DSD8/18 SPORTS SURFACE NEEDS ANALYSIS (D18/102018)

Director Social Development

Youth and Leisure

Executive Summary

At the March 2017 meeting, (GB15/17), Council resolved to:

- Receive a report investigating the possibility of another synthetic soccer pitch at Clifton Park, adjacent to the existing synthetic pitch to create a sporting hub that can be booked and enjoyed by the entire community and all clubs.

This report is provided in response to this resolution.

Following Council's decision, Council officers identified the need to strategically identify the most appropriate sites for synthetic and hybrid surfaces across Moreland, and consider the need for additional soccer synthetic surfaces at Clifton Park within this context.

To support this, in 2017, Council officers engaged a specialist consultant to undertake a Hybrid Synthetic Sports Surface Needs Analysis. This analysis assessed the requirements and opportunities for Football Federation Victoria, AFL Victoria, Lacrosse Victoria and Cricket Victoria. The report assesses minimum facility requirements and potential locations for the establishment of new synthetic and hybrid sporting surfaces across the municipality.

Through this assessment, Clifton Park was not identified as a strategic site for an additional synthetic soccer pitch, however a number of other sites across Moreland were identified.

The sites identified in this report are for Council to note. These are strategic locations that would be considered in future capital works planning, and when the Moreland Sport and Active Recreation Strategy (2019-2029) is being developed.

Officer Recommendation

That Council notes the Hybrid Synthetic Sports Surface Needs Analysis, at Attachment 1 to this report.

REPORT

1. Policy Context

The Hybrid Synthetic Sports Surface Needs Analysis (Needs Analysis) is aligned to the following key outcomes in the Council Plan 2017–2021:

Strategic Objective 1: Connected Community:

- Priority 2. Set a clear vision and strategy for aquatics, leisure and sporting facilities to meet ongoing community needs.

The Needs Analysis also aligns to the Moreland Sport and Physical Activity Strategy 2014-2018:

- Goal 1: To encourage participation in sport and physical activity.
- Goal 2: To ensure an adequate supply and distribution of good quality sporting infrastructure, used in the most effective and efficient manner possible.

The North West Regional Football Venue Strategic Review and Feasibility Study also relates to this report. This study was adopted by Council on 12 August 2009 (DSD28) and identified three locations for synthetic soccer pitches across the municipality:

- Hosken Reserve (in planning);
- Clifton Park (completed); and
- John Fawkner College (completed).

2. Background

Council has 56 sports grounds available for use for sporting activities in the Moreland. These are very well utilised by a variety of user groups including sports clubs, sports associations, schools, community groups and residents.

The demand on these facilities is ever increasing, with club membership growing annually, and Council supporting growth through inclusive participation policies.

In response to the challenges of supply and demand, over a number of years Council has invested significantly in warm season grasses, improved water management, as well as constructing three synthetic pitches (Fawkner College Synthetic Pitch, Clifton Park Synthetic Pitch and Brunswick College Hockey Synthetic Pitch). All three existing synthetic pitches are at capacity, and additional supply will be warranted into the future as sports participation and population growth continues to place pressure on grounds.

The Needs Analysis at **Attachment 1** identified a number of project drivers:

- Increased sports participation;
- Increased demand from local sporting clubs and schools for sports grounds and facilities;
- Current ground infrastructure, conditions and limitations;
- Declining levels of open space (or at least a restriction on current level); and
- The need for increased physical activity across all population levels.

3. Issues

Moreland has 56 sporting fields 56 which are facing pressure from increased sporting demand due to increased participation rates, as well as a growing population.

From a supply perspective, the majority of sporting grounds in Moreland can sustain a maximum of 15 hours of usage per week. This is a moderate usage rate which leaves many clubs requesting to access multiple grounds across the municipality to satisfy their requests for participation, and Council unable to allocate grounds to new or emerging sporting groups/needs.

Faced with these pressures, Council continues to explore ways to allow for greater utilisation of its sportsgrounds, and plan for the growth that will continue to occur into the future.

It is extremely difficult for inner-city municipalities to provide new sports reserves, or alter the distribution of existing facilities. However, if Council can continue to unlock capacity in existing reserves, physical activity targets, participation increases and positive health outcomes will be experienced by Moreland residents, even as population rates increase.

Current sport and recreation participation in Moreland

Sporting club membership figures for Moreland can be seen in the table below, providing a three-year comparison by sport.

Sport/activity	**Number of Players**	
	2015	**2017**
Australian Rules Football	2,913	3,707
Soccer (outdoor)	2,122	2,402
Cricket (outdoor)	2,342	2,186
Lacrosse	61	59
Total	**7,438**	**8,354**

From the above figures, the two growth sports are Australian Rules Football (AFL) and Soccer. In addition, in light of the growth of women's participation in AFL, Council will need to consider the impact on future facility needs.

In 2009, only 8% of people using Moreland's grounds for organised sporting activities were female. The Allocation and Use of Sporting Facilities, Grounds and Pavilions Policy (2016) has influenced female participation at Moreland sporting clubs with the figure now sitting at 22% - a 175% increase.

Hybrid Synthetic Sports Surface Needs Analysis

The Needs Analysis assessed the following elements:

- Identification of current and future community and sporting needs;
- Audit all sportsgrounds and open spaces within Moreland, identifying:
  - the most suitable locations for synthetic and hybrid surfaces;
  - the circumstances when hybrid/synthetic surfaces should be considered;
  - identify potential opportunities where the installation of synthetic surfaces could be embraced.
- The current club numbers and projections for the future to indicate demand;
- The current conditions of the sports fields and their ability to meet future demand;
- Council's Capital Expenditure (CAPEX) Active Sporting Reserves commitment;
- Workshop with Council officers; and
- Geographical assessment of fields across the municipality.

The Needs Analysis provides a long term view on opportunities for consideration and is centred in the ability for hybrid and synthetic surfaces to support increased usage rates, while also reducing overall water consumption.

Recommendations of the Needs Analysis

From this review the following locations were recommended to be considered as potential sites for future hybrid and synthetic surface conversion:

Location	Sporting Code	Surface Type Recommended
Balfe Park	Soccer	Hybrid
Clifton Park West	AFL/Cricket	Synthetic
Oak Park Reserve	AFL/Cricket	Synthetic
Parker Reserve	AFL/Soccer/Cricket	Synthetic
CB Smith Community Pitch	Soccer	Hybrid
Hosken Reserve North	Soccer	Synthetic (Council resolved 2009)
Hosken Reserve South	Soccer	Hybrid
Coburg High School	AFL/Soccer/Cricket	Synthetic
City Oval	AFL/Cricket	Hybrid

The above locations are recommended as for conversion to either hybrid or synthetic into the future. These would complement the existing facilities:

Location	Sporting Code	Surface Type
Brunswick Secondary College	Hockey	Synthetic
Clifton Park Synthetic Soccer Facility	Soccer	Synthetic
Fawkner College Synthetic Soccer Facility	Soccer	Synthetic

The Needs Analysis suggests Council considers the sites for hybrid or synthetic conversion when planning future works programs. These surfaces provide sports fields that can cope with a minimum of 35 hours (hybrid) play per week to a maximum of 70 hours (synthetic) play per week.

Investment in key hybrid and synthetic facilities throughout the municipality would allow for greater usage, maximise opportunities for participation in sport and active recreation, whilst supporting the longevity and condition of natural turf fields for competition purposes.

Human Rights Consideration

The implications of this report have been assessed in accordance with the requirements of the Charter of Human Rights and Responsibilities.

4. Consultation

The preparation of this study has been supported by Smart Connection Consultancy, with strategic input from the following external stakeholders.

- AFL Victoria;
- Football Federation Victoria;
- Cricket Victoria;
- Lacrosse Victoria.

Discussions identified that AFL Victoria, is very supportive of this study and can see the benefits of having additional synthetic facilities for their game. AFL Victoria is keen to promote the game further and believes that the natural turf fields alone are not adequate for their sports future needs.

AFL Victoria has expressed its commitment to working with Council to enhance opportunities to grow the game, and has offered access to funding of up to $100,000 for each facility or field that is developed.

5. Officer Declaration of Conflict of Interest

Council officers involved in the preparation of this report have no conflict of interest in this matter.

6. Financial and Resources Implications

Synthetic pitches are becoming an increasingly important piece of sporting infrastructure in assisting communities to be more active more often. Provision of synthetic pitches particularly supports training, and facilitates the growth and diversity of sports participation. Synthetic surfaces have an expected life span of 7 to 10 years (depending on usage rates).

This report does not recommend any immediate works, and provides sites for consideration only. As such, there are no financial implications associated with this report.

Any sites identified in this report as potential locations for hybrid or synthetic surfaces would be considered in the planning phases of relevant future capital works programs.

7. Implementation

The Hybrid Synthetic Sports Surface Needs Analysis will be considered in the development of future capital works programs and as a reference document in the development of the Moreland Sport and Active Recreation Strategy 2019-2029.

Attachment/s

1⇩ Hybrid Synthetic Sports Surface Needs Analysis D18/103420


CITY OF MORELAND
HYBRID AND SYNTHETIC SPORTS SURFACES
NEEDS ANALYSIS
ACTIVE MORELAND
Moreland City Council
Draft Report 2.04 | February 2018
Prepared for Moreland City Council by:
smart connection
consultancy

smart connection consultancy

Acknowledgements

The preparation of this Study has been a collaborative effort between Moreland City Council Youth and Leisure Services Department and Smart Connection Consultancy with strategic input from external stakeholders.

Appreciation to the following:

- Joe Luppino — Recreation Services
- Shayne Ward — AFL Victoria
- Kevin O'Byrne — Football Federation Victoria
- Annie Hateley — Cricket Victoria
- Sam Watson — Lacrosse Victoria

Content of Report

Key sections of the report are generic regarding the science behind the technology and would be common to most reports. This is provided free of charge as part of the report development and are sourced from three key publications, the Smart Guide to Synthetic Football Surfaces (Due Jan 2018), the Smart guide to Hybrid Surfaces (Due out March 2018) and the Smart Guide to Synthetic Rubber infills (Nov 2017) with the latest enhancements.

It is the philosophy of Smart Connection Consultancy that this knowledge is shared freely and tailored for each client so that decisions are based on accurate and up to date information.

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All recommendations and considerations identified by Smart Connection Consultancy are based on data and information provided by Council, and Smart Connection Consultancy has relied on such information being correct at the time this report was prepared.

The information within this Study is provided with good faith. Whilst Smart Connection Consultancy has applied its experience to the Study, we have relied upon information and views expressed by Council officers or other stakeholders involved in the project. We have therefore not conducted an audit of the information provided but have accepted it to be accurate and beneficial to this report, and received it in the same good faith as we now use that information.

Readers should be aware that in the preparation of this report it has been necessary to provide commentary on future projections that may be inherently uncertain, and that our opinion is based on the underlying assumptions at this point in time – which has been influenced by the information provided in good faith. We do not express an opinion as to whether actual results will achieve our estimates, or underwrite or guarantee the achievability of the projections or value assumptions which are based on future events.

COMMITTED TO

Promoting the benefits of being more active and providing opportunities both through programs, activities and events indoors and outdoors for the community

This Hybrid and Synthetic Sports Surface Needs Study aims to support Councils commitment to an active Moreland by identifying how the technology of hybrid and synthetic surfaces can improve sports fields in a manner that can both satisfy demand and allow Council, clubs, schools and others to encourage greater participation in play, recreation and community sports.

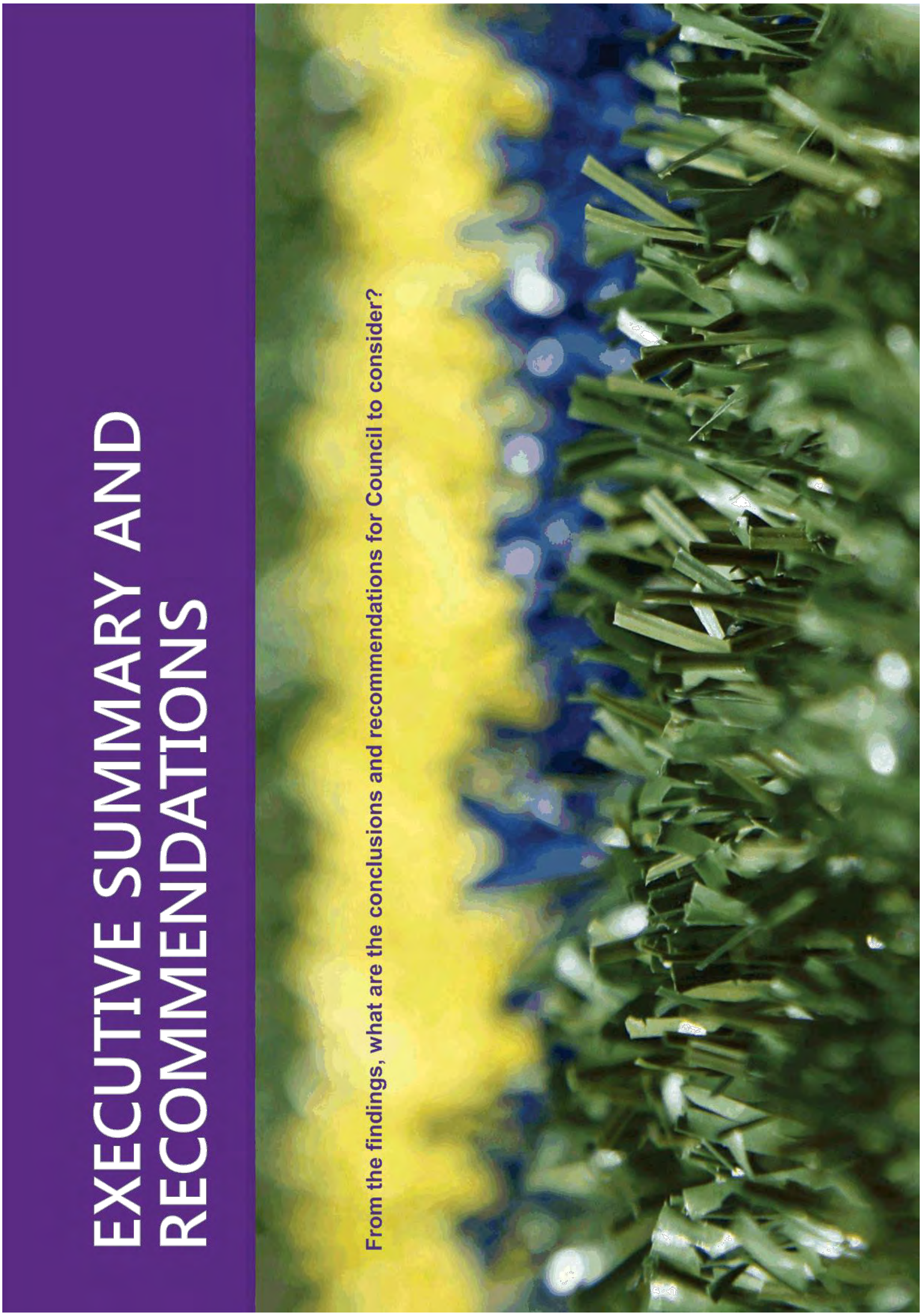
This Study has been prepared and written by

Martin Sheppard, Managing Director

of:

smart connection consultancy

CONTENTS


EXECUTIVE SUMMARY AND
RECOMMENDATIONS
From the findings, what are the conclusions and recommendations for Council to consider?

EXECUTIVE SUMMARY AND RECOMMENDATIONS

Setting the Scene

Moreland is a municipality in the inner north of Melbourne. The City of Moreland covers 50.9 square kilometres and lies between 4 and 14 kilometres north of central Melbourne. It is bordered by the Moonee Ponds Creek to the west, Merri Creek to the east, Park Street to the south and the Western Ring Road to the north.

Council has 56 sports grounds available for use for sporting activities in the City of Moreland. These are currently very well utilised by a variety of user groups including sports clubs, Sports Associations, schools, community groups and residents of Moreland. The demand on these facilities is ever increasing, with club membership growing annually, and Council also fuelling growth through inclusive participation policies.

While Council would like to have facilities available to meet all seasonal, annual tenancy and casual bookings requests this is becoming more difficult with the increasing demands on the existing sports grounds and the very limited opportunity for expansion within the existing turf surfaces (all grounds are suitable for use of approx. 15hrs per week).

In response to the challenges of supply and demand, Moreland has invested significantly in the use of warm season grasses, improved water management, the construction of three synthetic pitches and altering horticultural practices. However, Moreland is continually looking for more sustainable solutions to help local sport thrive in the face of weather extremes and increasing participation rates. Artificial grass surfaces have proven to be a viable alternative because they are easy to maintain and durable; provide a consistent playing surface; do not require watering or mowing; and most importantly allow up to three times as many hours of use than natural turf surfaces.

With an increasing population and increasing demand for sportsground use from local sporting clubs, schools and commercial providers Council finds itself in a position in which it must explore ways to allow for greater utilisation of its existing sportsgrounds

Through this study Council is seeking to explore and identify the potential locations for the establishment of new synthetic and hybrid sporting surfaces and across the municipality. The Study has emerged from the following circumstances:

- Increased sports participation;
- Increased demand from local sporting clubs and schools for sports grounds and facilities;
- Current ground infrastructure, conditions and limitations;
- Declining levels of open space (or at least a restriction on current level); and
- The need for increased physical activity across all population levels.

This Study is one of the steps that Council is taking to cater for future sports club growth and community use. It is believed that synthetic sports surfaces may be able to meet Council's needs better than any current natural turf site due to its ability to cater for increased use, while also reducing overall water consumption.

The Study aims to:

- Identify current and future community and sporting needs,
- Examine all sportsgrounds and open spaces within Moreland, identifying:
  - the most suitable locations for synthetic and hybrid surfaces;
  - the circumstances when hybrid / synthetic surfaces should be considered (i.e. principles or trigger points of usage to apply into future); and
  - identify potential opportunities where the installation of synthetic surfaces could be embraced.

The report will primarily focus on those sports that are currently played on natural turf sportsgrounds within Moreland. These include:

- Australian Rules Football;
- Cricket;
- Lacrosse;
- Soccer.

Further consideration should be given to other sports that could undertake training on synthetic surfaces.

Strategic Considerations

From the strategies provided by Council the following have been reviewed for this Study:

- Moreland Sport and Physical Activity Strategy (2014 -2018)
- Active Moreland Facilities Audit - Detailed Report
- Moreland Sportsfield Review (STC – May 17)
- Sports Grounds Locations
- Synthetic and Hybrid Needs Analysis Brief (Oct 17)
- Draft Aquatic and Leisure Strategy (2018-2038 (Otium Planning – 2017)

From these strategies the key aspects that need to be considered for this Study are:

- Sports grounds are becoming more stressed in key areas of the City;
- There is a need to plan for both traditional sports usage, casual and recreational needs as people's participation trends continue to change;
- Programs and opportunities are needed to encourage specific target groups to be more active as the traditional approach is not inviting to all of the community; and
- The population growth is projected to continue to grow and place greater pressure on key sports of soccer and AFL.

Key Sports Directions

The four key sports of Football (Soccer); Australian Rules (AFL); Cricket and Lacrosse are considered in this report and their growth and future strategic direction is found in Section 2.3. A summary of the findings are as follows:-

- Football (Soccer)

  Football Federation Victoria, as the guardian of the sport in Victoria is very supportive of the embracement of the technology to encourage more people to play the game. Specifically, they are keen to promote improved technology of natural, hybrid and synthetic technology to increase playing capacity of current fields. This will assist clubs in their need for casual use and training as well as match time.

