	4	128	3
11	152	3	471	5
12	219	4	286	4
13	150	3	152	3
14	160	3	138	3
15	319	4	497	5
16	150	3	255	4
17	410	5	✓	4
18	348	4	✓	4
IN	2206	33	2658	35
OUT	2014	31	2246	32
TOTAL	4220	64	4904	67

APPROVED STORAGE DAM

EXISTING CAR PARKING AND CLUBHOUSE TO BE RETAINED

UPGRADE ENTRANCE WITH NEW ROUNDABOUT PRACTICE NET

GOLF CLUB CAR PARKING

POSSIBLE LOCATION FOR NETBALL COURTS

PROPOSED SPORTING FACILITIES CAR PARK 200 SPACES

PLAYGROUND OR POSSIBLE ADDITIONAL TRAINING AREA

EXISTING SCOUT HALL AND GIRL GUIDES BUILDING

PAVILION INCLUDING 4 CHANGE ROOMS FOR TEAMS AND 1 FOR UMPIRES, CANTEN EQUIPMENT STORAGE AND POSSIBLE CLUB ROOMS

PLAYING GROUNDS. REFER TO PLAYGROUND CONFIGURATION 1 DRAWING FOR LAYOUT OPTIONS.

EXISTING DEPOT TO BE RETAINED

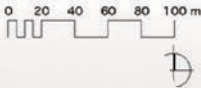
PUMP STATION VEHICULAR ACCESS ACROSS IDENTIFIED LOCATIONS ON GOLF COURSE

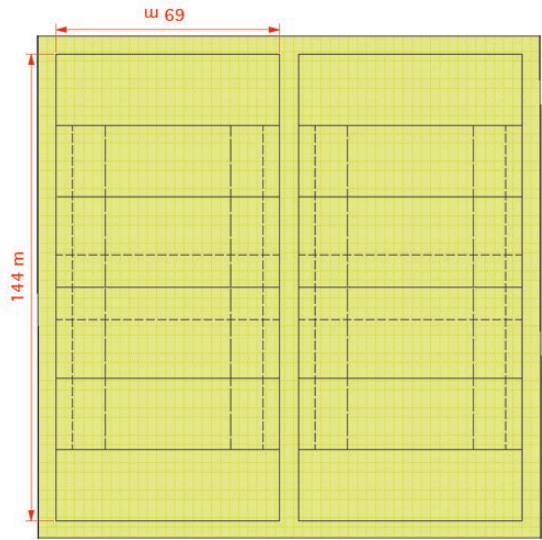
NORTHERN PUMP STATION

SOUTHERN PUMP STATION

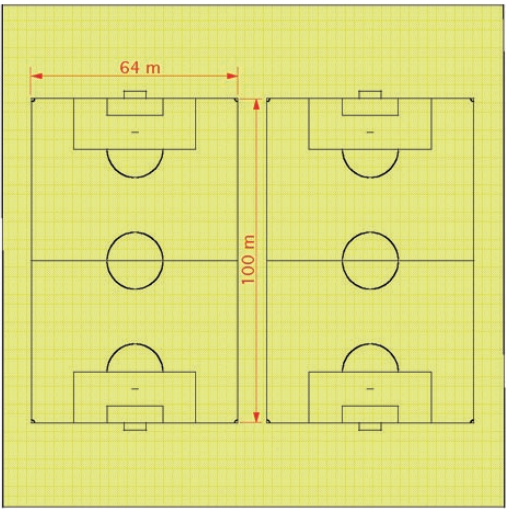
PUMP STATION VEHICULAR ACCESS ACROSS IDENTIFIED LOCATIONS ON GOLF COURSE

- EXISTING PUMP STATIONS
- REMOVED TEES AND GREENS OF GOLF COURSE
- GOLF HOLE NUMBER
- RETAINED TEES AND GREENS OF GOLF COURSE
- PROPOSED TEES AND GREENS OF GOLF COURSE
- NEW VEGETATION
- EXISTING SITE VEGETATION TO BE RETAINED
- EXISTING BUSHLAND
- SLOPE STABILISATION AND REPLANTING WITH NATIVE VEGETATION
- POTENTIAL PASSIVE RECREATION/PLAYGROUND AREA
- PLAYING GROUNDS
- ROAD/PARKING AREA
- BUILDINGS
- ACCESS TRACKS
- PROPOSED CONTOUR LINE
- WALKING TRACK
- FENCE LINE
- STUDY AREA

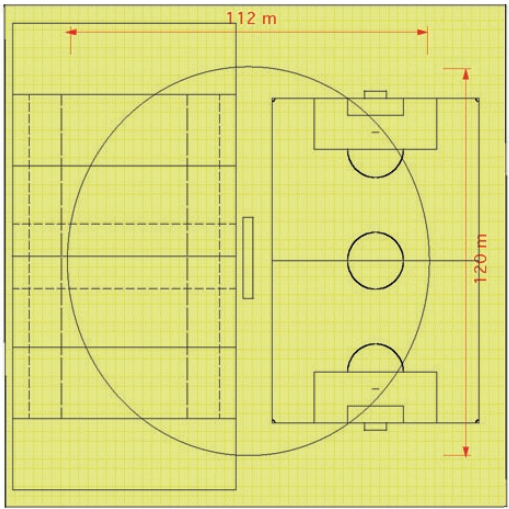




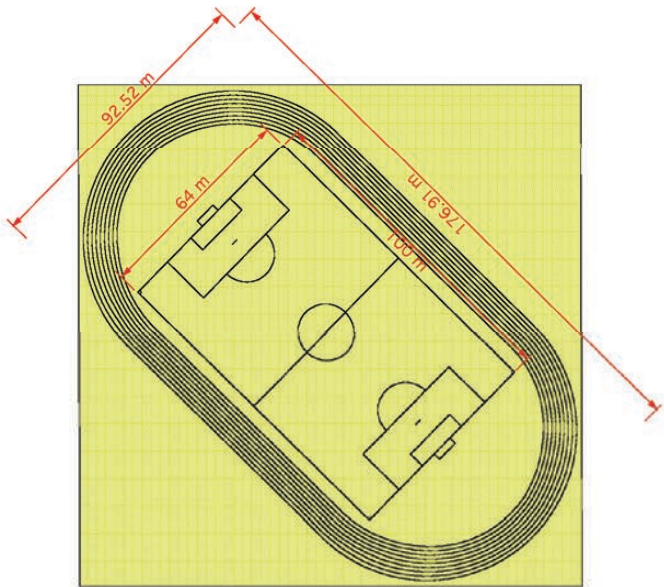
2 Rugby Union / Rugby League Fields



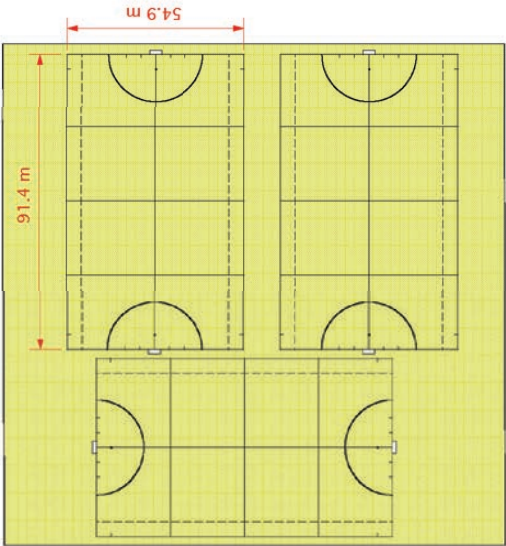
2 Senior Football Fields



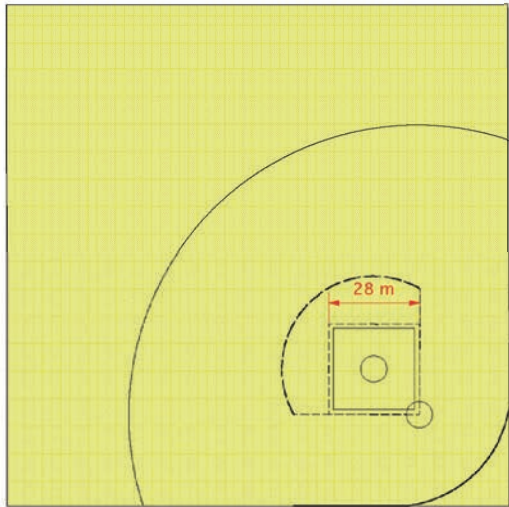
1 Cricket Oval
1 Rugby Union / Rugby League Field
1 Senior Football Field