  According to recent usage data presented by FFA the increase of 21.7% increase since 2014 membership numbers with 2017 membership only showing a 2.6% increase.

- Australian Rules Football

AFL Victoria is committed to supporting Council in the development of synthetic sports fields that they can use to promote participation in the sport, especially on weather affected days. Their key focus areas and targeted groups are: schools; women; casual / recreation play through AFL 9's and local club use.

Australian Rules Football recorded a 12% increase in the total number of Victorians playing the game in 2017, with a total of 461,000 participants (316,000 competitive and 145,000 in programs). With 108,000 females participating, doubling the number of teams (392 to 747 teams). The school children programs have had significant success with 43% increase in growth in NAB AFL Auskick and Sporting Schools programs.

AFL Victoria are committed to working with Moreland City Council to enhance the opportunities to grow the game and have offered access to funding of up to $100,000 for each facility or field that is developed.

- Cricket

The number of participants seem to have plateaued out over the past two years. So, review as opportunities become available.

Cricket Victoria, from their audit summarised the facilities in Moreland as having 25 sites with 30 playing fields, with more than half using synthetic cricket wickets, which has categorised approximately two thirds as being in moderate or poor condition.

- Lacrosse

Lacrosse Victoria is currently completing their strategic plan ready for 2018, which will have the growth predictions embedded, but unavailable currently.

Within Moreland, according to Lacrosse Victoria, the club is committed to attracting more females, as they have none currently. The reason given is that this is due to current volunteers. The aim of 4-5 teams to increase participation is their future target.

Lacrosse Victoria would be more than happy to play on synthetic grass, and acknowledge that their Rules would need to be amended to allow this to happen.

Needs for Synthetic Sports Fields

According the Councils Draft Aquatic and Leisure Strategy[1] provides an excellent summation of the demographic considerations for the municipality

"Moreland is experiencing high rates of population growth and the City's growth profile are expected to continue for the duration of this strategy.

Our estimated population in 2016 was 172,091 and this is projected to grow to 228,807 by 2036 (33%), with the majority of growth to occur South of Bell Street. We have a relatively even split between males (49%) and females (51%)

The impact of these demographics on sports field needs are similar to leisure and aquatic facilities, namely:

- The increased population growth will place pressure on the natural playing fields and local parklands where the community want access to both recreational opportunities and club sport;
- In areas of young ages and a prominence of schools will result in greater demands on the fields;
- Suburbs of a higher level of disadvantage will be most sensitive to price sensitivity and demand for lower cost facilities and programs or will take the opportunity to play recreational games in the parkland.

The growth sports have been identified by Council's previous reports and growing in Australian Rules Football and Football (soccer). Also, Council should be considering the needs of their growing youth cohort, who may not wish to join a traditional sports club, but still want to 'play' sport to keep fit, to be social and to have fun. The use of small Actives Zones would be a significant benefit to attract and retain this cohort.

The recreational growth expects to be significantly higher and the facilities need to be designed to accommodate these growth trends. The considerations should include:

- Multi-sport Active Zones – aimed at the recreational participation around the key football codes; basketball, netball and football. Positioning these in the main growth areas will assist in the continued growing populations.
- Traditional sports fields (e.g. Soccer, and AFL) should also be designed with the modified games lines integrated, which may include 5-a-side/futsal (Soccer); and AFL 9's (AFL).

Site Considerations

Moreland City Council manages and maintains 56 sports fields[2] catering for a wide variety of sports including football codes of Soccer (29), Australian Rules (19); Baseball/Softball (1), Cricket (32), Bocce (5), Athletics (1) and various recreational and informal sports. In addition, 57 tennis courts are also owned by Council.

The Active Sports Grounds as part of its open space areas, are shown on Figure 5 below:

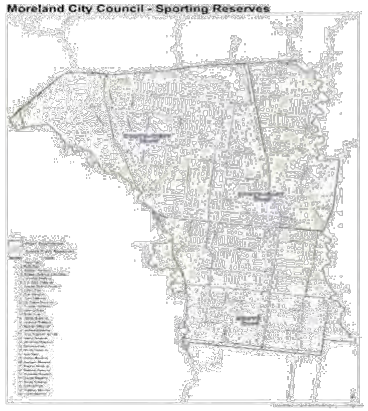


Figure 1: Moreland City Council Map

To ascertain the various impacts on the ability of the current fields to cater for demand, the following perspectives have been considered:

[1] Aquatic and Leisure Strategy (draft November 2017 – Otium Leisure Planning)
[2] Synthetic Sports Surfaces Feasibility Study (2013)

- The current club numbers and projections for the future to indicate demand;
- The current conditions of the sports fields and their ability to meet future demand;
- Council's CAPEX Active Sporting Reserves commitment;
- Workshop with Council officers; and
- Geographical assessment of fields with Council three areas or zones.

As part of the Moreland Sportsfield Review[3] it identified the fields against sport, number of teams, active usage hours per week, the casual use and the usage classification and this has allowed us to identify the sports fields for each sport that have either a high or excessive use category. Those high-risk fields are identified as:

- Balfe Park (Soccer) – Excessive use with 25.5 hrs
- CB Smith Community (Soccer) – Excessive use with 33 hrs
- City Oval (AFL/Cricket) – Excessive use with 30 hrs
- Gillion Oval (AFL/Cricket) – High use with 24 hrs and high growth at club
- Hosken Reserve North (Soccer) – High use with 21 hrs
- Hosken Reserve South (Soccer) – High use with 21 hrs
- Summer Park (Soccer) – Excessive use with 25.5 hrs

In discussions, Council officers have identified the following fields that may be worth considering:

- Parker Reserve
  - *It is recommended to consider both ovals at the next stage of assessment*
- Coburg High School
  - *It is recommended that the school site be identified for short-listing*
- Oak Park
  - *It is recommended that this site is reviewed at the short-listing stage*
- Reddish Reserve
  - *Not recommended for second stage short-listing*
- Fawkner College
  - Current Synthetic Football field needs to be replaced in 2 years' time
- Clifton Park (East)
  - *It is recommended that this site is reviewed at the short-listing stage*
- Alternatives could include:
  - Roberts Reserve – inside cycle track – not recommended
  - Jackson Reserve (Football/Cricket) - not recommended

From this initial review the following are recommended to be considered at the Stage 2 Assessment for hybrid and synthetic conversion: -

- South Ward
  - Balfe park – Hybrid - for soccer and due to current excessive usage
  - Clifton Park (West) – synthetic - current grass and to be converted to a synthetic AFL field.
- North West Ward
  - Oak Park – synthetic - to satisfy AFL growth needs and accessibility across the City for a number of clubs
  - Parker Reserve – Synthetic – to satisfy the non-club base usage for the whole City
- North East Ward
  - CB Smith Community – Hybrid due to current usage
  - Hosken Reserve South – Hybrid for Soccer due to high usage
  - Coburg High School – Synthetics for multi-sport and community usage
  - City Oval – Hybrid for additional usage and quality of surface
  - Fawkner Soccer – Synthetic field replacement for soccer

`A full assessment of these sites is provided in Section 4.4. The

Technology Embracement

As Council considers the embracement of the technology (addressed in details in sections 6-9) the acceptance around both hybrid and synthetic sports surfaces has grown significantly in Australia in the past 5 years.

The hybrid technology allows the fields to be used from 20 hours before they start deteriorating if natural turf and can add another 10 hours up to approximately 30 hours usage. Synthetic surfaces now offer greater technology around the areas of heat, safety and green engineering compared to when Council invested in their two long grass surfaces at Fawkner and Clifton Park, allowing in excess of 60 hours usage weekly, which is normally three times that of natural turf fields.

Recommendations

The following recommendations are made from this report:-

1. Council to continue to invest and embrace the use the synthetic and hybrid technology to assist in meeting the growing demands for active recreation and sport as the population continues to grow
   A Strategic Focus and Intent to be adopted for embracing the technology and used to encourage sports peak bodies and local clubs to develop business cases and funding applications to allow Council to afford the use of the technology in key locations.
2. Moreland City Council is committed through Active Moreland to encourage participation in active living, play, recreation and sport. By providing facilities for people to play, recreate and participate in sport the sports surfaces need to be appropriate, safe and can cope with the intended usage. To this end, the City has developed this strategic intent and commitment.

Intent

Offering sustainable sports surfaces that allows for growth in more people being active, recreating on Council's sports fields and participating in community sport.

Commitment:

By planning and embracing hybrid and synthetic sports surface technology Council will increase playing capacity on natural playing fields from 20+ to 30+ hours a week with the introduction of hybrid turf. Where further capacity is needed the embracement of synthetic turf technology should allow for playing capacity in excess of 30 hours per week to 60 hours which should then allow natural turf fields the time to recover and rest ensuring an integrated and sustainable sports fields strategy to meet growing playing needs. With key synthetic facilities throughout the city that allows for greater usage, to best encourage growth in training, ability to compete and to rest traditional natural turf fields for competition purposes.

[3] Moreland Sportsfield Review – Sports Turf Consultants May 2017

Key Principles:

As opportunities arise in the future, Council should embrace each project against the following key principles which have been developed from the outcomes and objectives of the Moreland Community Vision.

i) Compliance Requirements Commitment

- Where specific sporting codes require a synthetic surface as their base required and when demand meets or exceeds recommendations, Council will explore such an investment (e.g. athletics track, hockey field etc.)
- To ensure that the standards of any technological solutions meets the standards of the State Sports Association

ii) Assists to Promote Increased Broad Community Usage

- The management of the facility allows for a whole of community usage to maximize the Social Return on Investment (SROI)

iii) Multi-usage of Facilities

- Facilities that improve access to the broadest community groups through multi-use of the facilities receive the greatest investment from Council
- Multi-use active games areas be integrated into neighbourhoods to allow recreational participation, by replacing unused spaces (e.g. bowling greens, tennis courts, open space) in a manner that encourages young people to be active

iv) Best Value Economic Management

- When a synthetic surface is a cost-effective option to encourage greater patronage for a sport, and numbers justify need (e.g. cricket wickets, lawn bowls) or such an investment extends the season/usage
- Financial investment from other sources is encouraged to increase the opportunities to install more surfaces is explored
- The funding of such investments will be aligned with Council's financial priorities and ability to invest. This should be based around whole of life costings and a generational financial strategy to offset costs over the life of the synthetic surface and sub surface
- Invest in facilities that improve access to the broadest community groups through multi-use of the facilities

v) Partnerships

- Collaborations and partnerships with stakeholders, community clubs and groups together with other providers and funders should be encouraged in a manner that will provide increased opportunities for participation to the broader community.

vi) Environmental Sustainability

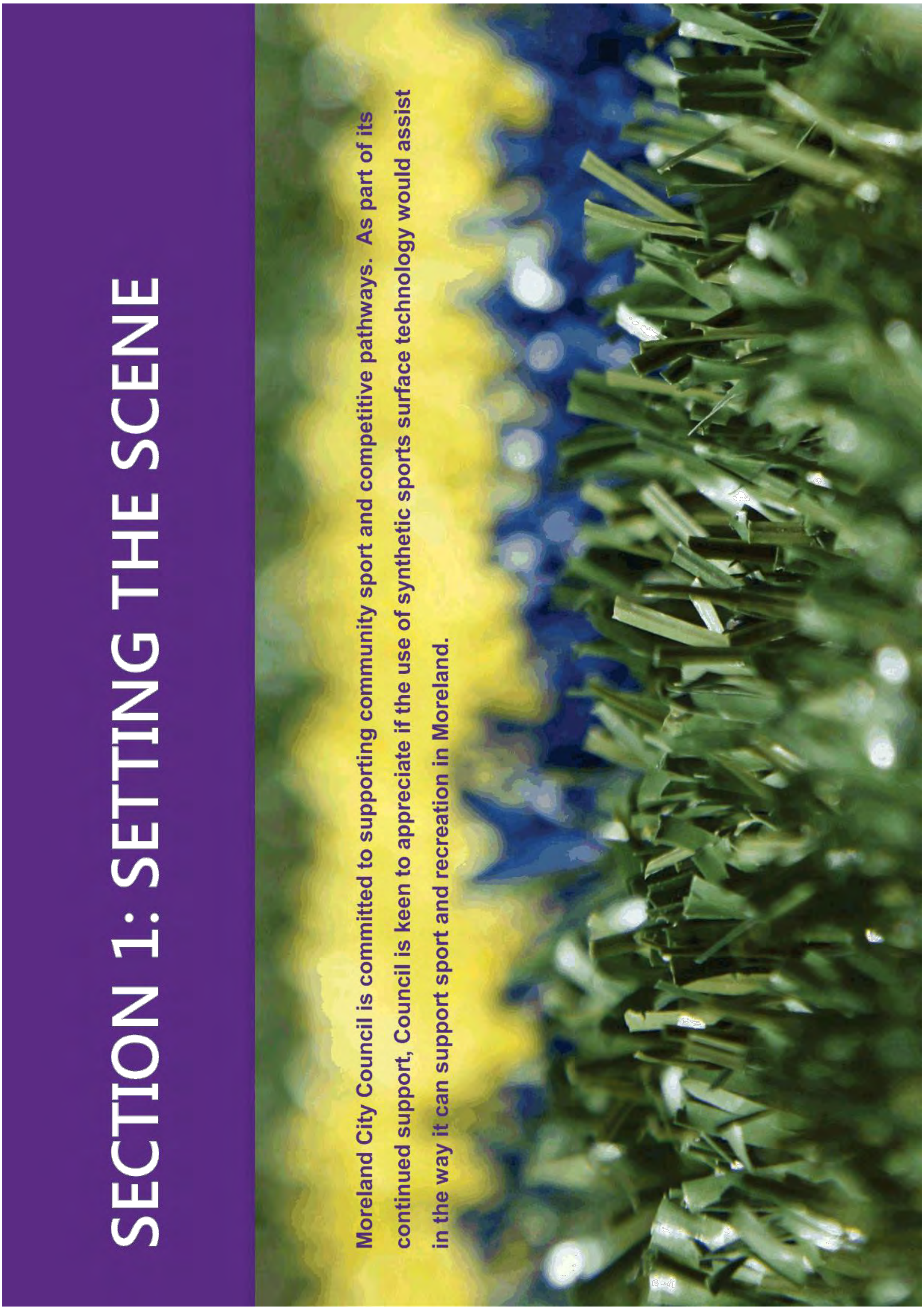
- Adoption of sustainability and Green Engineering principles for the design and sustainability of the technology
- The maintenance strategy adopted will maximise the life expectancy and sustainability of the fields

vii) Well Managed and Maintained

- The programming, asset management and financial prudency of the fields provides best value for the broad community
- Ensuring that the whole of life maintenance and replacement is considered

3. Council to encourage and secure funding and resources with external bodies including opportunities from State government (SRV), Sport Peak bodies (e.g. AFL) as well as donations from local clubs and local schools.
4. The key sports of Australian Rules Football and Football (soccer) should be positioned for future synthetic surfaces with cricket partnering with the AFL facilities and lacrosse being played on rectangular multi-sports fields
5. The adoption of hybrid/root-reinforced technology for high wearing areas should be strategically adopted on key fields annually to extend play to a minimum of 25 hrs per week
6. Extend the use of synthetic sports turf to Active Moreland Sport Zones which can be used in smaller spaces to provide recreational opportunities for young people to play recreationally where there is a growing children and youth population that currently over use small park areas.
7. From the site assessment the following specific recommendations are made:
    - South Ward
        - **Balfe Park** - upgrade the Balfe Park field to cope with the usage from 19 hpw to 30 hpw by expanding the pilot hybrid goal mouths to include the corridor up the main field and the lines person running lines
        - **Clifton Park (West)** – install a synthetic AFL/Cricket wicket for the AFL field at Clifton Park West with water harvesting for the West Soccer field.
        - North West Ward
    - **Oak Park** - Install a synthetic AFL/Cricket wicket for the AFL field at Oak Park Northern field with water harvesting for the back field
    - **Parker Reserve** - Install a synthetic multi-sports field at Parker Reserve for community use and a central point for training across the City
    - North East Ward
        - **CB Smith – Community** - Upgrade the CB Smith Community field to cope with the usage to approx. 25- 30 hpw by installing hybrid technology sports turf in the key high wear areas of the goal mouths to include the corridor up the main field and the lines person running lines.
        - **Hosken Reserve (Southern field)** Upgrade field to a hybrid surface
        - **Coburg High School** - Negotiate with the Principal to install a synthetic multi-sports field (AFL, Cricket and Soccer) for the community and convert the sports courts into a multi-sports activity
        - **City Oval** - Develop a business case for the City Oval to be fully converted to Hybrid technology sports turf to both cope with current AFL needs and future community growth projections
8. When adopting the latest technology the following recommendations are made
    a. The decision-making process on the priorities of which sport and fields should be used for synthetic sports surface technology should be holistic to achieve the Strategic Focus of this Study.
        i. The discussion points should be monitored annually to identify if circumstances have changed
        ii. A three-year review should assess priorities against playing capacity/condition of each field; standards of play needed; economic conditions; growth of the participation and strategic alignment
        iii. The type of synthetic surface technology should be aligned with the needs of the sport, the durability /sustainability and technology available at the time.

b. Where possible multi-sports fields should be adopted to allow maximum community usage.
    i. Where possible Football (all codes) should be considered for any future design unless there is so much usage in one venue (that is projected to continue for 10 years) that it would only warrant a single sport
    ii. Design fields for Football (Soccer) where the field can encourage match, training and recreational needs by including lines for half; quarter and 5-a-side football pitches
    iii. The standards for the football codes should be:
        - Football – FIFA Quality
        - Rugby Union – World Rugby Regulation 22
        - Australian Rules – AFL/Cricket Australia community facility
        - Rugby League – NRL Community Surface standard
        - Hockey – FIH National Standard
        - Lacrosse – agree a standard with Lacrosse Australia, either a Football or AFL should satisfy playing characteristics
c. Utilize the natural turf/hybrid turf technology for higher wear areas of key fields to allow all fields to be used for a minimum of 25 hrs per week.
    i. Explore the various Hybrid/Root reinforced systems for the identified fields
    ii. Develop a three-year strategy for adoption of hybrid/root reinforced technology to assist with the development of the fields to cope with continued demand.
    iii. Conduct an EOI process with current and new hybrid turf companies who are looking to enter into the market to maximise the interest and minimise cost to Council to have a number of Pilot Projects for Moreland.
d. Develop fields that are environmentally friendly and aligns with Councils ESD Policy
    i. When procuring synthetic turf where possible request virgin rubber that will negate the negative perceptions around recycled SBR tyres.
    ii. Ensure that the infill has been tested against the 'toy ingestion standard' EN71-03 Table 2 Category III.
    iii. Ensure heat reduction technology is part of the scoping strategy for the procurement of a synthetic system


SECTION 1: SETTING THE SCENE
Moreland City Council is committed to supporting community sport and competitive pathways. As part of its continued support, Council is keen to appreciate if the use of synthetic sports surface technology would assist in the way it can support sport and recreation in Moreland.

1. SETTING THE SCENE

1.1 About the City of Moreland

Moreland is a municipality in the inner north of Melbourne. The City of Moreland covers 50.9 square kilometres and lies between 4 and 14 kilometres north of central Melbourne. It is bordered by the Moonee Ponds Creek to the west, Merri Creek to the east, Park Street to the south and the Western Ring Road to the north.