400m Running Track
1 Senior Football Field



3 Hockey Fields



1 Baseball/ Softball Fields



	Unit	Rate	Qty	Total
Site Establishment				
Allowance for site establishment incl. fencing, signage, facilities	item			\$40,000.00
Earthworks				
Site clearing	m2	\$2.50	150000	\$375,000.00
Filling and compaction of capping, sealing, drainage and revegetation layers	m3	\$50.00	75000	\$3,750,000.00
New Golf Holes				
New greens and surrounds	no.	\$65,000.00	11	\$715,000.00
New tee blocks	no.	\$15,000.00	11	\$165,000.00
New fairway works incl. preparation, topsoil and turf	m2	\$15.00	53650	\$804,750.00
New fairway features incl. bunkers and mounding	no.	\$15,000.00	11	\$165,000.00
Golf Course Irrigation				
Allowance for 18 hole irrigation system	item			\$500,000.00
Cart Paths				
2.5m wide concrete cart path, tee to green only	m2	\$45.00	3500	\$157,500.00
Sports Fields				
Allowance for earthworks / excavation	item			\$100,000.00
Allowance for subsurface drainage to playing fields	item			\$50,000.00
Turf, incl. fertiliser to playing fields	m2	\$7.00	24000	\$168,000.00
Establishment of turf wicket square	m2	\$20.00	500	\$10,000.00
900mm high tubular steel fence incl. gates	lm	\$30.00	650	\$19,500.00
Carparking				
Excavation, base course and preparation	m2	\$25.00	7250	\$181,250.00
Asphalt surface	m2	\$50.00	7250	\$362,500.00
Allowance for misc. line painting, drainage etc.	item			\$10,000.00
Tree planting 100L	no.	\$250.00	41	\$10,250.00
Building Works				
Allowance for refurbishment of existing clubhouse	item			\$300,000.00
Allowance for new sports pavilion with maintenance storage rooms	item			\$600,000.00
Sub total (excl GST)				\$8,483,750.00
Contingency (5%)				\$424,187.50
TOTAL (excl GST)				\$8,907,937.50



Concept Option 2

Eighteen-hole Golf Course with 225m x 187m Sports Grounds

Main Features

- Acquisition of residential property in Bobbin Head Road
- Eighteen-hole golf Course with 4904m length Par value of 67
- Playing ground 225m x 187m See pg 39 for configuration of fields
- Shared clubhouse/ multi-purpose building for golf course users, sports field users and community use. ie yoga, pilates, activities room.
- To avoid user conflict, the facility rooms within the new building will remain separate. Facilities will be closed off from one another to restrict access of other users.
- Within the new clubhouse/ multi-purpose building, facilities of better quality will be provided for golfers.
- The sporting facility rooms will include; change rooms (4 sets for teams and 1 set for umpires), canteen, equipment storage and possibly club or multi- purpose room in a second storey.
- A proposed starters box/ Pro shop will be positioned near the 1st Tee.
- A two-way sporting facility car park with the use of current access point for entrance and the use of Bertrand Road as an exit.
- Retained character of tree-lined Bobbin Head Road by keeping existing trees along the road edge of the new sporting facility car park.

Staging of Construction Works

It is anticipated that the redevelopment of the NTRA for option 2 would take a minimum of 3-5 years or longer depending on the availability of funds. Construction would need to be undertaken in the following stages.

Stage 1: - Construct holes on landfill area

- build holes 11-16 inclusive, and part hole 6
- existing hole 11 to play to a temporary green, to allow new 15th green to be built
- existing hole 15 to play from a temporary tee, to allow new 16th green to be built

Stage 2: - Construct holes adjacent to proposed sporting grounds

Can only progress once stage 1 works are ready for play: ie one growing season minimum is required before play moves to new holes.

- take existing holes 6-11 inclusive out of play
- build new holes 6-10 inclusive

Stage 3: - Remove existing holes on proposed sporting fields and construct fields

Can only progress once stage 2 works are ready for play: ie one growing season minimum is required before play moves to new holes

- take existing holes 10, 13-16 inclusive out of play
- build sports facilities

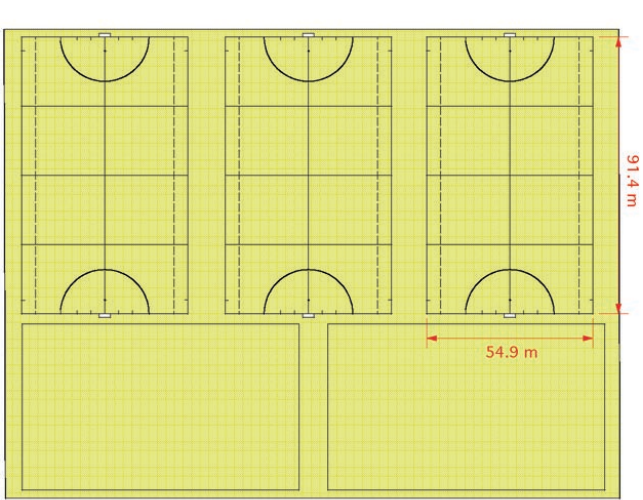
Stage 4: - Future Upgrading Works

Existing golf holes 17, 18, 1, 2, 3, 4, and 5 to the north of the golf club house site are to be retained as part of the proposed golf course. Future upgrade works, such as repair or reconstruction may be required in the long term period.

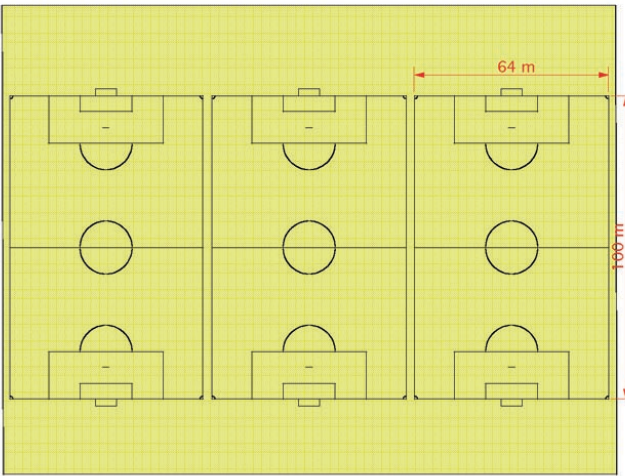


OPTION 2				
NORTH TURRAMURRA GOLF COURSE				
EXISTING			PROPOSED	
HOLE	LENGTH	PAR	LENGTH	PAR
1	375	4	✓	4
2	330	4	✓	4
3	313	4	✓	4
4	114	3	✓	3
5	150	3	✓	3
6	150	3	324	4
7	320	4	123	3
8	114	3	152	3
9	148	3	365	4
OUT	2014	31	2246	32
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13	150	3	152	3
14	160	3	138	3
15	319	4	497	5
16	150	3	255	4
17	410	5	✓	4
18	348	4	✓	4
IN	2206	33	2658	35
OUT	2014	31	2246	32
TOTAL	4220	64	4904	67