The City of Moreland includes the suburbs of Brunswick, Brunswick East, Brunswick West, Coburg, Coburg North, Fawkner, Hadfield, Glenroy, Gowanbrae, Oak Park, Pascoe Vale and Pascoe Vale South. The current population of Moreland is 178,609, and is forecast to grow to 228,807 by 2036 (48%).

Council has 56 sports grounds available for use for sporting activities in the City of Moreland. These are currently very well utilised by a variety of user groups including sports clubs, Sports Associations, schools, community groups and residents of Moreland. The demand on these facilities is ever increasing, with club membership growing annually, and Council also fuelling growth through inclusive participation policies.

While Council would like to have facilities available to meet all seasonal, annual tenancy and casual bookings requests this is becoming more difficult with the increasing demands on the existing sports grounds and the very limited opportunity for expansion within the existing turf surfaces (all grounds are suitable for use of approx. 15hrs per week).

In addition to the 56 turf surfaces, Council has one synthetic hockey pitch located at Brunswick Secondary College, Brunswick and two community synthetic soccer pitches, one located at Clifton Park, Brunswick and the second at John Fawkner College, Fawkner. All three synthetic pitches are currently booked to capacity. The installation of a third synthetic soccer pitch at Hosken Reserve, Coburg North has been endorsed by Council and referred to council's forward Capital Works Program (likely to be delivered within next 3-5 years).

In response to the challenges of supply and demand, Moreland has invested significantly in the use of warm season grasses, improved water management, the construction of three synthetic pitches and altering horticultural practices. However, Moreland is continually looking for more sustainable solutions to help local sport thrive in the face of weather extremes and increasing participation rates. Artificial grass surfaces have proven to be a viable alternative because they are easy to maintain and durable; provide a consistent playing surface; do not require watering or mowing; and most importantly allow up to three times as many hours of use than natural turf surfaces.

With an increasing population and increasing demand for sportsground use from local sporting clubs, schools and commercial providers Council finds itself in a position in which it must explore ways to allow for greater utilisation of its existing sportsgrounds.

1.2 Council's commitment to Sport and Active Recreation

Council recognises the importance and value of sport and physical activity in the lives of its community. This recognition is evident within the municipality through Council's current support for[4]:

- 6 leisure and aquatic centres
- 56 sporting fields
- 57 tennis courts
- 8 outdoor netball courts
- 59 pavilions
- 4 indoor sports stadiums
- 576 hectares of open space, including 136 reserves
- play spaces such as skate parks and play grounds
- 55km of off road bicycle paths
- an extensive network of walking paths
- the provision of grants and funding to support clubs and other activity providers
- a club development program
- the management of lease/ground use arrangements with 73 clubs and,
- initiatives to encourage the inclusion of people with a disability, people from culturally and linguistically diverse backgrounds, lower income earners, older adults, females and young people.

This is also reflected in the Sport and Physical Activity Strategy (2014 - 2018). The three major goals of the Strategy are:

- **Goal 1** - To encourage participation in sport and physical activity;
- **Goal 2** – To ensure an adequate supply and distribution of good quality sporting infrastructure used in the most effective and efficient manner possible; and
- **Goal 3** – Ensure Moreland's approach to improving sport and physical activity in underpinned and well informed by robust policies, strategies and plans.

1.3 Study Scope and Objectives

Through this study Council is seeking to explore and identify the potential locations for the establishment of new synthetic and hybrid sporting surfaces and across the municipality. The study has emerged from the following circumstances:

- Increased sports participation;
- Increased demand from local sporting clubs and schools for sports grounds and facilities;
- Current ground infrastructure, conditions and limitations;
- Declining levels of open space (or at least a restriction on current level); and
- The need for increased physical activity across all population levels.

This study is one of the steps that Council is taking to cater for future sports club growth and community use. It is believed that synthetic sports surfaces may be able to meet Council's needs better than any current natural turf site due to its ability to cater for increased use, while also reducing overall water consumption.

[4] Data correct as of 2014.

The Study aims to:

- Identify current and future community and sporting needs,
- Examine all sportsgrounds and open spaces within Moreland, identifying:
  - the most suitable locations for synthetic and hybrid surfaces;
  - the circumstances when hybrid / synthetic surfaces should be considered (i.e. principles or trigger points of usage to apply into future); and
  - identify potential opportunities where the installation of synthetic surfaces could be embraced.

The report will primarily focus on those sports that are currently played on natural turf sportsgrounds within Moreland. These include:

- Australian Rules Football;
- Cricket;
- Lacrosse;
- Soccer.

Further consideration should be given to other sports that could undertake training on synthetic surfaces.

1.4 Methodology and Approach

Council is committed to supporting community sport and recreation and this is reflected in their various strategies, number of facilities and continued investment in the municipality. The adopted methodology reflected the key principles of the agreed brief for the Study, namely:

- Analysis of current sports facility provision including a high-level assessment of Council's sports grounds;
- Consultation with Council Officers to analyse current practices, explore potential options and investigate trends;
- Identification of the future needs of the sport and its relevant State Sporting Associations;
- Development of principles, options and mapping of where synthetic and or hybrid surfaces can be constructed in the future to meet demands, including locations, sports type catered for, and facility development options.

From the agreed objectives above the following methodology was developed:

- **Strategic Review** – Review of Council and External Stakeholder Literature that may impact on the determination of sports facilities within the City.
- **Participation Analysis** – Review of growth in City of Moreland, exploring trends and impacts on the activities that the community will probably be interested in and the impact on the design and usage of future surfaces.
- **Location Assessment** – Workshop with Council staff to identify prioritised needs for current facilities across the City and identify a short-list of sites.
- **Technology Advice** – Provide a summary of considerations that Council should be cognisant of when determining the use of hybrid and synthetic surface technology.
- **Recommendations** – From the research and consultation provide Council with a 10-year Game Plan of how hybrid and synthetic surface technology can provide a vehicle to its continued support of community sport and recreation.

1.5 How the Study Will Work?

1.5.1 Strategic Context of Study

This Hybrid and Synthetic Sports Surface Needs Study is part of a series of documents, plans and strategies that Council has in place and it should be seen in context of these documents.

The key documents that have been reviewed from an internal perspective include Council's:

- Moreland Sport and Physical Activity Strategy 2014-2018
- Active Moreland Facilities Audit - Detailed Report
- Moreland Sportsfield Review (STC – May 17)
- Sports Grounds Locations
- Synthetic and Hybrid Needs Analysis Brief (Oct 17)
- Draft Aquatic and Leisure Strategy (2018-2038 (Otium Planning – 2017)
- AFL Vic. Strategic Plan 2017 -2022
- Australian Cricket Strategy
- FFV Facilities Audit (@Leisure – June 2017)
- Lacrosse Victoria Strategic Plan (2013-2017)
- FFV State Facilities Plan (June 17)

1.5.2 Study Structure

The Study is structured to answer the key questions that have been raised and includes consideration of the following facts.

Q1: Does the City need to embrace hybrid and synthetic sports surface technology to enhance how it supports recreation and sports usage?

The Study explored the following to answer this question:

- The current and strategic trends of participation that may impact on current and future playing field needs (Section 2).
- The current and future capacity of playing fields in the City (Section 3) and what would be needed for the future to satisfy the growth and or latent demand conversion.

This will provide a summary of what are the key supply and demand challenges and opportunities for consideration either by sport or geographical location (Section 3).

Q2: What considerations regarding sports surface technology does Council need to be cognoscente of?

The Study has provided significant knowledge sharing information which has been taken from the Authors own publications, which have been enhanced and paraphrased for this Study including:

- Synthetic Surface Options (Section 5)
- Hybrid Sports Turf Systems (Section 6)
- Synthetic Sports Turf Systems (Section 6)
- Health, Safety and Risk Management (Section 8)
- Standards for Synthetic Surfaces (Section 9)
- Sustainability Considerations (Section 7)

This knowledge will provide the key technical aspects that need to be considered for any future investments.

Q3: Strategically, what should Council be considering for the use and support for synthetic and hybrid surface and what should be their vision?

The study considered both internal and external strategic aspects plus national participation trends that would influence any future decisions, including:

- Strategic Considerations
- Financial Considerations

This will allow Council to have rigour that allows for the support of the use of synthetic fields in the City, either presently or in the future.

Q4: What sites, if demand is warranted should be considered for synthetic sports surfaces?

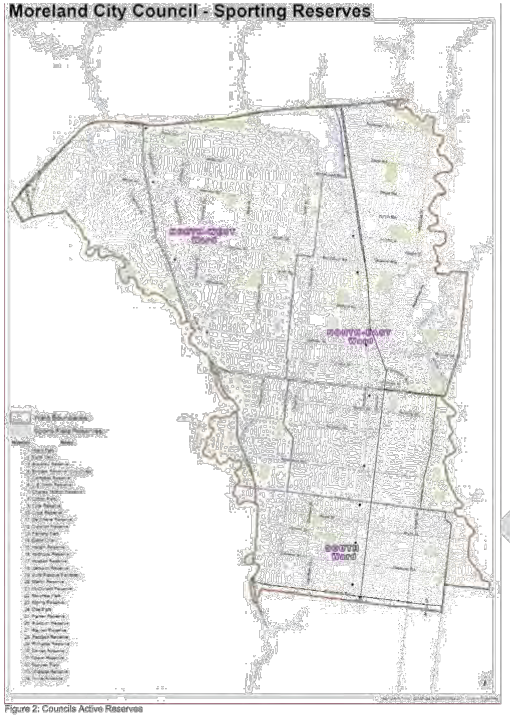


Figure 2: Councils Active Reserves

The Study has considered this question from both a specific sports perspective and a geographical location, there are all answered in Section 4.

To conclude, the Executive Summary provides the conclusion and key recommendations around the flavour of the Study by answering the key questions and providing a series of recommendations.

1.6 Why Council Needs a Study?

The development of a Hybrid and Synthetic Sports Surfaces Study will support Council achieve its various strategic objectives by embracing synthetic surface technology in a manner that will support its desire to encourage more residents to be more active. The strategy aims to provide Council with the following benefits:

- Identify the sports that are most likely to need increased access to more facilities in the future and how synthetic surfaces could alleviate that need for additional facilities by using the technology to allow greater usage;
- Identify any gaps of provision by sport across the City;
- Establish standards for each sport to ensure consistency of installation;
- Align such investments with Councils' other strategies around asset sustainability, open space management and Active Moreland;
- Develop sound economic principles for Whole of Life costing and financial strategy to ensure generational affordability;
- Ensure distribution geographically to encourage greatest usage and participation;
- Design in accordance with sustainability and Green Engineering best practice, whilst also ensuring generational design to meet future participation trends;
- Provide for investment opportunities as they arise, for geographical locations by sport; and
- Influence thinking of embracing the synthetic surface technology as part of Councils Sport and Recreation Strategy.

Photo 1: Synthetic surfaces are being used to encourage active recreation as well as traditional sports participation

SECTION 2: STRATEGIC CONSIDERATIONS

Strategically appreciating the opportunities from within Council and all stakeholders that reflect long term trends and commitments, is critical if all stakeholders are to embrace the technology as a vehicle to promote greater opportunities for the community to participate in active recreation and sport.

2. STRATEGIC CONSIDERATIONS

2.1 Introduction

For Council to appreciate how to move forward strategically, it needs to be cognisant of strategic influences from within Council and with key external stakeholders. This includes considering the following:

- Council strategic direction – policies, plans and strategies; and
- External strategic directions – strategic trends, stakeholders planning and priorities.

This section explores each of these areas of influence and makes suggestions as to the strategic framework for Council to consider for future use in planning and prioritising future sports needs with regard synthetic surfaces.

2.2 Council Strategic Direction

2.2.1 Council's Focus and Strategy

Council's strategic focus for the community is reflected in its document ***Moreland Community Vision*** (2025).

The ***Active Moreland Plan*** (2010 -2014) has a focus on key outcomes:

- ensure Moreland residents are more active more often at all stages of life;
- provide a diverse range of recreation opportunities that reflect our diverse community;
- provide supportive environments and facilities which encourage participation; and
- develop and maintain partnerships to enhance participation options.

The ***Open Space Strategy***[5] (2012-2022) identified the key sports areas for consideration against other open space needs.

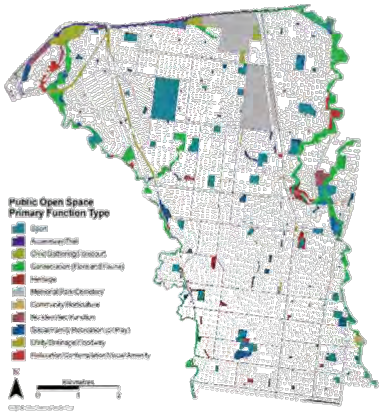


Figure 3: Public Open Space in Moreland

Within the Strategy it identifies key emerging issues effecting open space provision including:

- Higher rate of population growth than anticipated in Melbourne 2030 and increasing urban densities;
- Increasing obesity and adverse health issues within the general populous linked to lack of exercise.
- Increasing demand for space for team sports combined with pressures with maintaining sports grounds during harsh weather conditions.
- Loss of other government land including access to school sports grounds, other utilities open space areas i.e. Vic Track, and Vic Roads land.
- Shared use agreements with schools not being honoured.

This study is being developed due to some of these emerging issues

2.2.2 Council Geographical Outlook

The City of Moreland is located in the inner northern suburbs of Melbourne, with major centres at Coburg and Brunswick, 8 and 5 kilometres respectively from the GPO. It is bounded by the City of Hume to the north, the City of Darebin to the east, the Cities of Yarra and Melbourne to the south and the City of Moonee Valley to the west.

[5] Moreland Open Space Strategy – 2012 – 2022 (@Leisure)

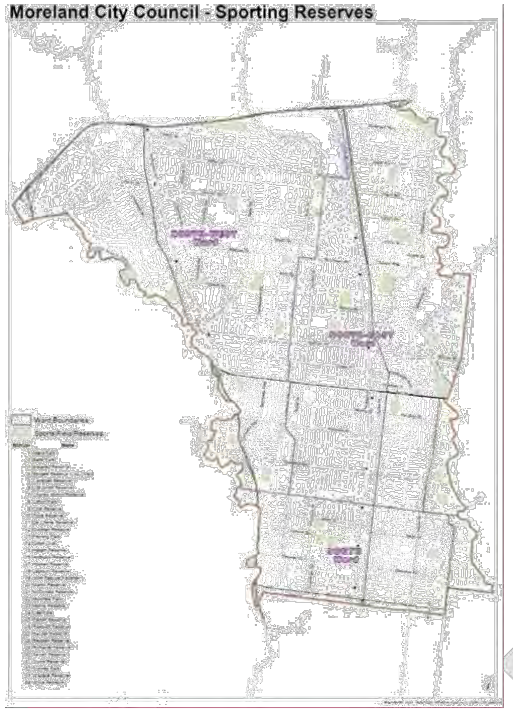


Figure 4: City of Moreland Sporting Reserves

2.2.3 Council Strategy and Policies

From the strategies provided by Council the following have been reviewed for this Study:

- Moreland Sport and Physical Activity Strategy (2014 -2018)
- Active Moreland Facilities Audit - Detailed Report
- Moreland Sportsfield Review (STC – May 17)
- Sports Grounds Locations
- Synthetic and Hybrid Needs Analysis Brief (Oct 17)
- Draft Aquatic and Leisure Strategy (2018-2038 (Otium Planning – 2017)

From these strategies the key aspects that need to be considered for this Study are:

- Sports grounds are becoming more stressed in key areas of the City;
- There is a need to plan for both traditional sports usage, casual and recreational needs as people's participation trends continue to change;
- Programs and opportunities are needed to encourage specific target groups to be more active as the traditional approach is not inviting to all of the community; and
- The population growth is projected to continue to grow and place greater pressure on key sports of soccer and AFL.

2.3 External Stakeholder Strategic Direction

2.3.1 Australian Sports Commission

The Australian Sports Commission (ASC) produces the participation data for Australia in community sport and active recreation and this information will influence the way Council plans for the future and how synthetic sports fields can assist in activating he people

2.3.2 Victorian State Government (SRV)

Sport and Recreation Victoria is located in the Department of Health & Human Services and according to their webpage their focus is on maximising the economic and social benefits provided to all Victorians by the sport and recreation sector through:

- *ensuring greater access and opportunities for participation in sport and recreation by all Victorians*
- *maintaining Victoria's reputation as Australia's leading state for sporting and major events*
- *improving the quality of community sport and recreation facilities*
- *strengthening the capacity of sport and recreation organisations*
- *continuing a robust evidence base for activities in the sport and active recreation system*
- *reinforcing the enriching role that sport, and recreation plays in people's lives.*

Sport and recreation plays an important part in the lives of individual Victorians and helps shape community identity. Sport and recreation opportunities provide settings for social interaction, sharing common interests and enhancing a sense of community.

The continued development of the sector relies on the collaborative efforts of individuals and organisations across the not-for-profit, private and government sectors. Such collaboration maximises the contribution of all players whether at grass roots or elite levels, and engages volunteers and professionals alike.

They provide a selection of grants to assist the management and growth of sport in the local community. The ones that may be applicable for such an investment as this would be within the Community Sports Infrastructure Fund – which includes:

- Major Facilities (up to $0.65m);
- Minor Facilities (up to $0.1m);
- Cricket facilities (up to $0.1m);
- Female Friendly Facilities (up to $0.1m).

All guidelines are on the webpage www.sport.vic.gov.au

In addition, they provide guidance on considerations such as Design for everyone based around the principles of Universal Design to sport and recreation settings.

Funding may also be available from State/Federal Government on specific complementary aspects of the project, such as water harvesting that should be explored.

A number of Victorian Councils are now submitting applications for synthetic surface funding to allow them to cope with current demand and future growth. As Moreland is in a growth zone, an application if the focus was on juniors and encouraging more women to participate would mostly likely be welcomed positively.

Within the Department of Education there are grants available to encourage partnerships with schools. Council staff have embraced this opportunity and continue to wait for the results of their recent submission.

2.3.3 Football Federation Victoria Direction

Football Federation Victoria, as the guardian of the sport in Victoria is very supportive of the embracement of the technology to encourage more people to play the game. Specifically, they are keen to promote improved technology of natural, hybrid and synthetic technology to increase playing capacity of current fields. This will assist clubs in their need for casual use and training as well as match time.

According to recent usage data presented by FFA the increase of 21.7% increase since 2014 membership numbers with 2017 membership only showing a 2.6% increase.

	2014	2015	2016	2017
Player	2161	2444	2577	2643
Non-Player	204	187	229	235
Total	**2365**	**2631**	**2806**	**2878**
% Difference		11.2	6.7	2.6

It is expected that there is a significant increase in recreational football around the 5 a side games, summer recreational competitions and the growth of academies for children outside the club structure.

2.3.4 Australian Rules Football

AFL Victoria, on behalf of Australian Rules Football, is very supportive of this Study and can see the benefits of having additional facilities for their game. They are keen to promote the game further and believe that the natural turf fields alone are not adequate for their sports' near future needs.

AFL Victoria is committed to supporting Council in the development of synthetic sports fields that they can use to promote participation in the sport, especially on weather affected days. Their key focus areas and targeted groups are: schools; women; casual / recreation play through AFL 9's and local club use.

Australian Rules Football recorded a 12% increase in the total number of Victorians playing the game in 2017, with a total of 461,000 participants (316,000 competitive and 145,000 in programs). With 108,000 females participating, doubling the number of teams (392 to 747 teams). The school children programs have had significant success with 43% increase in growth in NAB AFL Auskick and Sporting Schools programs.