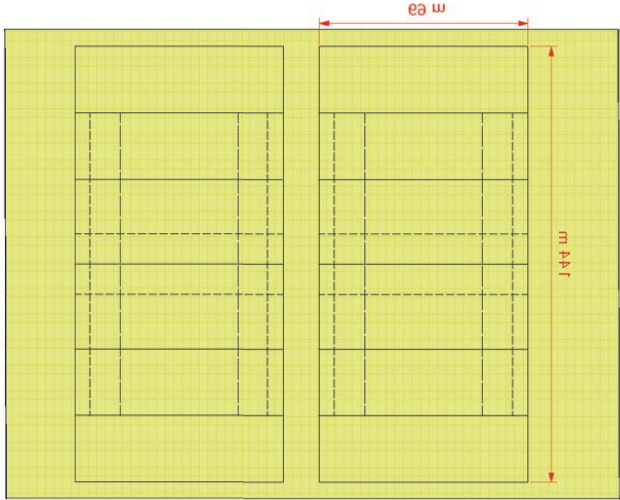




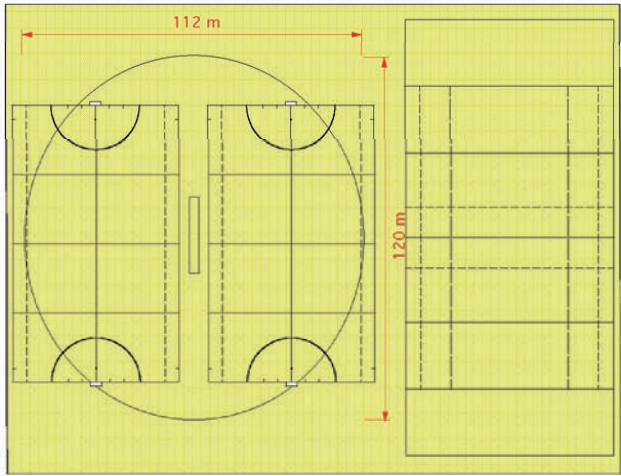
3 Hockey Fields
2 Training Fields



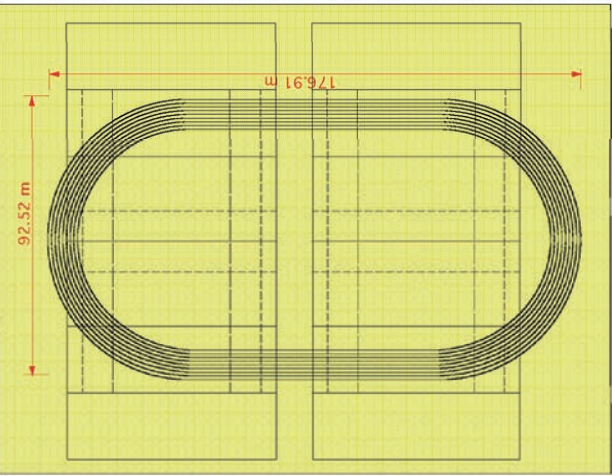
3 Senior Football Fields



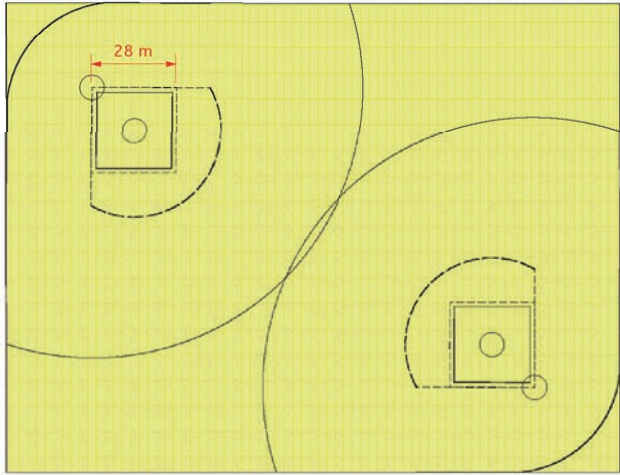
2 Rugby Union / Rugby League Fields



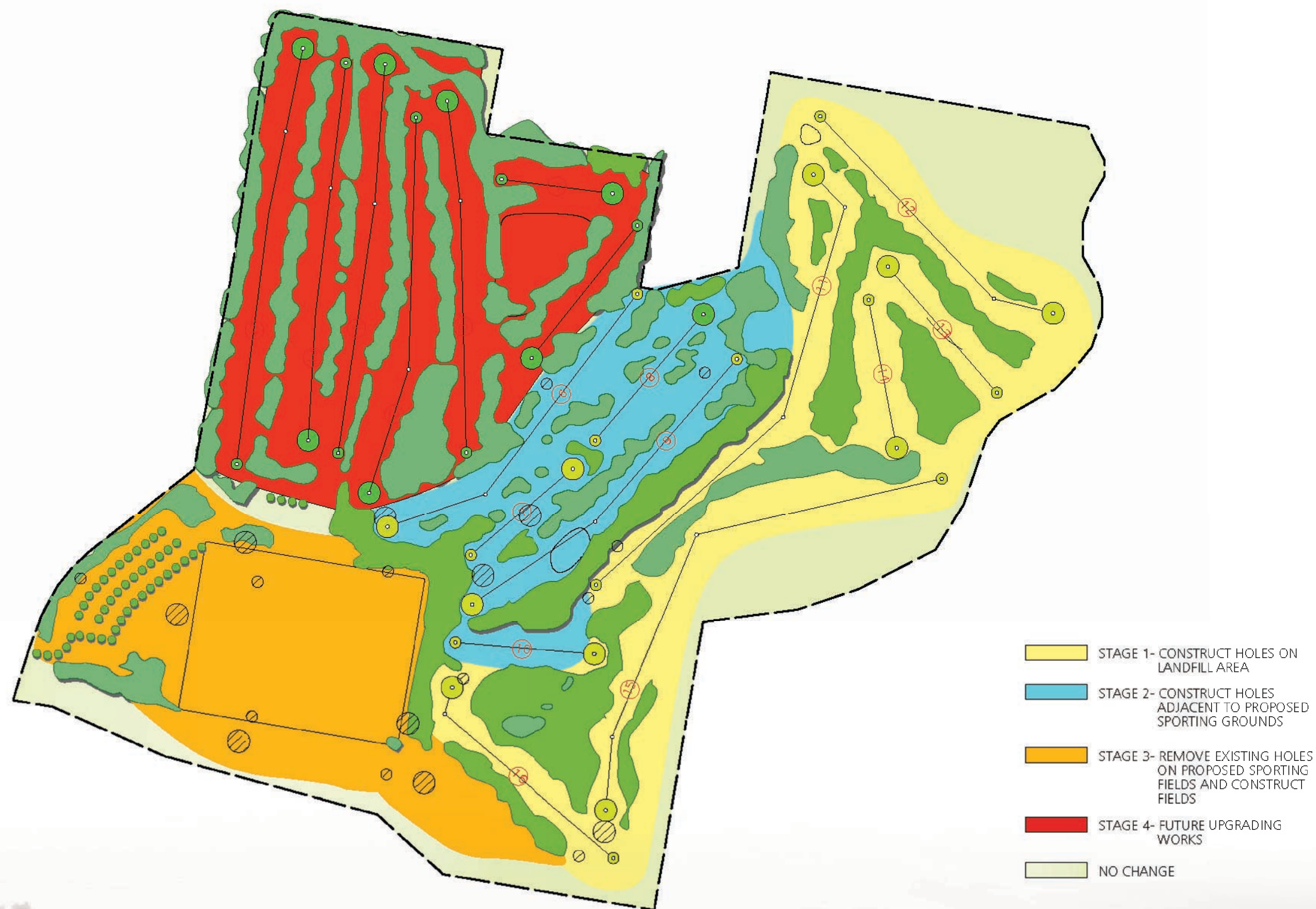
1 Cricket Oval
2 Hockey Fields
1 Rugby Union / Rugby League Field



2 Rugby Union / Rugby League Fields
400m Running Track



2 Baseball/Softball Fields



	Unit	Rate	Qty	Total
Site Establishment				
Allowance for site establishment incl. fencing, signage, facilities	item			\$40,000.00
Purchasing property, 361 Bobbin Head Rd	item			
Earthworks				
Site clearing	m2	\$2.50	150000	\$375,000.00
Filling and compaction of capping, sealing, drainage and revegetation layers	m3	\$50.00	75000	\$3,750,000.00
New Golf Holes				
New greens and surrounds	no.	\$65,000.00	11	\$715,000.00
New tee blocks	no.	\$15,000.00	11	\$165,000.00
New fairway works incl. preparation, topsoil and turf	m2	\$15.00	53650	\$804,750.00
New fairway features incl. bunkers and mounding	no.	\$15,000.00	11	\$165,000.00
Golf Course Irrigation				
Allowance for 18 hole irrigation system	item			\$500,000.00
Cart Paths				
2.5m wide concrete cart path, tee to green only	m2	\$45.00	3500	\$157,500.00
Sports Fields				
Allowance for earthworks / excavation	item			\$100,000.00
Allowance for subsurface drainage to playing fields	item			\$50,000.00
Turf, incl. fertiliser to playing fields	m2	\$7.00	32000	\$224,000.00
Establishment of turf wicket square	m2	\$20.00	500	\$10,000.00
900mm high tubular steel fence incl. gates	lm	\$30.00	650	\$19,500.00
Carparking				
Excavation, base course and preparation	m2	\$25.00	7250	\$181,250.00
Asphalt surface	m2	\$50.00	7250	\$362,500.00
Allowance for misc. line painting, drainage etc.	item			\$10,000.00
Tree planting 100L	no.	\$250.00	41	\$10,250.00
Building Works				
Allowance for new golf and sports pavilion	item			\$2,500,000.00
Starters Box/Pro Shop	item			\$100,000.00
Sub total (excl GST)				\$10,239,750.00
Contingency (5%)				\$511,987.50
TOTAL (excl GST)				\$10,751,737.50

Concept Option 3

Nine-Hole/ Eighteen-Tee Golf Course with Driving Range and 246m x 189m Sports Grounds

- Residential property in Bobbin Head Road retained
- Existing golf clubhouse retained for golf course users only.
- Independent clubhouse for sports field users, including change rooms (4 sets for teams and 1 set for umpires), toilets (2 sets of 8 and 1 disabled) canteen, equipment storage and possibly club or multi-purpose room in a second storey.
- A two-way sporting facility car park with the use of current access point for entry and exit.
- 9 hole/ 18 tee 6032m length Par 71
- Full size golf course driving range with 25 tee bays and coaching area.
- Playing ground 246m x 189m. See pg 44 for configuration of fields
- Land fill area utilized for driving range and possible chip and putt / putt-putt area and car parking.

Staging of Construction Works

It is anticipated, that the redevelopment of the NTRA for option 3 would take a minimum of 3-5 years or longer depending on the availability of funds. This option has considerable advantages over Option 1 and 2 in that redevelopment costs for the golf course would be lower. Construction would need to be undertaken in the following stages.

Stage 1: - Construct holes on landfill area

- build holes 2/11 and 4/13; 1/10 green and part fairway; 3/12 tees and green and part fairway; 5/15 tees and green and part fairway; 7/16 tees; and 8/17 tees

Stage 2: - Reconfigure golf holes at proposed dam site
Can only progress once stage 1 works are ready for play : ie one growing season minimum is required before play moves to new holes.

- take existing holes 3 and 4 out of play
- build new holes 6/15 (and treat as 2 holes in next stage)

Stage 3: - Construct holes adjacent to existing club house
Can only progress once stage 2 works are ready for play: ie one growing season minimum is required before play moves to new holes.

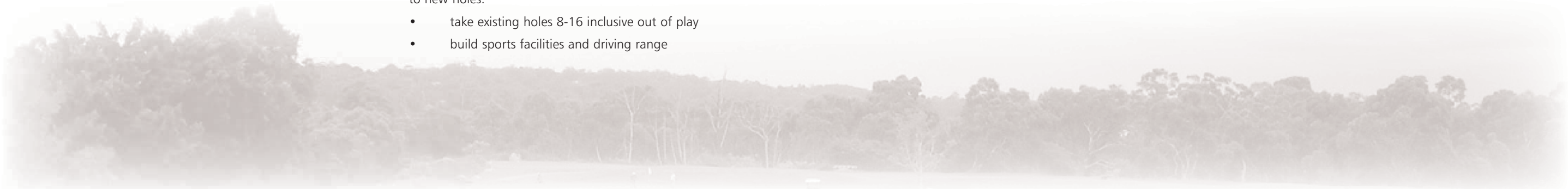
- take existing holes 5 and 7 out of play
- complete new holes 1/10, 3/12 and 5/14

Stage 4: - Construct holes above clubhouse and sporting fields. Can only progress once stage 3 works are ready for play: ie one growing season minimum is required before play moves to new holes.

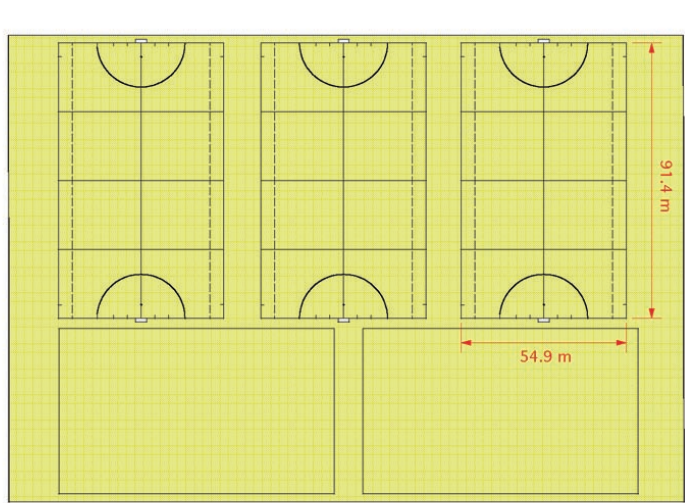
- take existing holes 2 and 17 out of play
- complete new holes 7/16, 8/17 and 9/18
- build sports facilities

Stage 5: - Construct driving range
Can only progress once stage 4 works are ready for play: ie one growing season minimum is required before play moves to new holes.

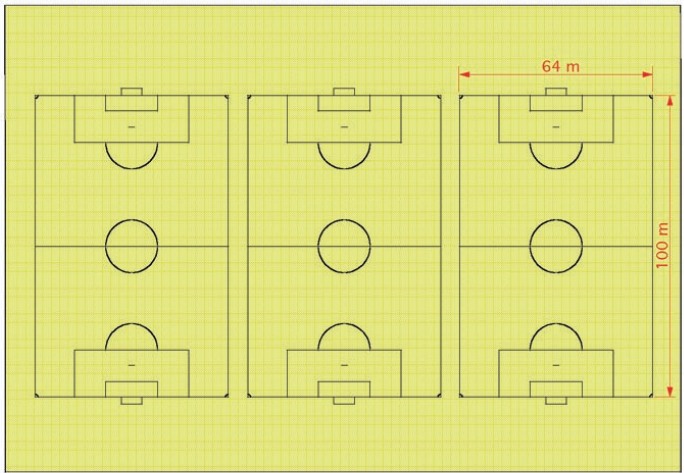
- take existing holes 8-16 inclusive out of play
- build sports facilities and driving range