Statistically the 2017 AFL Victoria participation Audit shows:

- Highest participation rate is the 5-9 age cohort followed closely by seniors;
- A 4% growth in participation from the 2016 season, with an additional 111 players, which was predominantly women, as males declined (by 271 players), and mainly in the 45-19 age cohort (-25% or 116 participants); and
- The women's game has had significant growth in 2017, reflecting national and Victoria-wide trends with 590 females (266% increase on 2014 participation rate) with 380 more females attracted in 2017, 70 of which are in the 15-19 age group.
- AFL Victoria has projected that by 2021 one new ground will be needed to cope with the projected 3,376 participants. Interestingly, this figure may be conservative if the women's game continues to grow. By 2026 the projection is for two AFL grounds to cope with the anticipated 3,713 participants.

AFL Victoria are committed to working with Moreland City Council to enhance the opportunities to grow the game and have offered access to funding of up to $100,000 for each facility or field that is developed.

2.3.5 Cricket

Cricket participation in club cricket since 2013/14 season to the 2016/17 season has shown:

	2013/14	2014/15	2015/16	2016/17
Boys	49	49	63	63
Senior M	65	56	69	63
Senior F	4	3	4	4
13/18 yrs	0	0	0	5
Total Teams	118	108	136	135
% change from 2013/14		-8.5%	15.3%	14.4%

The In2CRICKET program is relatively stagnant compared to 2014/15 and the T20 Blast analysis shows that Coburg Cricket Club has included 10 more games.

Cricket Victoria, from their audit summarised the facilities in Moreland as:

- 25 sites with 30 playing fields, with more than half using synthetic cricket wickets, which has categorised approximately two thirds as being in moderate or poor condition;
- 18 practice facilities with 16 practice nets; and
- Of the 25 sites, there are 21 pavilions, 20 changing facilities and 37 changing rooms.

In summary there is a need to consider for this study:

- Review and upgrade of synthetic cricket wickets across the City;
- The number of participants seem to have plateaued out over the past two years. So, review as opportunities become available.

2.3.6 Lacrosse

Lacrosse Victoria is currently completing their strategic plan ready for 2018, which will have the growth predictions embedded, but unavailable currently.

Lacrosse Victoria has indicated that outside of the traditional Lacrosse sports clubs, they are reaching a large number of participants with school participation numbers achieving 44,508 (club run clinics at 22,708 and Lacrosse Victoria clinics at 21,800). In addition, community participation clinics have attracted 1,103 and social events 2,608. The challenge seems to be how to convert these numbers into greater club membership, especially in Moreland.

Lacrosse has recently been accepted into the ASC Sporting Schools Program and believe that this should generate children and youth for clubs. They will know better in 18 months' time, as to whether this emphasis on juniors is working for growing club numbers.

Within Moreland, according to Lacrosse Victoria, the club is committed to attracting more females, as they have none currently. The reason given is that this is due to current volunteers. The aim of 4-5 teams to increase participation is their future target.

Lacrosse Victoria would be more than happy to play on synthetic grass, and acknowledge that their rules would need to be amended to allow this to happen.

In summary, the Author cannot identify a key reason for additional synthetic/hybrid technology needed for this sport in the short term.

2.4 Participation Trends

2.4.1 National Trends Show Major Changes in Planning

Australian local government forward planning for sport and recreation provision and facilities has historically been developed around community sports club provision. Research from the Australian Sports Commission will now question whether that traditional approach is still appropriate.

The management of the facilities and programs has traditionally through sports clubs and for key recreational needs known as *pay as you play* options, they have been through community recreation and leisure centres.

The Australian Sports Commission research over the past 4 years has reviewed trends of participation[6] and key characteristics of market segmentation[7] in sport and recreation to allow the industry to contemplate what the community's interests, drivers and barriers are. This may have an impact on the way that both local government and local sport is planned, developed and managed in the future.

From the Council Plan the following strategic vision and positioning has been developed, which needs to underpin the direction of this Study, in addition this should be considered as part of the future Sport and Physical Activity Strategy.

2.5 Active Moreland Technological Surface Embracement and Future Focus

It is recommended that Moreland City Council implements the following Strategic Focus for the adoption of hybrid and synthetic sports surface technology.

Future Use of Synthetic Surface Technology:

Moreland City Council is committed through Active Moreland to encourage participation in active living, play, recreation and sport. By providing facilities for people to play, recreate and participate in sport the sports surfaces need to be appropriate, safe and can cope with the intended usage. To this end, the City has developed this strategic intent / purpose and commitment.

Strategic Intent or Purpose:

Offering sustainable sports surfaces that allows for growth in more people being active, recreating on Council's sports fields and participating in community sport.

3. Commitment:

By planning and embracing the hybrid and synthetic sports surface technology, it provides sustainable sports fields that can cope with a minimum of 35 hours play per week. With key synthetic facilities throughout the city that allows for greater usage, to best encourage growth in training, ability to compete and to rest traditional natural turf fields for competition purposes.

4. Key Principles:

As opportunities arise in the future, Council should embrace each project against the following key principles which have been developed from the outcomes and objectives of the Moreland Community Vision.

i) Compliance Requirements Commitment

- Where specific sporting codes require a synthetic surface as their base requirement and when demand meets or exceeds recommendations, Council will explore such an investment (e.g. athletics track, hockey field etc.)
- To ensure that the standards of any technological solutions meets the standards of the sports peak body from the International Federation or Australian Sports Body

ii) Assists to Promote Increased Broad Community Usage

- The management of the facility allows for a whole of community usage to maximize the Social Return on Investment (SROI)

iii) Multi-usage of Facilities

- Facilities that improve access to the broadest community groups through multi-use of the facilities receive the greatest investment from Council
- Multi-use Active Games areas be integrated into neighbourhoods to allow recreational participation, by replacing unused spaces (e.g. bowling greens, tennis courts, open space) in a manner that encourages young people to be active

iv) Best Value Economic Management

- When a synthetic surface is a cost-effective option to encourage greater patronage for a sport, and numbers justify need (e.g. cricket wickets, lawn bowls) or such an investment extends the season/usage
- Financial investment from other sources is encouraged to increase the opportunities to install more surfaces is explored
- The funding of such investments will be aligned with Councils financial priorities and ability to invest, based around Whole of Life costings and a generational financial strategy to offset costs over the life of the surface
- Invest in facilities that improve access to the broadest community groups through multi-use of the facilities

v) Partnerships

- Collaborations and partnerships with stakeholders, community clubs and groups together with other providers and funders should be encouraged in a manner that will provide increased opportunities for participation to the broader community.

vi) Environmental Sustainability

- Adoption of sustainability and Green Engineering principles for the design and sustainability of the technology
- The maintenance strategy adopted will maximise the life expectancy and sustainability of the fields

vii) Well Managed

- The programming, asset management and financial prudency of the fields provides best value for the broad community

2.6 Conclusion and Key Learnings

Strategically, Council is focussed through its Active Moreland programs, policies and strategy to encourage greater participation. In addition, it is environmentally conscious and has significant emphasis on sustainability which would need to be reflected in the adoption of any synthetic technology.

The key principles from Council's various strategies and policies provide clear emphasis of a Council that embraces social inclusiveness; is keen to enhance their health and community spirit through their future Sport and Physical Activity Strategy; and recognises the need to plan for future growth of not only traditional sport but Active Recreation.

For local government and community sport and recreation to embrace the identified market segmentation changes and build on the trends there needs to be some major shifts in thinking, including:

- Agreement of the ***PEOPLE*** to target to play sport and recreation through the Active Moreland Program as opposed to continuing to offer the same as normal and expecting the community to automatically be engaged;
- Development of ***PROGRAMS***, activities and events that will engage, recruit and retain specific target audiences in play, recreation and sport;
- Development of new collaborations and ***PARTNERSHIPS*** to ensure that the programs are the ones that the community really want, and the collaborators are the best organisations to develop and deliver them, this may be far wider than traditional sports clubs providing community sporting opportunities;

[6] Megatrends of Sport (ASC, 2013)

[7] Market Segmentation for Sports Participation (ASC, 2014)

- Connecting, developing and investing in ***SPACES and PLACES*** that will encourage people to engage with the programs and return and be more active, more often and in more places.

There is support from all state sporting bodies as they can see the benefit in the coming years for the use of synthetic surfaces to grow participation in a manner that related grass cannot accommodate.

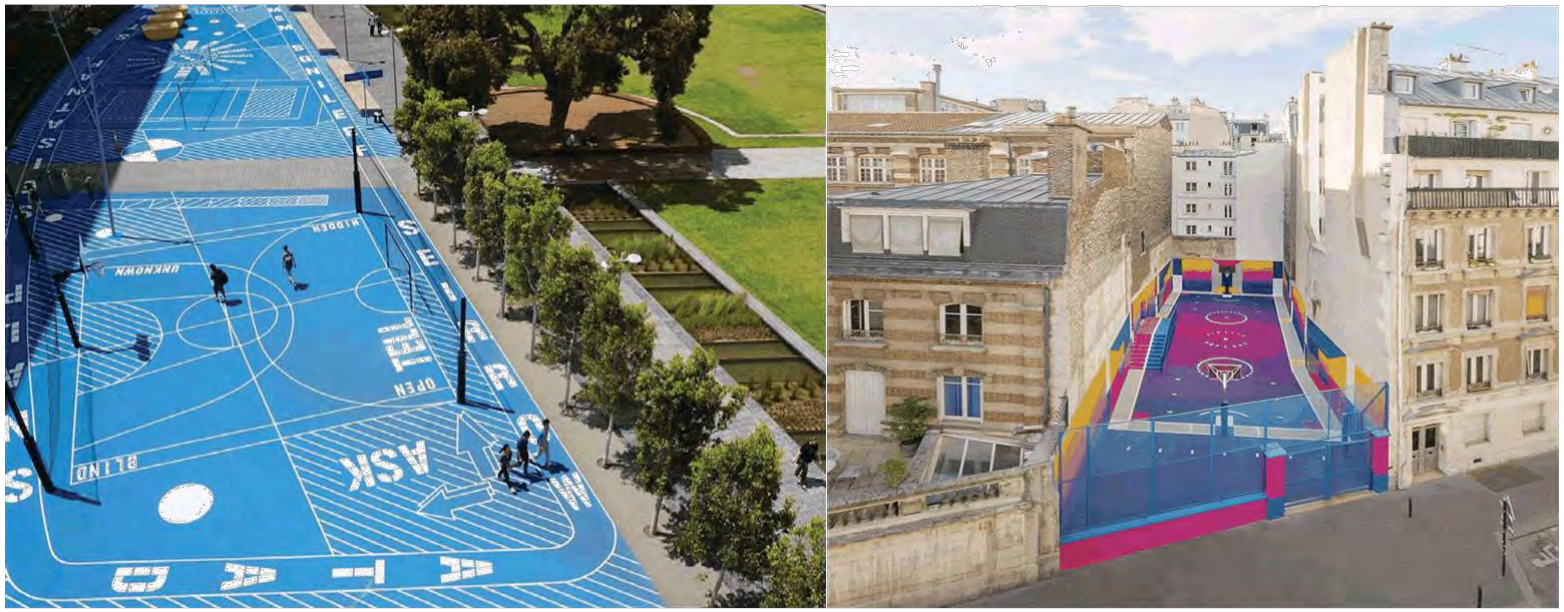


Photo 2: Synthetic surfaces are being used to encourage greater participation in urban sports facilities

SECTION 3: NEEDS FOR SYNTHETIC SPORTS FIELDS

Council is keen to explore the current future needs of the community and specifically around the sports of Football (Soccer and AFL), Lacrosse and Cricket with other sports where possible as well as general recreational needs.

This section explores the growth in the population, industry trends, existing sporting needs and the results of the consultation to allow Council to appreciate the needs for sport.

3. NEED FOR SYNTHETIC SPORTS FIELDS

3.1 Moreland Demographic Considerations

The Moreland Sport and Physical Activity Strategy, which presents a summary of population forecasts for the City of Moreland from 2013 to 2031, including forecast population changes to each of the suburbs and SLA's located within the municipality. It reveals the following:

- *The City of Moreland is projected to grow significantly over the next two decades, increasing by 18% from 2013 to 2031. An additional 28,000 people make Moreland their home during this period, and the overall population will increase from 160,000 people in 2013 to 188,000 by 2031.*
- *The majority of this growth will occur in the Brunswick SLA which will accommodate close to an additional 14,000 people during this period (a 27% increase), followed by the Coburg SLA with an additional 9,000 people (a 16% increase), and the North SLA with an additional 5,000 people (an 11% increase).*
- *However, by number the Coburg SLA will still accommodate, as it presently does (a population of 60,000 people in 2013) the largest population within the municipality by 2031 (approximately 69,000 people), followed by the Brunswick SLA (approximately 64,000 people) and the North SLA (approximately 54,000 people).*
- *By number the largest suburban populations within the municipality are currently Coburg (27,000 people), Brunswick (25,000 people) and Glenroy (21,000 people). These 3 suburbs will continue to accommodate the largest populations within the municipality by 2031, but contain significantly more than their current 2013 population levels. Brunswick will grow by 18% during this time and accommodate an additional 4,500 people; Coburg will grow by 20% and accommodate an additional 5,000 people, and Glenroy will grow by a more modest 11% and accommodate an additional 2,000 people.*
- *The other notable population growth feature for the municipality is the projected population change for Brunswick East which is anticipated to grow by approximately 70% during the forecast period, almost 8,000 additional people.*

Table 1: Small Area, SLA and Municipal Moreland population forecasts

Area	SLA	2013	2016	2021	2026	2031	Change No. 2013 to 2031	Change % 2013 to 2031
Brunswick	Brunswick	24,865	26,895	28,252	29,134	29,398	4,533	18%
Brunswick East	Brunswick	11,044	13,985	15,471	17,874	18,939	7,895	71%
Brunswick West	Brunswick	14,719	15,157	15,646	15,983	15,968	1,249	8%
Sub-total Brunswick SLA		***50,628***	***56,037***	***59,369***	***62,991***	***64,305***	***13,677***	***27%***
Coburg	Coburg	27,282	29,360	30,737	32,041	32,652	5,370	20%
Coburg North	Coburg	6,898	8,022	8,071	8,093	8,213	1,315	19%
Pascoe Vale	Coburg	15,563	16,226	16,551	16,845	17,093	1,530	10%
Pascoe Vale South	Coburg	10,274	10,551	10,891	11,120	11,373	1,099	11%
Sub-total Coburg SLA		***60,017***	***64,159***	***66,250***	***68,099***	***69,331***	***9,314***	***16%***
Fawkner	North	13,260	13,594	13,813	14,069	14,126	866	7%
Glenroy	North	20,693	22,224	22,687	22,932	22,996	2,303	11%
Gowanbrae	North	2,864	3,012	2,972	2,943	2,915	51	2%
Hadfield	North	5,979	6,371	6,542	6,680	6,789	810	14%
Oak Park	North	6,117	6,670	6,900	7,192	7,470	1,353	22%
Sub-total North SLA		***48,913***	***51,971***	***52,914***	***53,726***	***54,296***	***5,383***	***11%***
City of Moreland		159,558	172,167	178,533	184,816	187,932	28,374	18%

According the Councils recent Draft Aquatic and Recreation Strategy[5] provides an excellent summation of the demographic considerations for the municipality

"Moreland is experiencing high rates of population growth and the City's growth profile are expected to continue for the duration of this strategy3.

Our estimated population in 2016 was 172,091 and this is projected to grow to 228,807 by 2036 (33%), with the majority of growth to occur South of Bell Street. We have a relatively even split between males (49%) and females (51%)

We have a smaller proportion of people in the younger age groups (under 15 years) and a similar proportion of people in the older age groups (65+ years). Overall, 16.1% of the population was aged between 0 and 15 years, and 13.7% were aged 65 years and over, compared with 18.3% and 14.0% respectively for Greater Melbourne.

Cultural diversity is reasonably high with 28.6% being born in a non-English speaking country, and 38.2% speaking a language other than English at home, compared to 27.0% and 32.3% in Greater Melbourne.

Moreland City Council ranks 34th out of 80 LGA on the SEIFA Index of Relative Social Economic Disadvantage with a score of 998.1. The higher on the Index the lower the level of disadvantage."

The impact of these demographics on sports field needs are similar to leisure and aquatic facilities, namely:

- The increased population growth will place pressure on the natural playing fields and local parklands where the community want access to both recreational opportunities and club sport;
- In areas of young ages and a prominence of schools will result in greater demands on the fields;
- Suburbs of a higher level of disadvantage will be most sensitive to price sensitivity and demand for lower cost facilities and programs or will take the opportunity to play recreational games in the parkland.

3.2 Moreland Sport and Recreation Participation

3.2.1 Current Sport and Recreation Participation

[5] Aquatic and Leisure Strategy (draft November 2017 – Otium Leisure Planning)

Council provided the following summary of date of participation from the Sport and Physical Activity Strategy (2014-18) and 2017 figures added from the sports sources.

Sport / Activity	No. of Players	
	2015	2017
Australian Rules Football (AFL)	2,913	3,707
Soccer (outdoor)	2,122	2,402
Cricket (outdoor)	2,342	2,186
Lacrosse	61	59
Total	**7,438**	**8,354**

From the above figures the two growth sports are Australian Rules and Soccer that are trending upwards. Depending upon the growth of the future women's participation in AFL, Council will need to consider the impact on future facility needs.

3.2.2 Participation Trends in Sport and Recreation

The Megatrends of Sport and the Market Segmentation Trends for adults and children (14 and under) by the ASC identify the key issues that Council should be aware of:

- A significant change from traditional club membership towards 'casualisation of sport';
- Time poor people using sport to keep fit as opposed to keeping fit to play sport;
- Overall people are 'playing sport' less often in all age groups;
- Older people and people with disabilities are re-entering the sports market for personal, social and health outcomes;
- Expanding clubs are those who expand their offering to complement their traditional membership and program offering as they are looking at customers not just members;
- Overlapping sports seasons with many sports extending their seasons, which is having an impact on facilities; and
- Increased popularity of recreational sport;

The ASC AusPlay survey provides information about trends in sport and physical activity participation that will guide key decisions in this area. Findings from the first 12 months of AusPlay (Issued Dec 2016) data also show:

- Sport is very important for children and they are more likely to take part in organised sport-related activities than other forms of organised physical activity outside of school hours;
- Physical health and fitness is the top motivator for all types of sport and physical activity with sport-related activity seen as being more fun and social;
- Time constraints is the biggest barrier to sport and physical activity for adults up to middle age;
- Australians spend $10.7 billion a year on sport and physical activity participation fees, with less than a third (29 per cent) going to sports clubs;
- Use of technology in support of physical activity is particularly popular among young adults and women;
- The single most popular sport or physical activity for adults is walking (43 per cent), while the most popular organised sport or physical activity outside of school hours for children is swimming; and
- The most popular club-based participation sport in the country for adults and children is football.

3.3 Impact on Council's Consideration

3.3.1 Sports Focus

The growth sports have been identified by Council's previous reports and growing in Australian Rules Football and Football (soccer). Also, Council should be considering the needs of their growing youth cohort, who may not wish to join a traditional sports club, but still want to 'play' sport to keep fit, to be social and to have fun. The use of small Actives Zones would be a significant benefit to attract and retain this cohort.