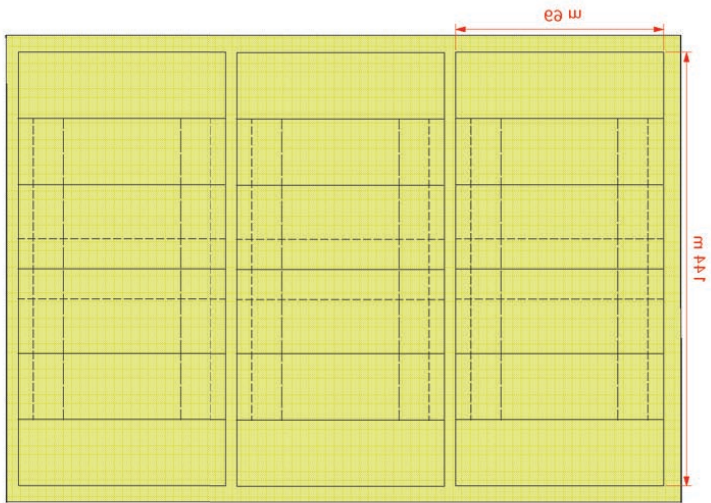




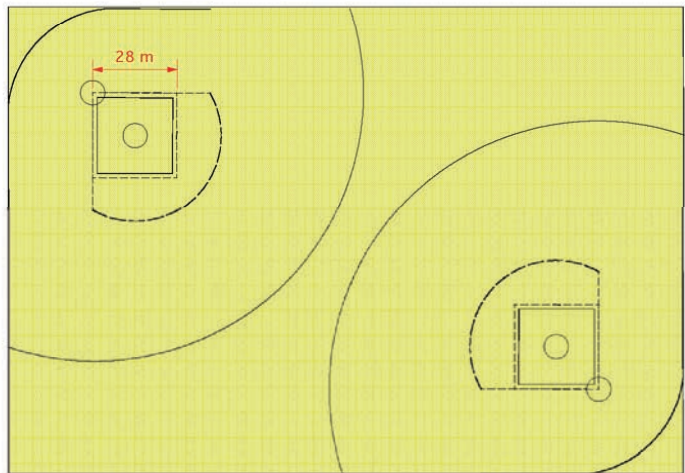
3 Hockey Fields
2 Training Fields



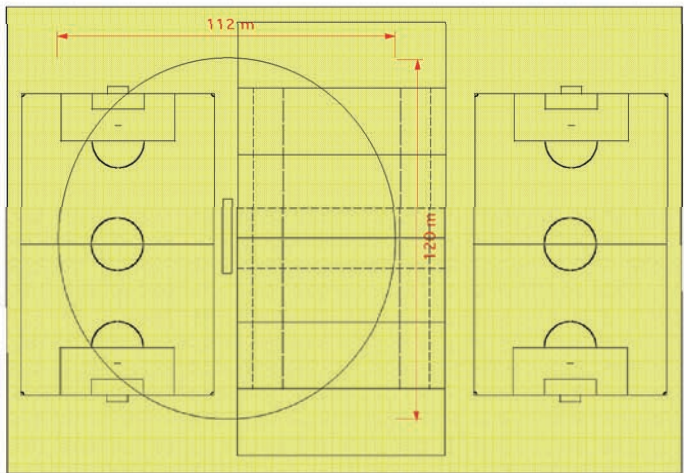
3 Senior Football Fields



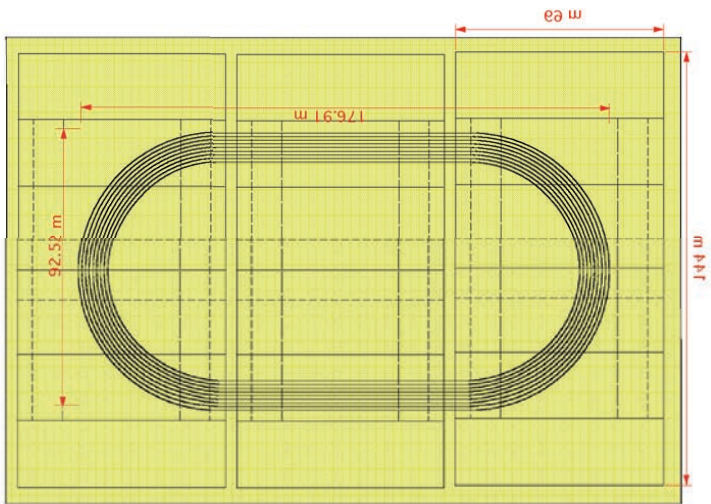
3 Rugby Union / Rugby League Fields



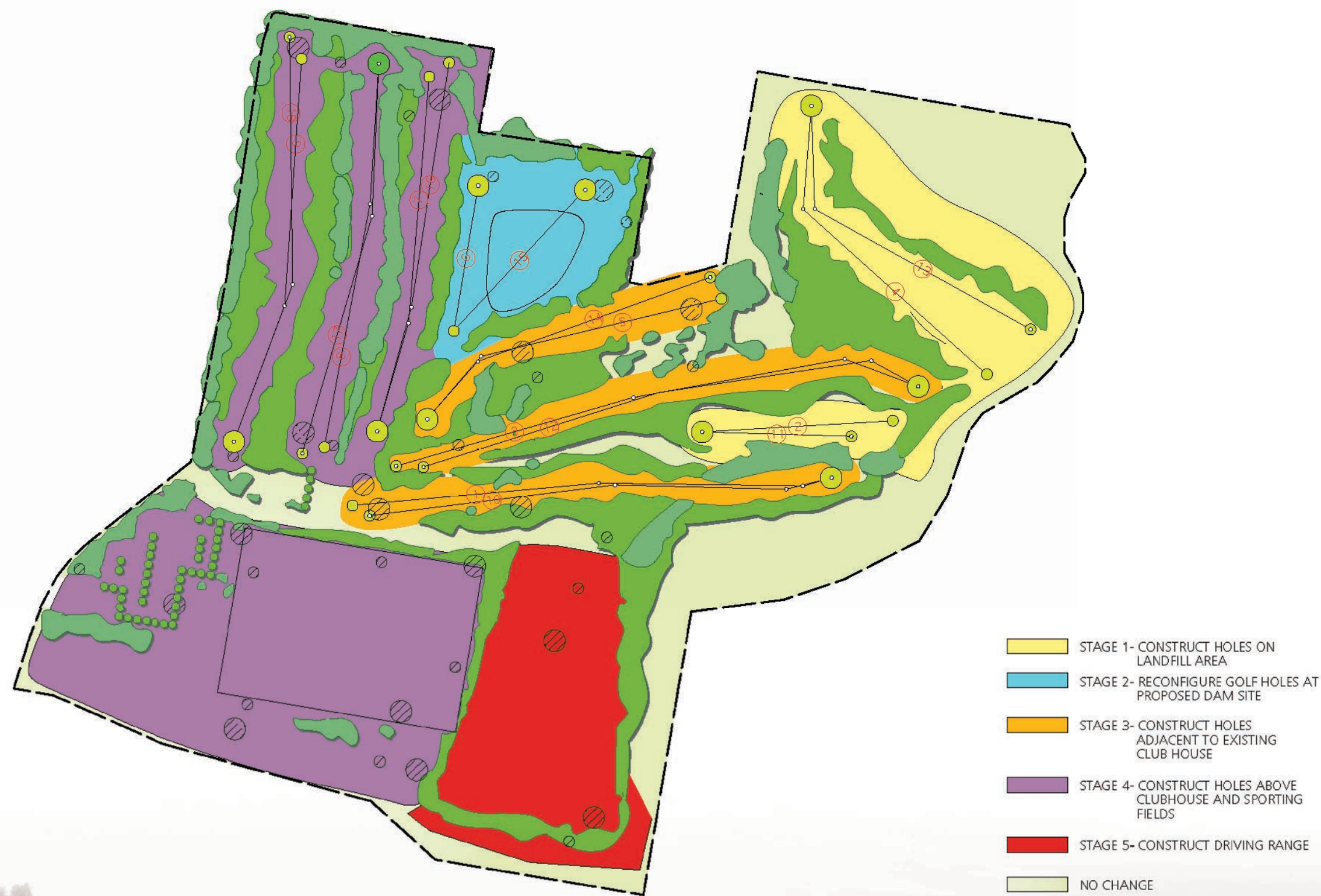
2 Baseball/Softball Fields



1 Cricket Oval
2 Senior Football Fields
1 Rugby Union / Rugby League Field



3 Rugby Union / Rugby League Fields
400m Running Track



	Unit	Rate	Qty	Total
Site Establishment Allowance for site establishment incl. fencing, signage, facilities	item			\$40,000.00
Earthworks Site clearing	m2	\$2.50	150000	\$375,000.00
Filling and compaction of capping, sealing, drainage and revegetation layers	m3	\$50.00	75000	\$3,750,000.00
New Golf Holes				
New greens and surrounds	no.	\$65,000.00	9	\$585,000.00
New tee blocks	no.	\$15,000.00	18	\$270,000.00
New fairway works incl. preparation, topsoil and turf	m2	\$15.00	49600	\$744,000.00
New fairway features incl. bunkers and mounding	no.	\$15,000.00	8	\$120,000.00
Golf Course Irrigation Allowance for 9 hole irrigation system	item			\$375,000.00
Cart Paths 2.5m wide concrete cart path, tee to green only	m2	\$45.00	2000	\$90,000.00
Driving Range Allowance for driving range incl. 25 tee bays and fencing	item			\$350,000.00
Sports Fields Allowance for earthworks / excavation	item			\$125,000.00
Allowance for subsurface drainage to playing fields	item			\$60,000.00
Turf, incl. fertiliser to playing fields	m2	\$7.00	35000	\$245,000.00
Establishment of turf wicket square	m2	\$20.00	500	\$10,000.00
900mm high tubular steel fence incl. gates	lm	\$30.00	550	\$16,500.00
Carparking and Roads Excavation, base course and preparation	m2	\$25.00	8000	\$200,000.00
Asphalt surface	m2	\$50.00	8000	\$400,000.00
Allowance for misc. line painting, drainage etc.	item			\$10,000.00
Tree planting 100L	no.	\$250.00	41	\$10,250.00
Building Works Allowance for refurbishment of existing clubhouse	item			\$300,000.00
Allowance for new sports pavilion with maintenance storage rooms	item			\$600,000.00
Sub total (excl GST)				\$8,675,750.00
Contingency (5%)				\$433,787.50
TOTAL (excl GST)				\$9,109,537.50

NTRA Preferred Option

Following the presentation of redevelopment options to council staff, a combination of Option 1 and Option 2 was considered the most appropriate redevelopment outcome and the one which would maximise recreation opportunities on the site and therefore best realise council’s vision.

The preferred option was further refined through an interactive process with council staff and includes a number of sub-options with regard to the potential or otherwise to acquire an existing residential property off Bobbin Head Road, as well as with regard to a number of potential playing field sizes and the respective uses these would permit.

The preferred sub-option will be chosen by council following a strategic review of playing field supply and demand in the Ku-Ring-Gai Local Government Area.

The preferred option provides council with a large degree of flexibility, both in terms of the range of sporting activities that could take place on the site and in terms of accommodating or responding to future changes in demand. It maximises the potential number of sports fields, provides an improved golf course and features upgraded existing and new purpose-built sporting facilities.

The following section provides an overview of the preferred option and sub-options, followed by plans, sections, a strategy plan and an indicative costing plan. Please note that these costs are extremely indicative and provided as a rough estimate. Each item will be subject to further revision and review prior to the final design adopted.

The preferred option incorporates the features common to the three concept options. They are briefly as follows:

- The golf course is stronger and more interesting
- New and existing Tees and Greens used.
- Golf course utilises land-fill area for new golf holes.
- New vegetation through the golf course
- Existing golf course parking retained with additional spaces (100 total).
- Upgrading works proposed on the existing golf course club house.
- Existing golf practise nets retained.
- Dedicated area for sports grounds proposed on the site.
- 30 metre safety buffer zone between golf greens and playing fields.
- Minimal clearing required for sporting fields.
- Creation of an embankment to the south of the new sporting fields.
- 6m fencing required around sporting grounds
- New sports grounds car park
- Potential to locate hard courts in car park
- Additional open space areas
- Potential for recreational walking tracks
- Sites boundary to be fenced with a 3m/ 6m fence
- Main entrance to the site is via Bobbin Head Rd
- Consolidation of depots to northern site
- Potential to construct a dam on site

Main Features

The distinctive feature of the preferred option are as follows:

- Eighteen-hole golf course of higher standard than existing with more challenging and a greater variety of fairways.

- Existing hole 12 retained as spare hole that can be used for teaching activities or to maintain an eighteen hole course when/ if other holes require repair or construction.
- A range of playing field sizes configuration options. Playing field area could range from 185m x 101m to 227m x 154m maximum, with most appropriate size likely to be between 154m x 110 m and 132m x 154m. Sporting field configurations are provided simply to illustrate the maximum capacity of playing space available. Refer to page 51 for configurations. Options for the specific sports to be played will continue to be considered when decision of the field is determined.
- Potential to provide up to four hard playing courts (ie: netball, basketball etc.) on the sporting field car park. This would reduce parking capacity while in use and may not be suitable for use on weekends.
- Potential playground site west of the playing facilities or alternatively close to clubhouse.
- Shared club building with a range of facilities including; change rooms, toilets, match room, canteen, multi-purpose/ community room.
- New Starters Box/ Pro Shop located near 1st Tee
- Incorporation of water management schemes for on-site collection and reuse. Stormwater harvesting and Sewer mining have been further investigated and are presented as two options for the site. Refer to Volume II for Storm Consulting’s Summary of Water Management Options report for more details.
- Appropriate traffic management recommendations for improvement of user conditions. Incorporation of safety of pedestrian and vehicular movements, cyclists and on site users. Refer to Volume II for APUP’s Review of Transport, Access and Parking report.

The preferred option also tested the idea of acquiring and retaining the residential property in the south-west corner of the NTRA site on Bobbin Head Road. These option are divided in sub- options as follows:

Sub-option a:

Residential Property in Bobbin Head Road Retained

- Does not require property acquisition
- Option for left-out only intersection at Bertrand Road to provide separate entry and exit to sporting facilities car park, reducing potential traffic congestion at the main entrance.

Sub-option b:

Acquisition of Property in Bobbin Head Road

- Acquisition of the residential property off Bobbin Head Road required prior to construction of sporting field’s car park.
- Provides informal open space areas for general (non-sporting) community use, such as picnicking or other passive leisure activities.
- Separate sporting field car park entry and exit to reduce traffic congestion and potential conflict at the main entrance. Exit to be left out only at upgraded Bertrand Road intersection.

Note: Sub-option a and b are not mutually exclusive, if site were to be developed according to sub- option a and the opportunity arose in the future for council to acquire the residential property, car parking and upon space areas could still be reconfigured as per sub-option b. However, this would be less cost-effective.



Staging of Construction Works

It is anticipated, that the redevelopment of the NTRA for the preferred option would take a minimum of 3-5 years or longer depending on the availability of funds. Construction would need to be undertaken in the following stages.

Stage 1: - Construct holes on landfill area

- build holes 11-16 inclusive, and part hole 6
- existing hole 11 to play to a temporary green, to allow new 15th green to be built
- existing hole 15 to play from a temporary tee, to allow new 16th green to be built

Stage 2: - Construct holes adjacent to proposed sporting grounds

Can only progress once stage 1 works are ready for play: ie one growing season minimum is required before play moves to new holes.

- take existing holes 6-11 inclusive out of play
- build new holes 6-10 inclusive

Stage 3: - Remove existing holes on proposed sporting fields and construct fields

Can only progress once stage 2 works are ready for play: ie one growing season minimum is required before play moves to new holes

- take existing holes 10, 13-16 inclusive out of play
- build sports facilities

Stage 4: - Removal of existing holes and construction of new replacement tees and greens

- remove existing holes 7, 9 and 11
- build new greens 6, 9, and 15

Note: All existing greens and tees will require upgrading, repair or reconstruction over time. However, if construction funds are limited , it would be possible to retain the following greens during the interim period.

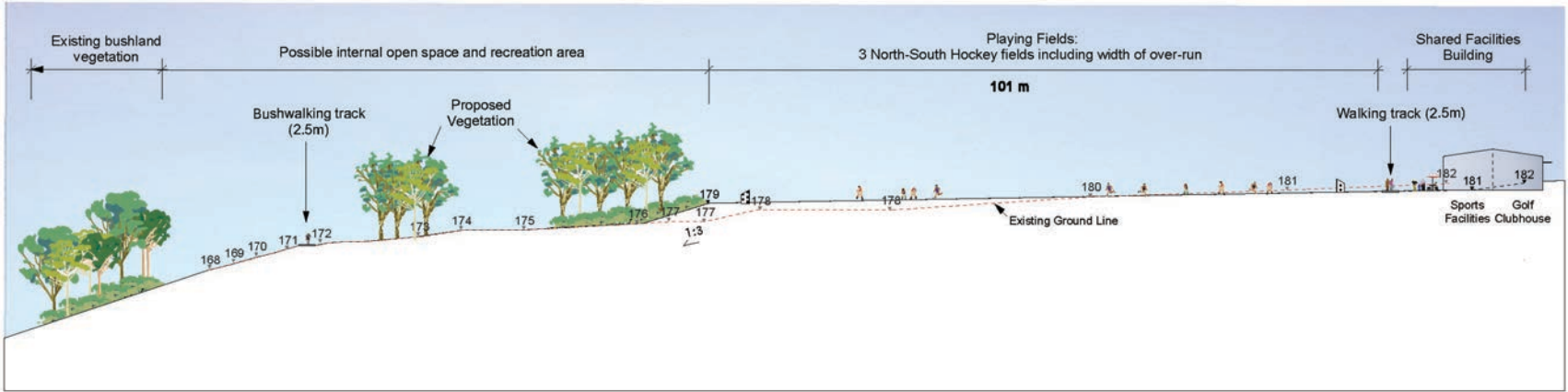
- Existing green no. 2, would be able to play until construction of a new green no. 6
- Existing green no. 9, would be able to play until construction of a new green no. 9

Stage 5: - Future Upgrading Works

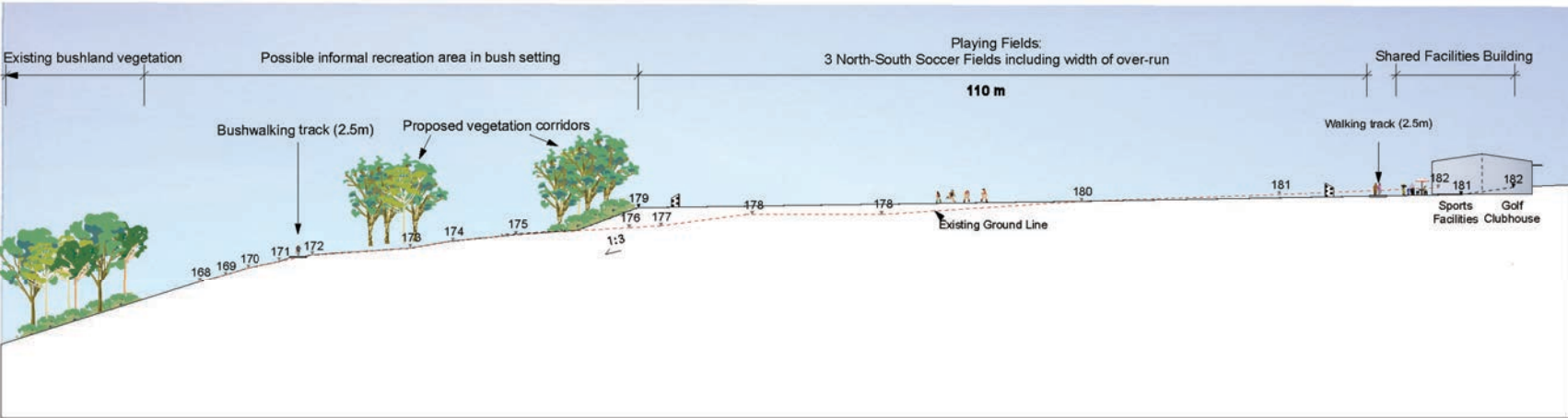
Existing golf holes 17, 18, 1, 2, 3, 4, and 5 to the north of the golf club house site are to be retained as part of the proposed golf course. Future upgrade works, such as repair or reconstruction may be required in the long term period.



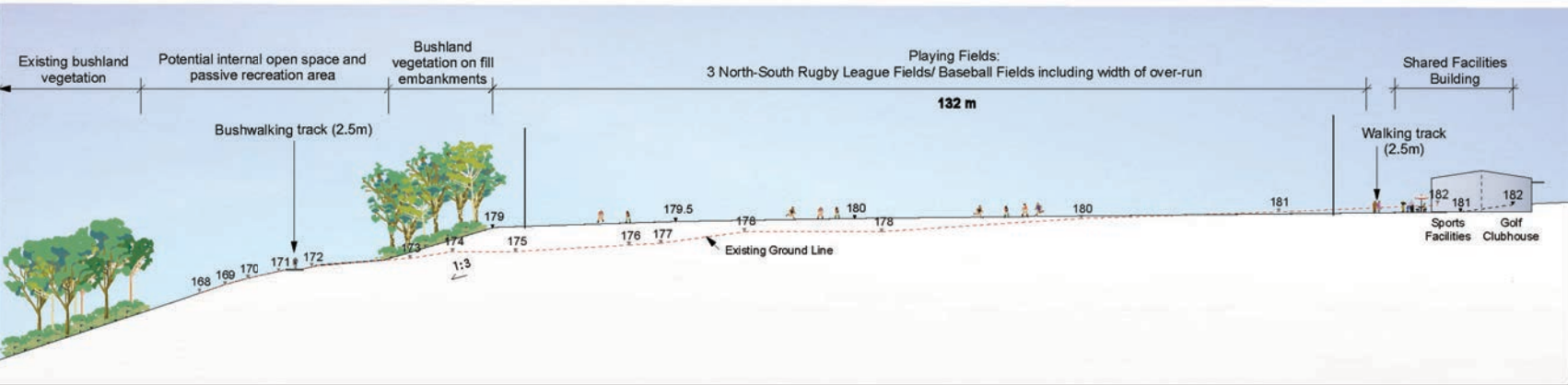




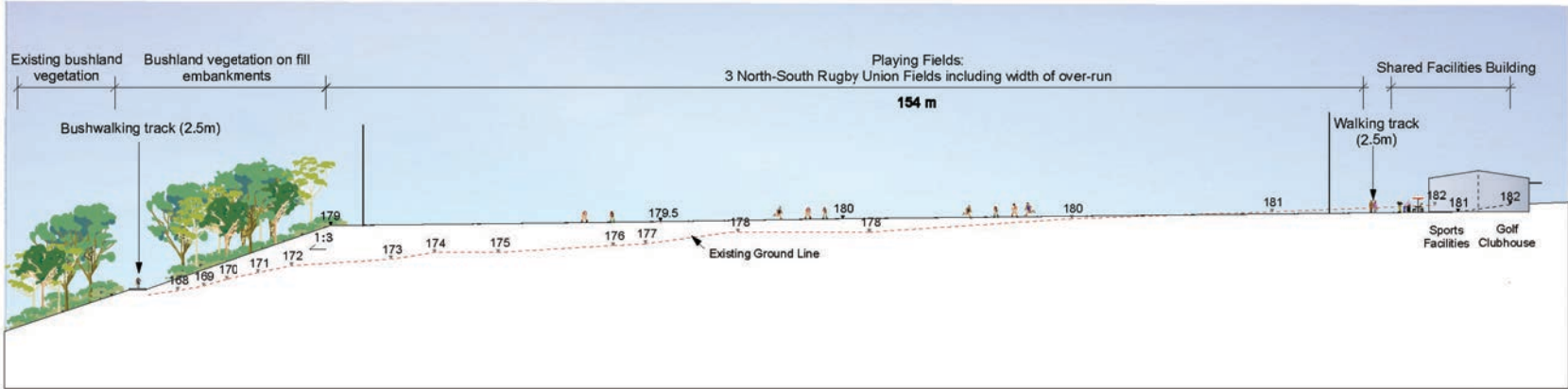
AA/1 SECTION NORTH-SOUTH THROUGH SPORTS GROUND SHOWING FIELD CONFIGURATION NO.1: 3 HOCKEY FIELDS
SCALE 1:500