Photo 1: Active Sports Zones in parklands are becoming more popular for local parks (Source: Kompan)

3.3.2 Design Reflects Trends

Council has the opportunity to consider the field design options that would most suit the growing demands for the municipality. The options could include:

- Single sport option:

A single sport may benefit from the projected growth that is expected over the next two decades. A single sport venue may also be designed for both summer and winter use; or both formal and informal use. This could include Football with options around 11-a-side field for winter, and 5, 6, 7-a-side field design for summer use. Or indeed for recreational use as shown at Lily's Football Centre, Blacktown (see Photo 2 below).

Photo 2: Lily's Football Centre, Blacktown NSW: Showing mini-fields and half of the full size 11-a-side pitch

There would need to be a very strong demand for a single sport for this to be justified.

- Seasonal sport option:
  There are a number of good examples where the facility can be designed for two sports, one in each season such as:
  - Football/Cricket
  - AFL/Cricket
  - Football/Touch or Oz Tag
  - AFL/Touch/Oz Tag

Photo 3: Blackman Park, Lane Cove - NSW Showing Football, Rugby, Cricket and AFL Fields

- Multi-sport:
  This is where a number of sports can be played on the same surface, which may satisfy a geographical need, where a single (seasonal) sport is not strong enough to need all of the time for themselves. This could include sports such as:
  - Rugby Union, Rugby League, Touch, Oz Tag and Lacrosse
  - Football / Rugby codes / Lacrosse
  - Hockey and Tennis
- Multi-use Active Sports Zones:
  Where local communities are provided with areas for informal recreation (see Photo 4) where small courts are designed around small sided games such as 5-a-side; Touch; Basketball; Tennis; Netball etc., allowing for the community to play a range of activities.

Photo 4: Multi-use Games Area - Victoria (Source ABS)

For the final design options there is a need to explore the capacity of the current fields to identify the shortage either by sport or geographically, to ascertain the needs for future planning.

3.4 Conclusion

The recreational growth expects to be significantly higher and the facilities need to be designed to accommodate these growth trends. The considerations should include:

- Multi-sport Active Zones – aimed at the recreational participation around the key football codes; basketball, netball and football. Positioning these in the main growth areas will assist in the continued growing populations.
- Traditional sports fields (e.g. Soccer, and AFL) should also be designed with the modified games lines integrated, which may include 5-a-side/futsal (Soccer); and AFL 9's (AFL).

The following Recommendations are made:

Strategy	Actions
Council to continue to support the embracement of synthetic and hybrid technology to meet future and current demand	- The key sports of Australian Rules Football and Football (soccer) should be positioned for future synthetic surfaces
	- The adoption of hybrid/root-reinforced technology for high wearing areas should be strategically adopted on key fields annually to extend play to a minimum of 25 hrs per week
Extend the use of synthetic sports turf to Active Moreland Sport Zones which can be used in smaller spaces to provide recreational opportunities for young people to play	- Identify an initial three Active Moreland Zones for multi-use games areas, one in each area of the City and Pilots, with a review and roll-out thereafter

SECTION 4: SITE CONSIDERATIONS

Council is keen to plan for the future needs of the community and specifically around a multi-sport focus of Football (Soccer), Australian Rules Football (AFL), Lacrosse and Cricket with a multi-sport opportunity for other sports.

4. SITE CONSIDERATIONS

4.1 Introduction to Moreland's Active Sports Grounds

Moreland City Council manages and maintains 56 sports fields[9] catering for a wide variety of sports including football codes of Soccer (29), Australian Rules (19); Baseball/Softball (1), Cricket (32), Bocce (5), Athletics (1) and various recreational and informal sports. In addition, 57 tennis courts are also owned by Council.

The Active Sports Grounds as part of its open space areas, are shown on Figure 5 below:

Moreland City Council - Sporting Reserves

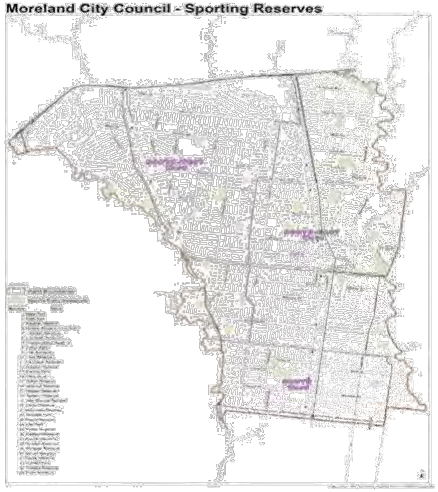


Figure 5: Moreland City Council Map

To ascertain the various impacts on the current fields ability to cater for demand, the following perspectives have been considered:

- The current club numbers and projections for the future to indicate demand;
- The current conditions of the sports fields and their ability to meet future demand;
- Council's CAPEX Active Sporting Reserves commitment;
- Workshop with Council officers; and
- Geographical assessment of fields with Council three areas or zones.

4.2 Site Assessments

The following considerations have been identified from the Study's findings:

4.2.1 Club Membership Projections

The club membership[10] figures provide a three-year comparison by sport with the following commentary:

1. Australian Rules Football

	2015			2016			2017		
	M	F	Total	M	F	Total	M	F	Total
Total Senior M/F	946	52	998	1,107	47	1,154	1,021	135	1,156
Total Junior M/F	1,810	105	1,915	2,043	212	2,255	2,205	321	2,526
Total Indigenous	-	-	-	3	-	-	0	-	0
Total Disability	-	-	-	25	-	25	25	-	25
TOTAL	2,756	157	2,913	3,178	259	3,437	3,251	456	3,707
Commentary: - Female numbers increasing annual significantly, while senior men reducing in 2017 and some growth in junior men									

Table 2: Australian Rules Football membership numbers (Source: Moreland City Council

2. Football (Soccer)

	2015			2016			2017		
	M	F	Total	M	F	Total	M	F	Total
Total Senior M/F	350	157	507	361	140	501	380	130	510
Total Junior M/F	1,662	265	1,927	1,761	258	2,019	1,573	319	1,892
Total Indigenous									
Total Disability									
TOTAL	2,012	422	2,434	2,122	398	2,520	1,953	449	2,402
Commentary: - The club membership in 2017 (2,402) is similar to 2015 (2012) which is different from the trends across Victoria which shows greater growth - Juniors male growth has decreased since 2015 for boys (1,662) in 2017 (1,573) despite an increase in 2016									

Table 3: Football membership numbers (Source: Moreland City Council)

3. Cricket

	2015			2016			2017		
	M	F	Total	M	F	Total	M	F	Total
Total Senior M/F	913	60	973	990	90	1,080	850	103	953
Total Junior M/F	1,277	97	1,374	905	50	955	1,070	163	1,233
Total Indigenous	-	-	-	-	-	-	-	-	-
Total Disability	-	-	-	-	-	-	-	-	-
TOTAL	2,190	157	2,342	1,895	140	2,035	1,920	266	2,186
Commentary: - Female growth since 2015 (0157) to 2017 (266) - Male (Senior and Junior) are both significantly reduced compared to 2015 (12% reduction) - Overall Cricket membership reduced by 6.7% since 2015									

Table 4: Cricket membership numbers (Source: Moreland City Council)

4. Lacrosse

	2015			2016			2017		
	M	F	Total	M	F	Total	M	F	Total
Total Senior M/F	27		27	30	-	30	30	-	30
Total Junior M/F	34	9	43	29	-	29	29	-	29
Total Indigenous	-	-	-	-	-	-			
Total Disability	-	-	-	-	-	-			
TOTAL	61	9	70	59	-	59	59	-	59

[9] Synthetic Sports Surfaces Feasibility Study (2013)

[10] Excel spreadsheet supplied by Council (18/12/17) and shown in Appendix 2

Commentary:
- No female participants since 2015
- Decrease in numbers since 2015 (70) compared to now (59)

Table 5: Lacrosse membership numbers (Source: Moreland City Council)

4.2.2 Site Consideration Assessment

As part of the Moreland Sportsfield Review[11] it identified the fields against sport, number of teams, active usage hours per week, the casual use and the usage classification and this has allowed us to identify the sports fields for each sport that have either a high or excessive use category. Those high-risk fields are identified as:

- Balfe Park (Soccer) – Excessive use with 25.5 hrs
- CB Smith Community (Soccer) – Excessive use with 33 hrs
- City Oval (AFL/Cricket) – Excessive use with 30 hrs
- Gillion Oval (AFL/Cricket) – High use with 24 hrs and high growth at club
- Hosken Reserve North (Soccer) – High use with 21 hrs
- Hosken Reserve South (Soccer) – High use with 21 hrs
- Summer Park (Soccer) – Excessive use with 25.5 hrs

From the fields above the following commentary has been identified:

- The two AFL ovals (Gillion and City Ovals) are premier ovals
- Hosken Reserve South is a premier football field
- Gillion Oval (AFL/Cricket) is adjacent to the Clifton Park synthetic sports field
- Brunswick Zebra's uses and trains at both Balfe Park and Summer Park, both with excessive use greater than 25 hours per week (winter usage)

In addition, officers have identified that the current synthetic soccer sports fields at Clifton Park (soccer) is seven (7) years old and due for renewal in 2021 (11 years old), Fawkner Soccer eight years (due for upgrade in 2018/19 and Brunswick hockey Approximately 12 years old and is due for refurbishment for the first quarter 2018.

The majority of synthetic long-pile fields which are used for the various football codes normally last 8-10 years, depending upon usage intensity and the level of maintenance.

It is recommended that the current synthetic fields at Clifton Park and Fawkner Park are reviewed to identify:

- An expected life expectancy together with any renovation program needed to extend their life: and
- Reflect this life expectancy with a replacement cost for the CAPEX budget to allow for their replacement.

4.2.3 Other Opportunities

In discussions, Council officers have identified the following fields that may be worth considering:

- Parker Reserve
  - Two ovals, central within the City, west side has some residents, but a good buffer in place. Baseball is played on north field
  - No usage in the winter on either oval
  - There are no lights but could be used centrally as a good community park for multi-sport and recreation facilities
  - *It is recommended to consider both ovals at the next stage of assessment*
- Coburg High School
  - Coburg High School, has provided tentative approval by the Department of Education for an AFL/Multi-purpose field
  - The current football club have identified that they would consider investing $250,000 into the facility
  - Council to explore investing in the school site, capturing the water off the synthetic field and water harvest the rain to use on this ground
  - The field also has a turf cricket wicket
  - *It is recommended that the school site be identified for short-listing*
- Oak Park
  - Front field next to update aquatic centre could be redeveloped for an AFL/Multi-sports field
  - Next to main road (Pascoe Vale Road)
  - *It is recommended that this site is reviewed at the short-listing stage*
- Reddish Reserve
  - Standard Football ground and small field next to it
  - Facilities and car park
  - Good lights
  - Significant residential housing surrounding
  - *Not recommended for second stage short-listing*
- Fawkner College
  - Principal keen to open up for AFL multi-sports synthetic field
  - Football already there on school grounds
  - Possible 1.5 field size to accommodate on AFL/Football set-up
  - Current Football field needs to be replaced in 2 years' time
- Clifton Park
  - Field already in place – targeted for replacing in 2021
  - Clifton Junior Football could be additional surface
  - Lighting design completed ready for next year
  - *Do not progress to next stage*
- Alternatives could include:
  - Roberts Reserve – inside cycle track
  - Jackson Reserve (Football/Cricket)

From this initial review the following are recommended to be considered at the Stage 2 Assessment for hybrid and synthetic conversion: -

- South Ward
  - Balfe park – Hybrid - for soccer and due to current excessive usage
  - Clifton Park (West)– synthetic - current synthetic and to be re-surfaced and possible AFL field to be converted
- North West Ward
  - Oak Park – synthetic - to satisfy AFL growth needs and accessibility across the City for a number of clubs
  - Parker Reserve – Synthetic – to satisfy the non-club base usage for the whole City
- North East Ward
  - CB Smith Community – Hybrid due to current usage
  - Hosken Reserve South – Synthetic for Soccer due to high usage
  - Coburg High School – Synthetics for multi-sport and community usage
  - City Oval – Hybrid for additional usage and quality of surface
  - Fawkner Soccer – Synthetic field replacement for soccer
  -

[11] Moreland Sportsfield Review – Sports Turf Consultants May 2017

4.3 Initial Site Analysis

4.3.1 Introduction

Out of the 56 sports fields across the city, the above recommended fields have been submitted for the second stage assessment which have considered the following aspects:

- Geographical location with municipality, using three areas for ease of dividing the city;
- Conditional assessment (May 2017)[12] of grounds against categories for poor, moderate, good and excellent;
- Playing capacity of every field[13] and accrual hours played to identify fields that are over-played;
- Community Impact – Will have any negative impact on the residential community?
- **Resources Committed** – Has resources already been committed by Council or a third party showing significant capital contribution?
- Sport/s played on each field and will the field satisfy growth and allow for continued growth and/or additional usage; and
- Specific infrastructural issues that may be associated with each field, such as flood zone; used as retarding basin; site infrastructure needs and whether such an increase in usage would have a significant impact on local residents.

4.4 Site Analysis

The actual sites that were reviewed in each of the ward areas were:

4.4.1 South Ward

I. **Balfe Park (Brunswick East)– Soccer**

Consideration: Hybrid - for soccer and due to current excessive usage

- **How would it help satisfy sports needs**
  By renovating and installing some Hybrid Role and Play carpet this should allow increase of the field to around 25-30 hours a week
- **Community Impact (-ve or +ve)**
  Council staff believe that this will be positively received by the community, however, this would need to be confirmed with formal consultation prior to proceeding
- **Current infrastructure (parking, lights, ease of access, changing facilities etc.)**
  As a new irrigation system has just been installed it would be a good opportunity to invest into a drainage system at the same time.
  The current pilots of hybrid technology being used in the goal areas should be expanded to the 'corridors' in the field and the lines people running areas.
- **Resources already committed**
  Additional resources will be needed for the drainage and the extension of the hybrid surfaces to the corridors and all high wear areas.
- **Design consideration**
  No additional design considerations identified
- **Recommendations**

Upgrade the Balfe Park field to cope with the usage to approx. 30 hpw by expanding the pilot hybrid goal mouths to include the corridor up the main field and the lines person running lines

II. **Clifton Park West (Brunswick) – AFL / Cricket**

Consideration: Synthetic - current synthetic and to be re-surfaced and possible AFL field to be converted

- **How would it help satisfy sports needs**
  The AFL and Cricket field could be replaced with a synthetic sports field for both sports for training and cricket matches Community Impact (-ve or +ve)
- **Current infrastructure (parking, lights, ease of access, changing facilities etc.)**
  It would reduce the training needs on Gillion Oval and Allard Park, which are used by the two largest clubs in Brunswick
- **Resources already committed**
  Lights are planned for 2018/19
  Design consideration
  Designed for AFL and Cricket and utlise water harvesting for the remaining natural turf field longer term
- **Recommendations**

Install a synthetic AFL/Cricket wicket for the AFL field at Clifton Park West with water harvesting for the West Soccer Field

4.4.2 North West Ward

III. **Oak Park (Coburg) – AFL / Cricket**

Consideration: Synthetic - to satisfy AFL growth needs and accessibility across the City for a number of clubs convert the Northern field.

[12] Sportsfield Winter Usage Review (June 2016: Sportsturf Consultants)

[13] Sportsfield Winter Usage Review (June 2016: Sportsturf Consultants)

- **How would it help satisfy sports needs**
  The AFL and Cricket field could be replaced with a synthetic sports field for both sports for training and cricket matches Community Impact (-ve or +ve)
- **Community Impact (+ve or -ve)**
  Teams from other fields would use this for training and then rest their match grounds, including JP Fawkner (x2), Oak Park Back field, Glenroy and ATC Cook Reserve.
- **Current infrastructure (parking, lights, ease of access, changing facilities etc.)**
  Lighting is needed
  A new pavilion is being constructed as part of the aquatic centre redevelopment
- **Resources already committed**
  Non-identified
- **Design consideration**
  Integration with the whole parkland with water harvesting used for the Back field to increase the utilisation of that field.
- **Recommendations**

Install a synthetic AFL/Cricket wicket for the AFL field at Oak Park Northern field with water harvesting for the back field

IV. Parker Reserve (Brunswick – AFL / Cricket

- **Consideration**: Synthetic – to satisfy the non-club base usage for the whole City

- **How would it help satisfy sports needs**
  With two ovals, central within the City, west side has some residents, but a good buffer in place. Baseball is played on north field and there is no usage in the winter on either oval
  There are no lights but could be used centrally as a good community park for multi-sport and recreation facilities
- **Community Impact (+ve or -ve)**
  Teams from other fields would use this for training and then rest their match grounds, as well as recreational use for a wide range of football codes
- **Current infrastructure (parking, lights, ease of access, changing facilities etc.)**
  Lighting is needed
- **Resources already committed**
  Non-identified
- **Design consideration**
  Integration into the landscape as a more active park should be considered
- **Recommendations**

Install a synthetic multi-sports field at Parker Reserve for community use and a central point for training across the City

4.4.3 North East Ward

V. CB Smith – Community (Fawkner) - Soccer

- **Consideration**: – Hybrid due to current usage

- **How would it help satisfy sports needs**
  Due to high usage it is suggested that the embracement of Hybrid technology in the high wear areas of the goal area, the central corridor and the line ref running areas to be converted to hybrid technology
- **Community Impact (+ve or -ve)**
  Council staff believe that this will be positively received by the community.
- **Current infrastructure (parking, lights, ease of access, changing facilities etc.)**
  Field installed in 2012 and infrastructure well serviced
- **Resources already committed**
  Non-identified
- **Design consideration**
  Non identified
- **Recommendations**

Upgrade the CB Smith Community field to cope with the usage to approx. 25- 30 hpw by installing hybrid technology sports turf in the key high wear areas of the goal mouths to include the corridor up the main field and the lines person running lines.

VI. Hosken Reserve (Coburg North) Soccer and Multisport Training

- **Consideration**: – Synthetic for Soccer due to high usage

- **How would it help satisfy sports needs?**
  The current northern field would remain as the identified and approved synthetic turf and satisfy community use and the southern field would be used by the club that currently utilises four other fields and this could be significantly reduced.
- **Community Impact (+ve or -ve)**
  The synthetic field would allow 60 plus hours usage which in turn would reduce usage at Redditch, Richards North and South and the seniors at CB Smith Premier fields.
- **Current infrastructure (parking, lights, ease of access, changing facilities etc.)**
  Satisfactorily serviced currently
- **Resources already committed**
  Council has already programmed $1.2 million for an upgrade to a natural sports field, this money could be used for the synthetic field (typically estimated at $1.4m for three times the weekly usage of a natural field)
- **Design consideration**
  Explore water harvesting for the northern field and also redesign of the Northern field into the Active parklands
- **Recommendations**

Install a hybrid soccer / multi-sports field for community use with the $1.2 m already allocated to the Hosken Reserve Northern field

VII. Coburg High School (Coburg) – Multi-sport and Community

- **Consideration:** Synthetics for multi-sport and community usage adding additional sports field space to the community
- **How would it help satisfy sports needs**
  The field would add additional playing hours to the community above what's currently available and then in addition the added hours that it could cater for in the evening and weekend usage would be extensive being a synthetic oval
- **Community Impact (+ve or -ve)**
  The synthetic field would allow 60 plus hours usage which in turn would reduce usage other fields especially at Jackson Reserve, City oval, the Shore Reserve, Parker Reserve and Rayner Reserve.
- **Current infrastructure (parking, lights, ease of access, changing facilities etc.)**

Lights and possible fencing would need to be considered

- **Resources already committed**
  the AFL (Vic) have indicated that they would invest approx.. $100,000 towards the development and the Moreland Zebra's have indicated that they would invest co-invest approx.. $250,000.
- **Design consideration**
  Security issues with the school and landscaping the other natural grass areas within the 'oval'. In addition the multi-sports courts need to be consider at the south of the oval. These could be converted into a Multi sports Activity Zone
- **Recommendations**

Negotiate with the Principal to install a synthetic multi-sports field (AFL, Cricket and Soccer) for the community and convert the sports courts into a Multi-sports Activity Zone

VIII. City Oval (Coburg) – AFL /Cricket

- Consideration: Hybrid for additional usage and quality of surface

- **How would it help satisfy sports needs?**
  The current premier field should be converted to hybrid sports turf to cope with the 30 plus hours current usage. If synthetic fields are placed elsewhere this should take the pressure off the premier field somewhat in the short term, but with the continued projected growth in AFL then this needs to have a business case developed for its resurfacing
- **Community Impact (+ve or -ve)**
  The hybrid surface (except for the grass turf wicket areas should be replaced with a hybrid turf technology
- **Current infrastructure (parking, lights, ease of access, changing facilities etc.)**
  Satisfactorily serviced currently
- **Resources already committed**
  Non identified
- **Design consideration**
  No special requirements identified
- **Recommendations**

Develop a business case for the City Oval to be fully converted to Hybrid technology sports turf to both cope with current AFL needs and future growth projections

4.5 Conclusion and Recommendations from Site Assessments

By assessing the growth in the four sports within the city the emphasis from the conditional assessments, the current and future growth indications, and a review of the short listed sites the following conclusion and recommendations can be drawn.