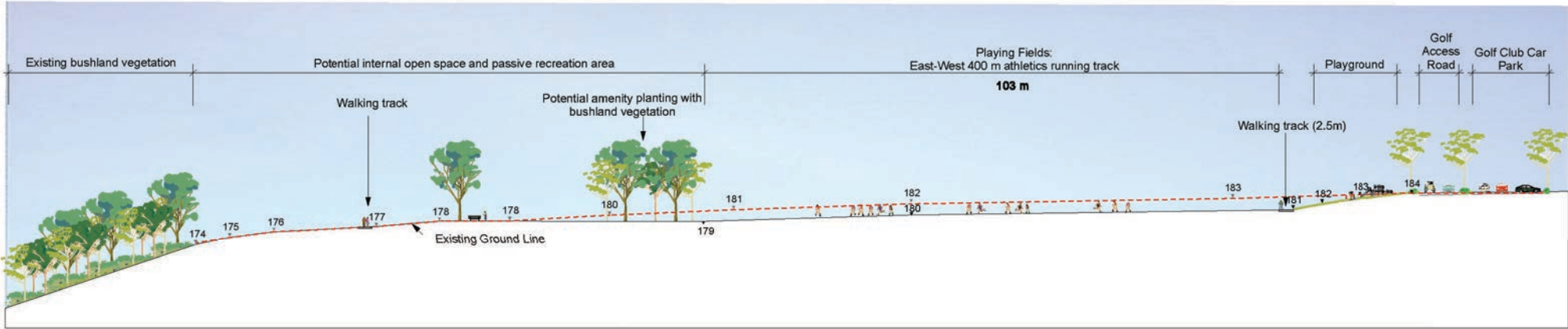
AA/2 SECTION NORTH-SOUTH THROUGH PLAYING GROUNDS SHOWING FIELD CONFIGURATION NO.3: 3 SENIOR SOCCER FIELDS
SCALE 1:500



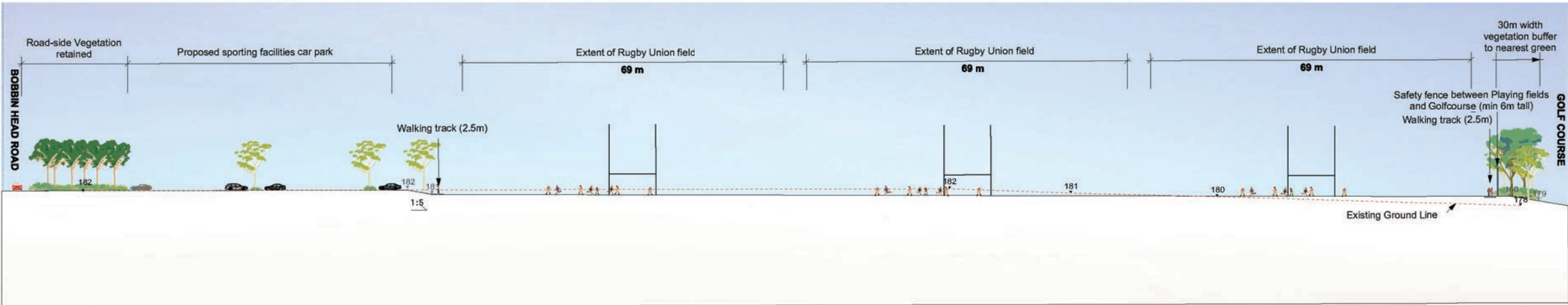
AA/3 SECTION NORTH-SOUTH THROUGH PLAYING GROUNDS SHOWING PLAYGROUND CONFIGURATION NO. 4: 2 BASEBALL FIELDS
SCALE 1:500



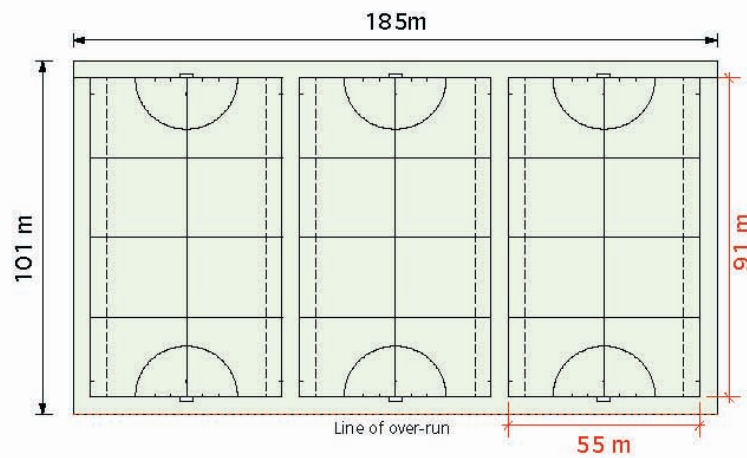
AA/4 SECTION NORTH-SOUTH THROUGH SPORTS GROUNDS SHOWING FIELD CONFIGURATION NO.5: 3 RUGBY UNION FIELDS
SCALE 1:500



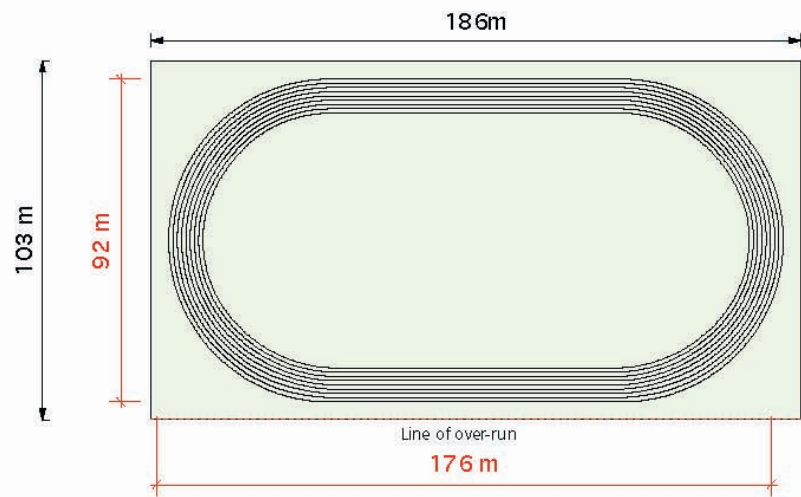
BB SECTION NORTH-SOUTH THROUGH SPORTS GROUNDS SHOWING FIELD CONFIGURATION NO.2: 400M ATHLETICS RUNNING TRACK
SCALE 1:500



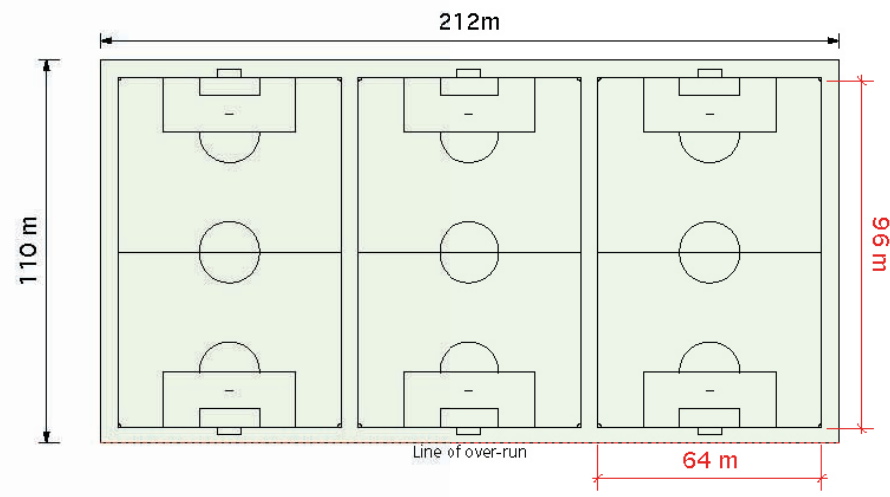
CC SECTION WEST-EAST THROUGH PROPOSED CARPERK AND SPORTS GROUNDS SHOWING FIELD CONFIGURATION NO.5: 3 RUGBY UNION FIELDS
SCALE 1:500