4.5.1 Sports Specific Findings

- The sports that are continuing to grow are Football (Soccer) and Australian Rules Football and should be the focus when prioritising the opportunities
- As cricket is predominantly played in the middle of the AFL fields and a lacrosse field can be played in the rectangular boundaries of a good size Football field then both of these sports can be accommodated in the focus on the two faster growing sports.
- The synthetic cricket wickets in Moreland are reviewed for safety and performance in conjunction with Cricket Victoria and any replacements incorporated within the Capex budget for 2018/19 onwards
- With the growth of urban sports facilities for the younger groups in the community and also the people who desire not to part of the traditional team club sports culture there is a need for casual play parks to cater for this growing cohort. Council to conduct a city-wide assessment of pocket parks and current sports field that could be used to pilot an Active Moreland Sports Zone multi-use games area to encourage the young of the city to be more active and play sport

4.5.2 Sports Field Assessments

From this initial review the following are recommended to be considered at the Stage 2 Assessment for hybrid and synthetic conversion: -

- South Ward
  - Balfe park – Hybrid - for soccer and due to current excessive usage
  - Clifton Park – synthetic - current synthetic and to be re-surfaced and possible AFL field to be converted
- North West Ward
  - Oak Park – synthetic - to satisfy AFL growth needs and accessibility across the City for a number of clubs
  - Parker Reserve – Synthetic – to satisfy the non-club base usage for the whole City
- North East Ward
  - CB Smith Community – Hybrid due to current usage
  - Hosken Reserve North – Synthetic for Soccer due to high usage
  - Coburg High School – Synthetics for multi-sport and community usage
  - City Oval – Hybrid for additional usage and quality of surface
  - Fawkner Soccer – Synthetic field replacement for soccer

A detailed assessment of each site has been conducted as part of Section 4.4. a summary of the findings is as follows:

4.5.3 Recommendations

4.5.3.1 South Ward

- **Balfe Park** - upgrade the Balfe Park field to cope with the usage to 30 hpw by expanding the pilot hybrid goal mouths to include the corridor up the main field and the lines person running lines
- **Clifton Park** – install a synthetic AFL/Cricket wicket for the AFL field at Clifton Park West with water harvesting for the West Soccer field.

4.5.3.2 North West Ward

- **Oak Park** - Install a synthetic AFL/Cricket wicket for the AFL field at Oak Park Northern field with water harvesting for the back field
- **Parker Reserve** - Install a synthetic multi-sports field at Parker Reserve for community use and a central point for training across the City

4.5.3.3 North East Ward

- **CB Smith – Community** - Upgrade the CB Smith Community field to cope with the usage to approx. 25- 30 hpw by installing hybrid technology sports turf in the key high wear areas of the goal mouths to include the corridor up the main field and the lines person running lines.
- **Hosken Reserve (Northern field)** - Install a synthetic soccer / multi-sports field for community use with the $1.2 m already allocated to the Hosken Reserve Northern field
- **Coburg High School -** Negotiate with the Principal to install a synthetic multi-sports field (AFL, Cricket and Soccer) for the community and convert the sports courts into a Multi-sports Activity
- **City Oval** - Develop a business case for the City Oval to be fully converted to Hybrid technology sports turf to both cope with current AFL needs and future growth projections

SECTION 5: SPORTS SURFACE OPTIONS

This section provides Council with the background of the options for sports turf systems, between natural, hybrid and synthetic surfaces.

5. SPORTS SURFACE OPTIONS

5.1 Introduction

With the challenges of a growing population who are wishing to both play sport (competitive and training) together with those who are keen to use sport as a means to stay fit, the pressure on local community sports fields continues to grow. With that pressure on natural turf the fields are having to cope with more people, many playing modified versions of the sport, such as 5-a-side Football; AFL 9's; Touch Rugby; Viva Rugby; Hockey 5's to name but a few, which means a further intensity than a normal 22 players on a football field, now having to cope with 80 plus playing 5-a-side.

Photo 5: Multi-sport field designed for local parks to encourage play and recreation

5.1.1 The Challenges

In addition, all levels of government encouraging children to play sport and recreate is increasing daytime and weekend usage. So how can the natural turf really cope with the demand?

Not forgetting the changes in weather patterns with some states having more rain then they can remember, or indeed droughts are becoming more common.

In 2007 the Victorian Government, Municipal Associations of Victoria and others published 'Strategies for Managing Sports Surfaces in a Drier Climate' on how to deal with the management of sports fields in drought conditions. Whether that is too little rain, or indeed too much rain, how can sport and local government ensure that they have the right technology to support to the level of discussed usage?

If the challenge for local government, education and sport surrounding how can their natural surfaces cope with the additional intensity of recreation, training and matches. What are these options?

5.1.2 Informing the Decision-Making Process

To make the decision on the type of surface that will be needed for a specific project there are a number of variable that need to be considered.

In essence, a field should be considered not only by itself but as part of the network it is part of, whether that be by sport or indeed by geographical region as many times reworking of the programming of fields can allow the teams to play on non-home fields to rest them during the week so that matches can be played at weekends.

The most common decision-making points are based around:

- Playing capacity

What are the needs of the community to satisfy demand? What type of synthetic or hybrid surface together with the current facilities should be planned for the future to meet the growing demand?

- Standards of play

Is there a specific standard for the level of sport that is linked to the International Sports Federation or National Sports Organisation that the sport or clients wishes to have in place? (e.g. Hockey, Athletics, and Netball are not keen to play on natural grass)

- Economic considerations

What can be afforded at the capital installation time, the recurring budget costs of maintenance and the replacement costs, also to consider the revenue strategy opportunities to offset the budget costs?

- Technical consideration

What are the technical aspects that will need to be considered to achieve the previous three decision making points?

- Strategic alignment

How does the suggested decision align with key strategic and policies of the purchaser and the key stakeholders?

- Environmental benefits

What are the environmental benefits to environment for the various options to assist with the decision-making point, from Green Engineering best practice, water sustainability, to installation methods, management sustainability and impact on the environmental footprint?

5.2 Overview of Sports Surfaces

There are a considerable number of sports surfaces to choose from and depending on the sport and level of play that should influence the preferred options. To provide an overview the following are summarised:

5.2.1 Natural Surfaces

- Grass – many large ball and small ball sports

Many outdoor sports are played on natural grass including the football codes of Rugby Union, Rugby League, Australian Rules Football and Soccer and continue to have the majority of their games on grass globally. Tennis plays on grass (and other surfaces), local hockey and athletics has been known to use grass for lower level competition and training.

There are different types of natural grass, designed for different durability, weather types and resilience levels and this is addressed in Section 2, Natural Turf Fields.

- Sand / Clay

Tennis utilises the clay tennis courts as this remains one of the Grand Slam surfaces and is embraced by many international tennis federations as a good surface to develop skills at the highest levels.

5.2.2 Hybrid and Stabilised Turf

Many of the top stadiums around the world are now using an integrated synthetic system with their natural grass, including the MCG and Etihad in Melbourne; Dunedin and Forsyth Barr Stadium in New Zealand, as well as nine Premier Football League club grounds in the UK.

Integrating natural turf with synthetic root reinforcement systems allows for the natural grass to be reinforced below the ground to a depth of 200mm. This has provided up to twice the normal usage patterns according to the sales literature of the Australian distributor. The combination of fibrillated synthetic turf and natural turf allows the natural grass roots to become entwined in the matrixes web of synthetic yarn, growing downwards through a plastic mesh and into the foundation material, providing a stabilised solution for stadiums. See Figure 6 for a local Australian example with Melbourne City's training ground.

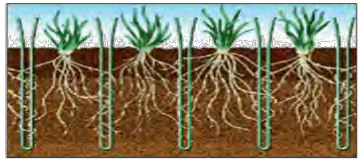


Figure 6: Cross Section of Desso Grassmaster Reinforced natural grass (Source: www.hgturf.com.au)

The predominantly sand filled layer provides an excellent growing environment for the natural turf with the durability of synthetic grass. As one supplier's marketing material states, "The plant's roots, crowns, rhizomes and stolons that grow within the stabilised zone are shielded from wear damage, extending the field's playability and accelerating turf recuperation following regional use.

Shear damage and compression displacement become a thing of the past. As with traditional natural turf grass fields, groundsmen managing this (product) are encouraged to practice the essential turf maintenance strategies of aeration, topdressing and scarifying.

Key aspects of this stabilised system include:

1. The natural turf grass blades reside above the tops of the synthetic tufts creating a fully natural grass surface. If the turf canopy is worn away, the sand-filled synthetic matrix continues to provide a consistent, sure-footed playing field;
2. The grass roots become entwined in the matrix of synthetic tufts and, unimpeded, grow downward through the plastic mesh and into the foundation material below;
3. The predominantly sand fill layer is selected to be compatible with the site's foundation material, minimising the potential for layering and assuring high water infiltration rates through the turf; and
4. The tough plastic mesh immediately below the vertical fibres acts as the anchor for the components above it and provides additional horizontal subsurface load bearing capacity.

5.2.3 Synthetic Sports Surfaces

There are a number of synthetic sports surfaces that are chosen for sport, including:

- Woven Carpet – Bowls

This type of playing surface is flexible in its use and resembles a woven carpet that you can either roll out or place over an existing hard surface in large rolls. Generally, this type of carpet is used for competitive and local use and by many is regarded as the best surface for bowls.

Photo 6: Lawn Bowls have been using synthetic surfaces since the 1970's

- Turf Carpet – Limited infill of sand or rubber

Short pile carpet is increasingly being used as a safer, more attractive and visually stimulating alternative to asphalt in many schools and community areas. It can be laid in different colours, line markings and patterns and suits the needs of multipurpose areas. The short pile turf offers a safer and more aesthetically pleasing and cooler option to asphalt, however it can be warmer in the sun than natural grass turf. Carpet is usually a woven 'carpet-like' synthetic surface that may not require any or only a limited infill, the pile height is always very short, and the fibres are quite coarse, "brush-like" and sturdy.

Photo 7: Multi-games area, used for schools and local parklands

There is a range of carpet types including; monofilaments (single blades) based on various yarn types, fibrillated (grass with a lattice structure), and fine fibrillated (finer perforations compared to general fibrillated turf). Non-directional characteristics are introduced by texturised (yarn passed through a heated texturiser that crimps the yarn) or the knit de knit process.

Due to the multi-purpose nature of short pile carpets they are generally only used at schools, playgrounds and for other community level purposes and therefore the standards may be limited as competitive sports are not played on them.

- Artificial Clay – Tennis

Artificial clay is a synthetic surface with the appearance and performance of clay, commonly known as en-tout-cas, which combines synthetic carpet and specifically graded coloured sand and reduces the need for constant watering. It is increasingly being used to replace existing clay-based tennis courts. This is now the preferred tennis surface because of its durability, playability and the fact that there is no need for water on this surface for it to play comparably to clay.

Tennis is one of only a few sports that have an official specification on the use of clay playing surfaces.

Photo 8: Artificial Clay Surface – Greensborough Vic (Source: TigerTurf)

- Acrylic Varieties – Many Sports

Acrylic surface coated layer set onto rubber pad is used for a variety of sports. Generally, the surface will sit at 5mm – 15mm off of the base/ground and can vary from one 5mm rubber pad all the way to many layers of shock absorbing rubber layers below an acrylic surface. Acrylic surfaces generally expel water quite quickly so there is no need to dry or even cease play if the surface gets wet from rain. The acrylic surface layer itself is very durable, all weather and UV resistant, making it resistant to degradation. It can range from the more economical hard-court coating to the high performance cushioned coating discussed above. Players benefit from the quality traction and shock absorbent nature of the playing surface. Ideal for clubs, schools and community level use.

Due to the multi-purpose nature of acrylic surfaces they are generally only used at schools, playgrounds and for other community level purposes and therefore the standards may differ depending on the specific purpose.

- Cushioned Hard Court

Cushioned hard court is a specially constructed 'cushioned acrylic' hard court surface designed to increase shock absorption in the court itself and reduce players' foot and leg fatigue. Unlike other cushioning systems, it provides a firm and uniform surface. This prevents the subtle fatigue caused by playing on a soft, spongy surface. This type of surface has been used at the Australian Open, the Medibank International, the Adelaide International and the Hopman Cup.

Photo 9: Cushion hard court – indoors (New Zealand)

This type of surface is normally a series of flexible layers installed in liquid form on site that contain rubber and acrylic particles. The multiple cushion layers are installed prior to the top surfacing system.

Ball bounce and speed are affected by this surface by the function of the surface finish (e.g. aggregate selection and density). Users can continue to gain all the benefits of this surface with the added comfort of the elastic layers.

There are two standards of competition grade cushioned hard court: 'tournament' specifications and 'prestige' specifications - the only difference being the under-base. The prestige system has been chosen by Tennis Australia as the playing surface for the Australian Open series. The International Tennis Federation (ITF) pace rating classification ensures that the court speed is within the guidelines needed.

This surface would also be good for netball as opposed to the asphalt that is often chosen.

- Synthetic Sports Turf – Long Pile – Football Codes

Long pile turf has long blades of fibre similar to natural turf playing surfaces. The long grass fibres (40mm – 70mm in length) allow for a greater amount of infill to be integrated into the pitch, adding to the shock absorbency and force reduction characteristics of the ground. These fibres can be monofilament (single fibre) or fibrillated filament yarn (brush-like at the tip) or indeed now the latest thinking is a combined field that allows the two yarn types to integrate.

The pitch infill normally comprises a performance infill and shock absorbing and cushioning surface emulating the performance characteristics we come to expect from a natural turf pitch. Some sports such as rugby also need to have a shock absorbing cushion system under the 'turf', and this may be stipulated. Indeed, Smart Connection Consultancy recommends a shock pad on all performance fields.

Photo 10: Blackman Park, Lane Cove for Rugby Union, AFL, Football and Cricket

A synthetic turf pitch provides the player with a sure-footed and consistent playing surface that is free from bumps, hollows and imperfections whilst being unaffected by the sun and rain. There is a standard of turf available for most levels of sporting competitions, including:

- Australian Rules Football – AFL
- Football (soccer) – FIFA
- Cricket – Cricket Australia
- Rugby (union and league) – World Rugby and NRL

- Synthetic Sports Turf - Hockey Turf

Hockey preferred surface is to use a synthetic surface and the types that are generally used for the Game depending upon the level of play.

From these hockey performance standards, the manufacturers have developed synthetic hockey systems that meet the above standards and have flexibility of use whilst offering affordable options. These include:

i) Sand-Filled Surfaces

The carpet has yarn tufted with sand infill close to the top of the yarn to keep it standing vertically. The yarn is normally 25mm-40mm in length and has significant amount of sand within the carpet. There is no need for water on this surface. The sand is normally a silica rounded sand, ensuring limited compaction and provides a safer surface if players fall. It also allows for good drainage. These surfaces can only achieve the FIH National Standard, or the Multi-Sports Standards. These fields are normally 'slow-playing' compared to the more up-to-date hybrid or water-based fields.

ii) Sand-Dressed Surfaces / Hybrid Surface

It has a shorter pile height (12-25mm) with significant less sand infill compared to a sand-filled carpet and often has irrigation so that the fields can 'run faster'. Overall a 'dry' quality sand-dressed or hybrid surface can achieve more than 95% of the FIH Global Standard performance criteria and with the water added the majority should be achievable.

Photo 11: Sand Dressed Hybrid Hockey Surface – National Standard

The logic of sand-dressed is that it does not need as much water, which in many climates is a big benefit. It can never be classed as a 'Global' standard, as this is only available presently for water-based fields. Compared to the sand-filled option, you do not see the sand on a quality hybrid surface.

iii) Non-Filled Water Based Pitch

The Global Standard is the chosen standard that the majority of competitive hockey players aspire to, due to the speed of the ball and therefore the game. The pitch is best when watered and normally holds 5-8mm of water equally over the playing field surface. The water-based fields need to ensure that the extent of fall from middle to ends/sides is less than 0.2% so that the water does not 'dry out' the middle.

Photo 12: Global Hockey Field (Source: Polytan)

iv) Hockey – Multi-sport Long Grass Turf

Predominantly used for large ball games, such as Rugby, Soccer, AFL, Gridiron etc. it can still be used for Hockey, although it only offers playing characteristics similar to those of a natural grass field. One of the most important aspects is the speed of the ball on the surface. This normally only achieves the Multi-Sport Standard although some have achieved the National Standard (e.g. ANU Canberra).

By comparison it would be expected on a water-based (Global) field that the ball roll performance criteria are greater than 10m, on a hybrid (National Standard) it would be greater than 8m and for a multi-sport long (or 3G) grass it would be greater than 5m.

The sand-dressed and sand-filled fields provide a multi-sports opportunity with them being used for tennis, netball, 5-a-side football etc. but the non-filled water fields if not watered may offer challenges including:

- Greater risk of injury to players, due to no fill and hardness and dryness of the surface;
- Reduced consistency of playability;
- Greater wear and tear on yarn, which could reduce the life of the yarn and field; and
- Pitch surface temperature rise quicker than with a wet surface.

Photo 13: Water-based Hockey field - South Australia Hockey Centre (Source: TEAM Sports)

5.3 Conclusion

The challenges facing both sport and government is around satisfying the growing demand, as the population continues to grow. Embracing the synthetic sports surface technology around single sport, multi-sport, recreational and elite surfaces allows for increased usage.

There are a range of technological solutions that meet the majority of play, recreational and sporting needs. This is reflected in the number of schools who are embracing the technology to replace asphalt and seeing the results of a growing number of children enjoying playing on the new surface.

Multi-use sports or Active Sports Zones are now becoming more and more popular for encouraging casual sports recreation by combining facilities where many sports can be played locally such as 5-a-side, basketball, netball, cricket etc.

SECTION 6: HYBRID SPORTS TURF SYSTEMS

This section provides Council with an explanation of the technology and how it is being embraced by local government to expand the playing capacity of community fields.

6. HYBRID SPORTS TURF SYSTEMS

6.1 Introduction

6.1.1 Evolution from Natural Sports Turf

Historically, in some regions natural grass sports fields by half way through the winter season reflected a mud bowl, which with the rain, lack of sunlight and intense usage continued to be degraded. In some regions of Australia, the lack of rain turns the playing fields into dust bowls. Both impacting negatively on local sport and the benefits sports brings to local communities.

Over the past twenty years, better understanding and management of natural grass, growing medium and improved drainage techniques and systems have made significant improvements to playing surface standards. The understanding of natural turf and its limitations has encouraged the use of advanced technology to support its management. This has meant that many fields have been able to sustain greater playing capacity.

In the past five years more than 100 third generation long pile synthetic sports fields have been installed in Australia to assist in the growing population needs to meet demand.

Many councils and sport are seeking alternative technology solutions from natural and synthetic fields. Many wish to support a more natural solution and have sought information regarding hybrid solutions, integrating natural turf and synthetic technology. This resulted in the development of what is commonly referred to as hybrid technology. This paper explores what does this mean and what options do both stadia and community grounds really have.

6.1.2 What is Hybrid Sports Turf?

Hybrid turf simply is the combining of natural turf grass elements with the synthetic fibres into a single sports turf system.

Forms of 'hybrid turf systems' have been around for over 20 years, particularly in Europe and many of these fields now offer increased stability, increased load bearing, increased root anchorage and both agronomic and playability performance.

There are predominantly four types of synthetic elements used to enhance natural fields of play, including:

- ***Filled Carpet System*** – where a carpet backing, similar to synthetic turf backing; supports the fibres which are infilled with various growing mediums in which the natural turf is grown.
- ***Fibre System*** – where various types of synthetic fibre and elastic material are mixed into the soil or growing medium homogenously and into which the natural grass is grown, providing root stability within the growing medium (e.g. sand or soil).
- ***Mesh -based System*** – where either a mesh or shredded mesh is mixed into or placed in-situ into the root zone area, where the grass will grow.
- ***Stitched Systems*** – where synthetic fibres are injected or stitched into the surface, not attached to any backing, with some of the synthetic fibre (20mm) standing proud of the pitch, with the natural grass growing between the fibres.

6.2 Types of Systems

6.2.1 Filled Carpet / Ready to Play Systems

The filled carpet system can be 'built' into the field of play or at a nursery and then brought into the field.

The best outcome construction of the field/system involves the conventional construction of a suspended water table field and the installation of a synthetic grass carpet at the surface layer.

Carpet systems can be incorporated into existing grounds or place on sand carpeted fields; however, some of the drainage performance may be restricted and would have to be evaluated on a case by case basis.

The carpet is filled with a growing medium, which could include sand, soil, organic components, to best allow the natural grass to grow in the local environment.

Some hybrid carpet backings are designed to partially biodegrade over time (approx. 8 weeks) allowing the roots an open zone to grow down into the lower profile layer thus creating a very stable system that performs as one. These systems can be retrofitted into current playing fields, or can be pre-grown externally and installed as a ready to play solution.

Photo 3: xxx

The finished surface presents itself as a mixture of grass fibres and natural grass.

6.2.1.1 Advantages

- Quick to install
- Increased stability of surface and root zone
- Increase playing capacity up to 30-35 hours usage per week
- 15-year life expectancy and can possibly be recycled at its end of use
- Good for community and higher use sports fields than traditional grass due to its durable and robust construction
- Aesthetically provides partially green surface, once natural grass cover gone
- Meets FIFA stands for synthetic turf even without the presence of natural grass

6.2.1.2 Disadvantages

- Increased maintenance compared to non-reinforced field to manage thatch levels and keep the fibres interacting with the surface
- On high use fields, or where not maintained well the synthetic yarn can get buried under the growing medium
- Specialist installation and annual renovation needed
- Cannot be installed after grass is grown

Many global stadiums have installed these type of hybrid surfaces and in Australia that includes AAMI Park and several stadia in New Zealand.

At a local community level, carpet type hybrid turf installations completed in Australia are in high wear areas, goal squares, centre bounces, soccer boxes, linesman runs and cricket run-ups.

Photo 14: High Wear Area example of embracing hybrid technology

HG Sports Turf has completed works using XtraGrass Hybrid Turf for a number of councils including:

- Casey Council – Casey Fields
- Monash Council – Brandon Park
- Hume City Council – John Ilhan Reserve
- Bayside Council – Dendy Park
- City of Port Phillip – Wattie Watson Reserve
- Whitehorse Council – Mont Albert Reserve
- City of Wyndham – Galvin Park
- Alexandra Football Club
- Carton FC – Ikon Park

There are many other installations planned with a number of full fields in the planning stages. In 2016 HG Sports Turf will install the first two Carpet Hybrid Fields in the region for Auckland Council, NZ.

Currently XtraGrass Hybrid Turf and Hero Hybrid Turf are available to the Australian market. Other systems available in Europe and possible soon to Australia include; Extreme Hybrid Grass (ACT Global), Mixto Hybrid Grass (Limonta – GreenPlay Australia), Desso PlayMaster Hybrid Turf.

Photo 15: Hybrid carpet – Mixto by Limonta – www.mixtoastarn.com

6.2.2 Fibre System/Netting Systems

The fibre over netting systems really focuses on root stabilisation, with the growing medium having a mix of polypropylene, polyethylene and in some cases natural fibres with the netting system placed with the upper sod root zone. The interlocking fibres with the growing medium create a reinforced matrix. Specialise installation is required.

6.2.2.1 Advantages

- Quick to install
- Increased stability to root zone and therefore surface
- Increased playing capacity
- Can be re-grassed
- Good for community fields

6.2.2.2 Disadvantages

- Increased maintenance compared to natural turf
- Intensive renovation at end of winter season
- Reinforcement cannot be installed after grass growing
- No green covering when natural grass lost
- Surface not as stable as other hybrid/root reinforced systems and seed growth needs to allow roots to penetrate fibrous system
- The stability of the surface is reliant on the presence of the natural grass and its health condition. If the grass cover is lost or pest/disease weakens the natural grass and roots this system can have significant problems.

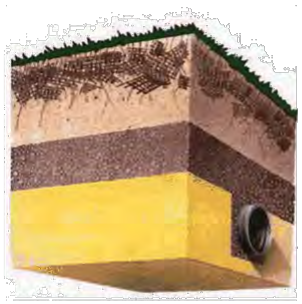


Photo 16: StrathAyr ReFlex Mesh Hybrid Sports Turf Technology

Typical Systems in Australia

- StaLok Evergreen
- Netlon – Evergreen
- ReFlex Mesh - Strethair
- Matrix - Evergreen
- Transformer – Pitchcraft

6.2.3 Stitched Systems

The stitched systems involve the injection of fibres into the surface which are approximately 20mm proud of the growing medium (sand, soil etc.) with the synthetic yarn installed to a depth of 180mm below the surface.

Many stadiums globally have this type of system and until recently only Desso with their Grassmaster system was available. Now this patent has run-out, other companies are offering similar technology. The only current field in Australia is Melbourne City's training venue at Latrobe University built by HG Sports Turf.

Photo 17: Desso GrassMaster machine stitching the yarn into the field

From practical experience, the strength, stability and playability backing is significantly better with this option than the fibre/netting system and slightly more than the carpeted system.

6.2.3.1 Advantage

- Increases stability and usage levels
- Protects grass cover with some protection of the growing point of the plant
- Increased traction of surface
- Can be installed with existing fields
- Provides partially green cover when grass lost

6.2.3.2 Disadvantages

- Higher maintenance than natural grass
- Renovations annually after winter season
- Cannot be re-grassed
- Cost
- Struggles to meet the multifunctional needs of Australian Stadiums

Typical examples in Australia:

- Melbourne City FC Elite Training Pitch – La Trobe University
- SIS Grass

6.2.4 Use of Hybrid Systems for Community Fields

Australia and New Zealand have started considering the adoption of hybrid technology for high use 'natural sports fields' for either the whole field or the high use areas.

The high use areas may include goal boxes, half way line, the 'kicking area' straight up and down between the goals or the line ref's areas on the touch line. High use areas and training fields are also being considered to alleviate wear on primary fields.

Photo 18: Lines person running lines being reinforced with hybrid technology

6.3 Maintenance Commitment

The maintenance of a hybrid system is similar to natural grass of sand-based fields with some restrictions in the use of slit aeration methods due to the integrity of the backing.

Annually it would be recommended that the following maintenance is considered:

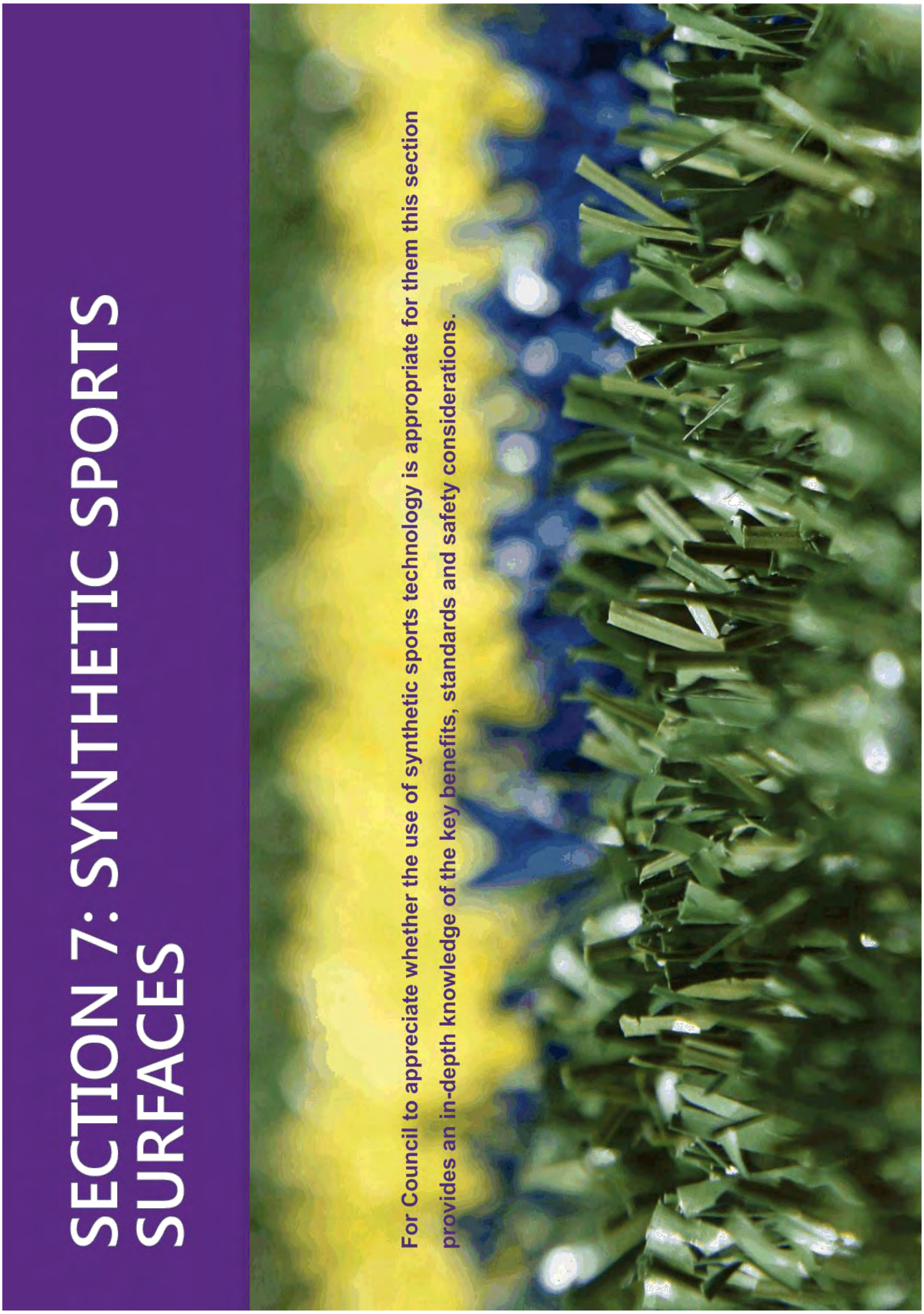
- Fraise mowing – cleaning thatch and organic debris
- Vert cutting 15mm deep – opening surface and release buried fibres
- Top dressing
- Deep aeration with vertidrain
- Fertilization
- Over seeding/Grass re-establishment
- Irrigation and maintenance

6.4 Conclusion

It is a certainty that hybrid turf systems will become adopted more widely across Australia and New Zealand. With ever increasing populations leading to higher demands and increased capacity of usage on sports fields, it is becoming evident that councils and municipalities require a mix of options to satisfy the community needs.

In some cases, community resistance to giving up "green space" in favour of traditional synthetic sports fields have resulted in hybrid turf being chosen as a solution to increase capacity.

The 'hybrid' turf systems allow the fields to be played on from the natural grass systems playing capacity of 20-25 hour to 30–40 hours, but they still need rejuvenation of a summer and rest.


SECTION 7: SYNTHETIC SPORTS SURFACES
For Council to appreciate whether the use of synthetic sports technology is appropriate for them this section provides an in-depth knowledge of the key benefits, standards and safety considerations.

7. SYNTHETIC SPORTS SURFACES

7.1 Overview and Context

7.1.1 History and Evolution

The popularity of synthetic surface technology in sport has been embraced by both community and elite levels over the past five decades, with different reasons for their use and introductions.

The technology has evolved significantly from the first generation carpet that was developed by Monsanto for the Ford Foundation at Moses Brown School, Providence, Rhode Island in 1964. The first major commercial mainstream surface was used in 1966 at the Houston Astrodome in Texas. Key milestones, for their usage over the past 50 years include:

- 1960's

First Generation Turf (1964). A knitted nylon carpet with a foam backing was used for indoor Gridiron, but lacked the sophistication of the present systems.

Photo 19: First Generation Artificial Grass

The first synthetic athletics track was used at the Mexico Olympic Games (1968) and has been the surface of choice since for track and field athletics.

- 1970's

The use of the 1st generation nylon carpets continued in American stadiums where light was too poor for natural grass growth. Although the "turf look" was a positive use of technology, it didn't provide an accurate reflection of natural playing surfaces. The coarseness of the nylon resulted in inconsistent playing conditions and injuries caused the majority of football and baseball surfaces to be replaced with natural grass again.

One sport that did prosper with the use of synthetic turf during this time was hockey. When the synthetic grass was wet the ball played far faster and the game was far more enjoyable. The sport embraced the technology and the first international hockey game using artificial turf was played at McGill University, Canada in 1975. The following year it was show-cased at the Montreal Olympics, where it has been used ever since.

At the turn of the decade there were two schools of thinking around the use of synthetic technology:

i. Performance needs to mirror natural grass – with the use of the 1st generation surfaces needing to perform more closely to natural grass; and

ii. Performance enhanced surfaces – with IAAF (athletics) choosing the rubber tracks and FIH (hockey) choosing technology to improve the performance of natural surfaces.

These opposing viewpoints can still be seen 40 years on when we compare how sports have embraced the use of technology.

- 1980's

The 2nd generation synthetic turf was developed to look and feel like grass, with the soil replaced with sand and the blades of grass replaced with 20-35mm tightly packed polypropylene yarn. This was softer than the nylon on players' skin, but when combined with sand, created some challenges:

- Playability – the sand infill and yarn combination didn't let the large ball used for football (soccer) have the same playing characteristics as on natural turf. It bounced unpredictably, and the roll was far faster; and

- Safety – the friction on skin was significant and caused 'skin burns' which then developed into wounds if not treated.

The durability for community football pitches (5-a-side facilities) was excellent and allowed many more people to play the game. As 5-a-side in the United Kingdom has larger participation rates than 11-a-side this was a positive outcome.

Four United Kingdom professional football clubs invested in synthetic turf in the 1980's, including Queens Park Rangers (Loftus Road), Luton Town (Kenilworth Road) and Oldham Athletics (Bonding Park).

Hockey continued to embrace the technology with most major competitions being played on synthetic watered turf.

Photo 20: 2nd Generation Synthetic Turf (source: Cranfield University www.cranfield.ac.uk)

At the end of the decade the European governing body for soccer EUFA ruled that professional level games should not be played on synthetic turf.

- 1990's

The major manufacturers of synthetic turf understood the benefits to community and elite sport that the technology could offer, but could not convince the world sports' governing bodies by themselves.

The peak body with the most interest in the 1990's was FIFA for football (soccer) and they made it clear that the playability and performance needed to reflect the standards of natural turf.

The 3rd generation (3G) synthetic turf was born using a different and more holistic approach in Europe and America. After much research, the end of the 1990's saw a new generation turf, using a softer yarn, polyethylene, with rubber granules and sand now used more as ballast rather than the key component of the infill. This allowed the surface to take a normal stud, which convinced the rugby codes, AFL and cricket to try this 3rd generation, joining football and gridiron.

- 2000's

The last decade saw the defining period for the use and adoption of synthetic technology, with many sports embracing the benefits. Many of the sports peak bodies:

- Developed standards for elite and/or community pitch performance, including football (FIFA), rugby union (World Rugby), hockey (FIH), bowls (WB), athletics (IAAF), Australian rules football (AFL) and tennis (ITF);
- Introduced an accreditation scheme for suppliers and/or products;
- Changed the rules of the game so that players could compete on the surfaces including: Football (FIFA), Rugby Union (World Rugby), Bowls and Australian Rules (AFL);
- Ensured that pitches were tested regularly to meet the standards; and
- Promoted the use of the technology to grow participation in the game.

- 2010's

In this decade we have seen the systems become more sophisticated and the research has been embraced around the science of the issues affecting the play, including:

- Multi-sport – so that more than a single code can be played, including the football codes of soccer, union, league, Aussie rules all being played on a single surface;
- Durability – the technology has developed to allow more hours and intensity of usage; and
- Environmental considerations – removal of heavy metals; increased usage of virgin rubber and organic material and attempting to address the heat issue.

7.1.2 Benefits and Challenges

The main reasons given for installing a synthetic surface for sport and recreational use are:

- **Climatic**: Under drought and water restrictions or excessive rain conditions, it can be difficult to maintain a safe and suitable natural grass surface. Synthetic sports surfaces in general are not affected by the reduced or increased rainfall;
- **Usage**: There is a limit to the hour's natural turf can be used before there is a significant impact on surface condition. A high quality natural turf surface may only withstand use for up to 20 hours[14] per week before it starts to deteriorate. Synthetic surfaces can sustain significantly higher use than natural grass with 60 hours[15] plus per week as an acceptable expectation;
- **Maintenance**: Maintaining a turf surface can be time consuming, expensive and generally requires a qualified person to do it. Synthetic surfaces require lower ongoing maintenance than a natural turf surface;
- **Consistency and quality of play**: Synthetic surfaces provide a consistent and safe surface all year around for all sports to play on, improving the quality of performance for each sport compared with natural playing surfaces;
- **Mandated**: some sports governing bodies insist that if a particular level of game is played, it has to be on a particular level of synthetic surface (e.g. Athletics and hockey fields etc.).

7.1.3 Negative Perceptions

There is a significant lack of understanding about the technology, with some community groups expressing concern around how the technology is made, managed and/or how it integrates into the local environment. The major concerns include:

- Environmental integration – whether there is a negative impact on the environment (e.g. leaching)
- Player comfort and safety – for injuries, overall safety and impact between the surface and the player

7.2 Synthetic Sports Turf System

7.2.1 Introduction

The quality of performance of the playing surface is influenced by the components that make up the overall synthetic sports turf system. All of these components are as important as each other, with the civil engineered solution for the pavement and drainage probably more important than any other aspect longer term.