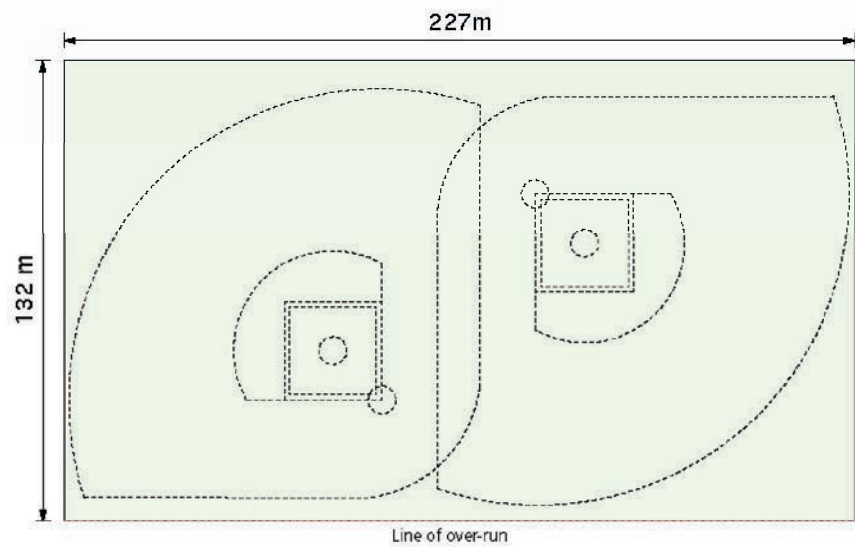
Field Configuration 1
3 Hockey Fields



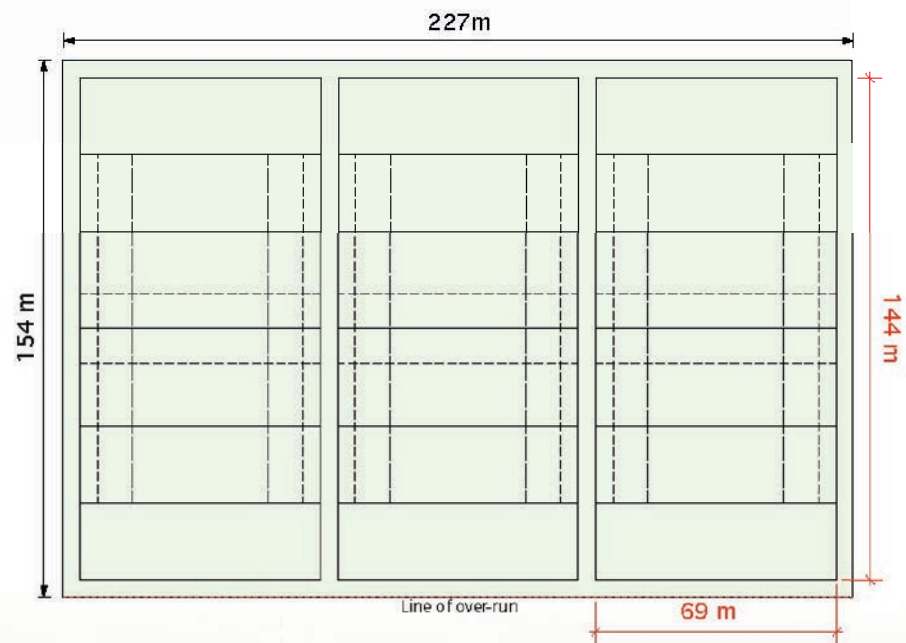
Field Configuration 2
400m Running Track



Field Configuration 3
3 Senior Soccer Fields



Field Configuration 4
2 Baseball fields



Field Configuration 5
3 Rugby Union Fields

PLAYGROUND CONFIGURATIONS

PLAYING GROUND CONFIGURATIONS FOR PREFERRED OPTION



NORTH TURRAMURRA RECREATION AREA COST SUMMARY



ITEM	DESCRIPTION	PRELIMINARIES, OVERHEADS & PROFIT	BUILDING WORKS	EXTERNAL WORKS	FF&E	SUB-TOTAL	10% CONTINGENCIES	PROFESSIONAL FEES	TOTAL (EXCL. GST)	10% GST	TOTAL (INCL. GST)
	BASE MODEL										
1	Clubhouse & Pro Shop	\$ 207,500	\$ 1,667,500	\$ 60,000	Excl.	\$ 1,935,000	\$ 193,500	Excl.	\$ 2,128,500	\$ 212,850	\$ 2,341,350
2	Golf Course Areas	\$ 555,400	\$ -	\$ 5,854,600	N/A	\$ 6,410,000	\$ 641,000	Excl.	\$ 7,051,000	\$ 705,100	\$ 7,756,100
3	Consolidated Depots & Beekeepers Facilities	\$ 33,800	\$ 221,200	\$ 165,000	N/A	\$ 420,000	\$ 42,000	Excl.	\$ 462,000	\$ 46,200	\$ 508,200
4	Dams & Sediment Basin	\$ 76,900	\$ -	\$ 973,100	N/A	\$ 1,050,000	\$ 105,000	Excl.	\$ 1,155,000	\$ 115,500	\$ 1,270,500
5	Relocation of Communications Tower	\$ 3,000	\$ -	\$ 27,000	N/A	\$ 30,000	\$ 3,000	Excl.	\$ 33,000	\$ 3,300	\$ 36,300
BASE MODEL TOTAL		\$ 876,600	\$ 1,888,700	\$ 7,079,700	\$ -	\$ 9,845,000	\$ 984,500	\$ -	\$ 10,829,500	\$ 1,082,950	\$ 11,912,450
	OPTIONS										
A	Playing Fields - Field Configuration 3 (3 Senior Soccer Fields, 110m)	\$ 149,800	\$ -	\$ 1,860,200	N/A	\$ 2,010,000	\$ 201,000	Excl.	\$ 2,211,000	\$ 221,100	\$ 2,432,100
B	Playing Fields - Field Configuration 4 (2 Baseball Fields, 132m)	\$ 179,100	\$ -	\$ 2,255,900	N/A	\$ 2,435,000	\$ 243,500	Excl.	\$ 2,678,500	\$ 267,850	\$ 2,946,350
C	Playing Fields - Field Configuration 5 (3 Rugby Union Fields, 154m)	\$ 203,500	\$ -	\$ 2,551,500	N/A	\$ 2,755,000	\$ 275,500	Excl.	\$ 3,030,500	\$ 303,050	\$ 3,333,550
AA	Roads & Carparking (Sub-Option A Residential Property Retained)	\$ 112,000	\$ -	\$ 1,398,000	N/A	\$ 1,510,000	\$ 151,000	Excl.	\$ 1,661,000	\$ 166,100	\$ 1,827,100
BB	Roads & Carparking (Sub-Option B Residential Property Acquired)	\$ 128,200	\$ -	\$ 1,566,800	N/A	\$ 1,695,000	\$ 169,500	Excl.	\$ 1,864,500	\$ 186,450	\$ 2,050,950
A1	Option A - Stormwater Harvesting	\$ 18,000	\$ -	\$ 212,000	N/A	\$ 230,000	\$ 23,000	Excl.	\$ 253,000	\$ 25,300	\$ 278,300
A2	Option B - Sewer Mining	\$ 175,000	\$ -	\$ 2,180,000	N/A	\$ 2,355,000	\$ 235,500	Excl.	\$ 2,590,500	\$ 259,050	\$ 2,849,550
VARIATION TO DESIGN											
α	Treatment to Landfill Area	\$ 1,474,800		\$ 18,440,200	N/A	\$ 19,915,000	\$ 1,991,500	Excl.	\$ 21,906,500	\$ 2,190,650	\$ 24,097,150
β	Slope Stabilisation	\$ 53,600	\$ -	\$ 691,400	N/A	\$ 745,000	\$ 74,500	Excl.	\$ 819,500	\$ 81,950	\$ 901,450
TOTAL		\$ 1,528,400	\$ -	\$ 19,131,600	\$ -	\$ 20,660,000	\$ 2,066,000	\$ -	\$ 22,726,000	\$ 2,272,600	\$ 24,998,600

- All costs shown above are current as at January 2007
- Refer to "List of Exclusions from the Estimate"

CAR PARK OPTIONS COST ESTIMATE		COST MATRIX 1			
		FIELD CONFIGURATIONS COST ESTIMATE			
		BASE MODEL	A	B	C
		AA	\$ 14,701,500	\$ 15,169,000	\$ 15,521,000
BB	\$ 14,905,000	\$ 15,372,500	\$ 15,724,500		

WATER MANAGEMENT OPTIONS COST ESTIMATE		COST MATRIX 2			
		SUMS AS PER COST MATRIX 1			
		VARIATION COST ESTIMATES WITH WATER MANAGEMENT OPTIONS	AA/A-BB/A-A1	AA/B-BB/B-A1	AA/C-BB/C-A1
		A1	\$ 14,954,500	\$ 15,422,000	\$ 15,774,000
	\$ 15,158,000	\$ 15,625,500	\$ 15,977,500		
A2	BB/A-BB/A-A2				
	BB/B-BB/B-A2	BB/C-BB/C-A2			
	\$ 17,292,000	\$ 17,759,500	\$ 18,111,500		
	\$ 17,495,500	\$ 17,963,000	\$ 18,315,000		

- 7 HA CATCHMENT
DRAINING TO DAM

-IRRIGATE GOLF COURSE AND SPORTS FIELD FROM STORAGE DAM (10ML CAPACITY)

APPROX. 2 HA
CATCHMENT TO BE
DIVERTED

- SUBSURFACE DRAINAGE TO BE
INSTALLED IN FORMER LANDFILL
AREA TO MINIMISE INFILTRATION

EXISTING TABLE DRAIN-

1 HA CATCHMENT -
TO BE DIVERTED

COLLECT RUNOFF FROM PART OF BOBBIN HEAD ROAD, -
DIVERT INTO STORMWATER PIT AND PIPE TO DAM.
TREAT THROUGH GPT PRIOR TO PIT ENTRY

INSTALL WSUD MEASURES (EG
NATION TRENCHES) IN CARPARK
DESIGN TO TREAT RUN OFF

CAPTURE RUNOFF THROUGH
SURFACE/SUBSURFACE DRAINAGE MEASURES.
THIS MAY INCLUDE INSTALLATION OF
SWALES/WSUD MEASURES.

LEGEND

— — — SURFACE DRAINAGE (SWALES)

■ ■ ■ ■ ■ SUBSURFACE DRAINAGE

 CATCHMENT AREA

WATER MANAGEMENT OPTION A STORMWATER HARVESTING



WATER MANAGEMENT OPTION B SEWER MINING