The 'system', as it is commonly referred to, consists of the pavement, base and drainage solution which the performance surface sits upon. The performance grass system which has the synthetic carpet (yarn, backing and infill) as well as the shockpad.

7.2.2 Synthetic Turf Yarn

The synthetic turf aspect of the system has yarn that is developed through an extrusion process from a combination of polymers to provide either a softer polyethylene based fibre or a slightly harder polypropylene fibre. The first generation was made from nylon (polyamide) yarn, which was prone to friction burns due to its coarse nature.

The current manufacturing process produces one of two forms of yarn, a monofilament single thread of yarn or a slit-film tape, commonly known as fibrillated yarn. The process for both types of yarn includes taking the raw materials, namely the polyethylene polymer (which is almost exclusively used for long grass fields) with the colour and melting them in an extruder.

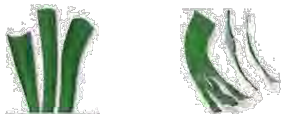


Photo 21: Example of Mono-filament and Fibrillated Tape (Source: FieldTurf)

The melted and coloured material is then either pushed through a spinneret (similar to a thick spaghetti maker) to the shape of the monofilament and then cooled, or formed into a film, cooled and then perforated in a fibrillated tape.

[14] As quoted by Keith McAuliffe, Sports Turf Institute in conference 2011 before deterioration of turf on average in Australia

15 FIFA consultant at NSSCE Conference in Sydney quoted 60 hours per week as their expectations in Europe

Photo 22: Extrusion Process producing mono-filament yarn

The mix of polymers follows the above process. The formulas of the polymers are a proprietary intellectual property of the yarn manufactures as they strive for the right balance between fibre rigidity (to keep the fibre upright) and softness, for feel and skin/player interaction.

The key variables that need to be considered with the yarn include:

UV Resistance

As Australia has one of the most aggressive climates with one of the highest UV levels in the world, it has a direct impact on the longevity of the synthetic turf system. The yarn should be provided with a warrantee against UV. Some cheaper yarns that are being imported into Australia may not have been tested to the appropriate levels needed, and this should be considered. The UV stabilisation is a big part of the yarn cost and is tested using a QUV machine that exposes the yarn to high levels of artificial UV light and combined with artificial weathering (heat, light, rain etc.) simulates eight years of exposure. This now involves 5,000 hours of testing.

The Australian standard that the surface needs to adhere to is AS2001-4: B02-2001, for minimal UV degradation.

Colour Fastness

Extensive weathering such as heat, rain and wind can impact on the colour fastness of the pigments in the yarn. When combined with intensive play, the pigments, if not stabilised with the yarns' polymers, can cause accelerated breakdown. In some earlier yarns (pre-2002) the use of heavy lead pigments (e.g. lead chromate) were used. The key manufacturers in the late 1990's embraced the EU Packaging Directive removing heavy metals from recycled plastic packaging products (1994). Some cheaper imported products may not have embraced these standards. It is important that any purchaser of synthetic surfaces ensures that this is adhered to by the supplier.

The Australian standard for colour fastness in artificial light, which can be used to test the colour fastness, is AS2001-4 BO2-2001 which also addresses the minimum UV degradation.

The safety of the colour pigment is not addressed by any Australian standard and the European DIN standard 18035 states that the levels should be:

Heavy Metal	Acceptable Level	Units
Lead	<0.04	mg/L
Cadmium	<0.0005	mg/L
Chrome Total	<0.05	mg/L
Mercury	<0.001	mg/L
Zinc	<3.0	mg/L

Table 6: Acceptable heavy metal levels (source: DIN 18035)

Length of Yarn

The length of the yarn is determined by the purpose of use, whether that is 11mm for hockey, 60mm for rugby union or 220mm for synthetic horse racing tracks. Some sports determine the length of the yarn (e.g. Rugby Union at 60mm minimum) while others focus on the performance outcomes only.

Sport	Normal Range
Bowls	10mm - 15mm
Football (11-a-side)	40mm - 65mm
Football (5-a-side)	20mm - 65mm
Rugby League	40mm - 65mm
Rugby Union	60mm minimum
Tennis	10mm - 25mm
Australian Rules	40mm - 65mm
Hockey	10mm - 45mm
Cricket Wicket	9mm - 12mm

Table 7: Example of yarn height ranges for each sport

From experience we have found that with a football field with a 40mm or 45mm yarn the dispersement of the infill being 'kicked out', has meant that the infill 'disappears' down to the sand quickly. So, we would suggest a minimum of 50mm length for ball sports.

Thickness of Yarn

There is balance between the thickness of the yarn, which may assist with its ability to remain standing and the softeners of a slightly thinner yarn. Over the years, manufacturers have tried many sorts of yarn types to optimise the balance of thickness and softness to polymers.

Yarn Extrusion Options

When the yarn is extruded, there are normally five (5) broad options:

- ***Monofilament fibre*** – a single length or blade which tries to replicate that of a single blade of natural grass. A grass with this yarn would normally have a greater amount per square metre. It is also renowned for staying upright longer and being more durable.
- ***Fibrillated yarn*** – the yarn is produced in a sheet (slit-film sheet) then cut to the width desired, so the texture has more uniformity than the single blade of the mono-filament yarn with the superior turf bind and economies of a fibrillated yarn.
- ***Hybrid system*** – some manufacturers are offering a combined yarn system that offers the aesthetics and durability of a monofilament yarn with the superior tuft bind and economies of a fibrillated yarn.
- ***Knit-de-knit*** – straight yarn that is given the tight curly appearance for hockey pitches, producing a non-directional surface.
- ***Texturised*** - straight yarn that is heat-set to produce a tight curly appearance which is non-directional to meet the needs of hockey. This approach is also used for the "thatch" part of the 'grass-system' mainly for landscape grass, reducing the need for infill.

Cooler Grass Technology

Most of the manufacturers have a proprietary approach to the reduction the heat retention in the yarn, some claim by 20-30%. This is worth considering when purchasing. It is always worth considering the question 20-30 percent of what? This reduction normally occurs because the polymers in the yarn are able to reflect infrared and dissipate heat into the atmosphere, as opposed to absorbing them into the yarn.

Pile weight/Density

Identifying the quality of yarn within a square meter, using the number of stitches and the gauge manufacture. As a rule, the tighter the pile, the higher the price. The linear density is a measure of the weight of the yarn, and is referred to as the 'Denier'.

7.2.3 The Backing

The backing material is critical as it holds the tufted or woven yarn in place but also needs to be durable enough to hold the field in place, so there is no shrinkage or expansion. It is also critical for connecting each roll of grass on the field, allowing water to pass through the surface.

The tufted yarn option is predominantly tufted through the backing and the yarn needs to have a coating or glue type bonding agent so that the tufts cannot be easily moved or pulled out.

The most commonly used coating is a polyurethane bonding agent, due to its superior water resistance. Latex, thermo-plastic coatings, natural rubber and other bonding agents can also be used. The porosity of the backing is normally achieved in one of two ways; either using a heat soldering hole and puncturing across the roll of grass, or having the polyurethane backing only attributed to the yarn tufted areas and the space in between the tufts is therefore more porous.

The majority of carpet backing is double backed with the 'second backing' sprayed on to seal the carpet tufts. Some manufacturers only 'seal' the turf and gauge, leaving the space between not double sealed, allowing for greater water porosity. These pictures below provide an understanding of the two key options.

The water porosity through the carpet backing must be achieved for the key sports. For instance, in football (soccer) the FIFA guidelines are 180ml per hour. In rugby union the World Rugby guideline is 500ml per hour, whilst Australian Rules (AFL) is 200ml. Smart Connection Consultancy recommends all pitches should have a porosity rate of 500ml per hour. It's important to design drainage rates to cope with this.

Photo 23: Examples of Backing Surfaces

7.2.4 Carpet Seams and Joining

The carpet is normally created on rolls of 3.2m – 4.5m in width and these are laid width wise across the field. The 'straight lines' are normally integrated when woven and the circular lines laid at installation.

Any other straight seams are usually secured by sewing or using an adhesive, depending upon the manufacturer's system. The important point is that the carpet should be seamless and have a maximum possible joint strength.

The adhesives used should be proven in Australia and are not considered volatile in adverse weather conditions (e.g. heat, rain, wind, humidity etc.).

Photo 24: Example of seam failure

7.2.5 Infill

The infill within the 3G long grass synthetic turf aims to provide a consistency between the ball, player and surface interaction that allows the synthetic system to perform to the required standards set by each sport (e.g. FIFA, World Rugby etc.).

There are a number of aspects that need to be considered when choosing the most appropriate infill for a sports field including:

- The type of infill for the surface;
- The depth and height of the infill compared to the yarn, and
- The amount of infill per metre^2.

Purpose of Infill

The infill, or lack of it, is needed to assist the performance of the whole synthetic grass system, which ensures that the infill plays a similar role as the soil in natural grass fields. The different types of grass surfaces that are commonly categorised are as follows:

1) Unfilled

Although the first nylon pitches in the 1960's were unfilled, the pitch systems are far more sophisticated now-a-days. Water is used; predominantly for hockey's premium standard – global. Water is applied through an irrigation system immediately prior to play, increasing the speed of the ball interaction with the surface. Technology is now looking for infilled fields that have similar playing conditions as traditional water based pitches. Many are sand dressed instead.

2) Sand-Dressed

Dressed synthetics surfaces aim to add weight to the carpet to keep the denier pile upright while also maintaining the playing standards for hockey. Some football (soccer) 5-a-side/futsal courts use this type of system as it seems to provide a more durable solution to people using flat training shoes.

Photo 25: Example of a mixed profile of sand and rubber infill

3) Filled Fields

The aim of the filling is to replicate the sand or soil profile in a natural pitch where the grass/synthetic yarn is held upright. The filling can be compiled from rubber, sand or organic infill's. The amount of fill is normally determined by the manufacturer, when they consider the length of grass yarn, the performance outcomes, the shock pad & purpose of the field. For instance, rugby union has to be at least 60mm, whilst hockey can be around 11mm.

Type of Infill

Depending on the manufacturers systems, there will always be a choice for the purchaser depending upon the affordability and philosophical standing. Some Local Governments do not like the idea of using recycled types (SBR) due to community perceptions, although these perceptions have been proved unfounded. In terms of sustainability approximately 20,000 recycled tyres are used per 9,000m^2 typical football turf field. In essence there are five types of infill, all offering slightly different options, but with the same outcome, namely the performance standards stipulated by the sport(s). The key options are:

1) Crumbed Rubber (SBR)

This is the most popular infill in the Asia Pacific region, probably due to the cost-effective price point. It is derived from recycled truck tyres that are ground up and recycled. Two types of crumbled rubber are used – ambient and organic. They are both predominantly metal free, and according to the

United States, Synthetic Turf Council's (STC) Guidelines for crumb rubber infill should not contain liberated fibre in the amount that exceeds 0.01 percent of total weight of crumbed rubber.

Recycled and shredded rubber is normally 0.5 - 2mm in size, is the least expensive and still provides the necessary sliding and shock absorbing qualities. The shredding of the rubber is normally completed mechanically. Sifting technology is used to ensure that the dimensions are correct. The benefits are that it is recycled, economical, UV stable and has a long-life span.

Photo 26: Crumbed Rubber (Source: TigerTurf)

The black rubber has, according to the UK's Sport and Play Construction Association's (SAPCA) independent Consultant polymer chemist, Dr Bryon Willoughby, "selected to offer optimum performance in a demanding application which requires strength, fatigue and abrasion resistance". SBR is a general-purpose rubber.

Both the ambient and cryogenically shredded rubber can be coated with obscurants, sealers or anti-microbial substance if required. This approach provides a great aesthetic appeal, but the additional cost may not justify it for may LGA's.

2) Sands

Silica sand is the preference for sports fields due to the rounding of each particle, as opposed to the sharpness of natural sand, as you would find on the beach. This sand is chemically stable, fracture resistant, non-toxic and is rounded.

Photo 27: Silica Sand (Source: www.flexsand.com)

It can be used by itself, as seen in some sites in Victoria and ACT or in combination with rubber or organic infills. It is important that the Silica sand has a high purity of grains of more than 90 percent as recommended by the STC. This sand can also be coated with either a firm or flexible coating which is normally elastomeric or acrylic, forming a coating that allows for different sizes depending on the system's needs.

3) TPE (Thermo Plastic Elastomer) or TPV

This is a new material, which is heated and compressed into grains or various shapes for performance. Once cooled, it retains its new shape, is elastic in nature and can also be recycled. It has a long life and shows durability according to various manufacturers. There does seem to be some question about its suitability in hot climates over 40 degrees and its ability to retain its structural integrity.

This 'virgin plastic' infill is non-toxic, chemically stable, resits fading and is long lasting. It can also provide the benefit of being recycled at the end of the "grasses life". Providing a wide range of colours, TPE is often used in playgrounds, athletic tracks as well as for field infills. It has elastic properties; uniform shape and its virgin rubber and filling provide a high-performance infill option.

4) EPDM Infill (*Ethylene-Propylene-Diene-Rubber*)

This type of infill is produced from a polymer recovered from three monomers: ethylene, propylene and diene. It is manufactured new with options for various colours made to order.

Photo 28: EPDM 'Bionic' infill (Source MILOS)

It is odourless and offers consistent quality. It is often used beside playgrounds and on tracks as well as for performance infill. It is commonly coloured in light colours and provides a significant contrast from the traditional black SBR.

5) Organic Infill

There seems to be some experimentation using organic or natural infill's by a small number of companies. The mix of the organic infill may have a bearing on other considerations. The basic approaches seem to be:

i. **Cork infill** – allowing cork to be stripped from trees (every nine years) then used as a top-up type infill with similar rebound qualities as the larger rubber patches. As it takes on a small amount of water it will not break down as quickly as other organic infills. It is cooler when wet than rubber, stable and retains its shape. The marketing rationale from a key supplier states that it has 12 million air cells per cubic cm. It is the costliest, but an excellent solution.

ii. **Cork/organic infill** – allowing less cork with other plant/organic compounds such as coconut husk etc. There seems to be more concerns about this combination due to:
   - The plant/organic compound breaking down quickly with the typical level of use that Australian LGA's programme their pitches (e.g. 40-60 hours).
   - Additional cost of maintenance due to compaction and possible organic growth with plant substance.
   - Additional cost of continual replacement and top-up.
   - This option, in Australia's climate also needs to be watered regularly as it will turn to dust with the breakdown of the natural fibres.

Some would say this negates the benefits of synthetic turf and a hybrid stabilised turf/grass solution should be considered.

Photo 29: Organic Infill (Source: Limonta)

Future Directions

The European suppliers are promoting a light-coloured EPDM which offers strong shock absorption whilst also ensuring that some of the heat issue is realised. This is yet to be tested in Australia in significant amounts.

Rubber Infill Migration

Rubber infill is lighter than water and also has a tendency to migrate across areas of a field. FIFA raised this as a concern at a recent Australian conference[16] and indicated that they are exploring the options of how this could be stabilised.

Amount of Infill

The amount of infill used in a field will depend on how the manufacturers systems work and against what sports performance standards are chosen. If a shock pad is used, then for the same football codes the yarn length may be as little as 43 mm. In Europe the mix of silica sand and EPDM is being used with a yarn of 43 mm allowing 21 mm for the fibre to be left above the infill with an infill level of around 22 mm.

The important aspects to consider are the structure of infill or square meter and the thickness of the yarn fibres to allow the yarn to stay upright. Our recommendation is that if the field is an open field (i.e. not a stadium) then the minimum height of yarn should be 50 mm.

Photo 30: EPDM (Virgin Rubber) infill allowing around 20mm of grass above the infill

Safety of Infill

There has been community discussion around the environmental and health and safety of some infills, which is covered later. We would recommend that to provide community comfort that the rubbers used are virgin rubbers and have been assessed to EN71.3 (Table 2 Category III) which is Europe's Safety Standard for Toy Ingestion.

There is a move to adopt virgin rubber, so as to move away from the recycled infills, which are the most economical option. The virgin rubbers predominantly add an additional 8-10% to the field project costs.

7.2.6 Shockpad

Shockpad Considerations

The shockpad is an elasticated layer (E-layer) between the base and the synthetic grass carpet. It is used by many suppliers to provide a degree of comfort, meet the sports' requirements for critical fall height and extend the life of the pitch.

The types and thickness of shockpads need to be considered as part of the overall synthetic surface system to ensure that the important requirements of international sports standards, regarding shock absorption, energy restitution and vertical deformation are met. These requirements may not be met with the compaction of rubber infill.

There has been much consideration, opinions and sales propositions put forward as to whether a shockpad for a synthetic grass field for football (soccer, rugby and AFL) is needed. Many experts believe that if the pitch is played on intensively it is unlikely the playing characteristics will meet the sports performance standards over time if there is not a shockpad in place. Due to the youthfulness of the FIFA Quality Concept and the level of retesting that has been completed on pitches, it is hard to ascertain with much certainty the impact of not having a shockpad.

The belief of the majority of Australian suppliers is that a shockpad is critical in the long-term to achieve performance standards. Over the next couple of years, it will be interesting to explore how many FIFA 1 Star pitches have a shock pad that are re-tested and achieve the performance criteria, after four and eight years.

In September 2014 the European Synthetic Turf Organisation (ESTO) which represents the majority of turf manufacturers, produced an information sheet with the following conclusion:

- "When a Football Turf (World name for synthetic football field) system is regularly and adequately maintained all systems (with and without shock pad) did retain an acceptable level of performance; and
- Within the range of tested samples, we see that the systems containing a high-quality shock pad were likely to show less deterioration than the system without a shock pad in cases where the maintenance was not done correctly."[17]

The question therefore, is what needs to be considered when deciding on the type of shock pad, especially if the client feels less confident that they will be able to meet the exact routine maintenance obligations?

There are systems that have longer yarn and a denser rubber infill that provide an excellent case for why a shockpad is not needed. The considerations for when a shockpad is believed to be more important is when:

- The field is being used for high contact sports (e.g. Rugby and AFL)
- There may not be adequate maintenance (1 hour per 30 hours of usage)
- There is going to be intense use with flat soled shoes
- The sport stipulates that it is needed (e.g. Rugby Union)

[17] Press Release – European Synthetic Turf Organisations Recommend Shock Pads for Synthetic Sports Fields, 2014

Types of Shockpad

The types and thickness of shock pads needs to be considered as part of the overall synthetic surface system. This is to ensure that the important requirements of international sports standards regarding shock absorption, energy restitution and vertical deformation are met. There are two kinds of shock pads:

i. Pre-fabricated construction

There are many systems on the market, including roll-out pads, normally up to 5m in width, prefabricated sheets which once laid out can reduce the time of installation. The latest approach to the preformed shock pads is to allow for breathing in the pad for when they expand and contract.

Some shockpads are currently being developed with breathable channels which allow water through easier and trap air, making them cooler (according to the marketing literature). Tests are being held to ascertain the reality of this process.

Photo 31: Prefabricated Shockpad being laid (Source: TEAM Sports)

ii. In-situ construction

This surface infill mix comes in a variation of thickness between 35mm and 10mm and consists of a polyurethane binder mixer combined with rubber crumb (SBR) or shredded rubber (e.g. soles of training shoes). The mix needs to be perfected with the infill for the system to be optimised.

The IRB have stated in their performance standards that "shockpads are preferred" and at a conference in New Zealand[16] said they would recommend a shockpad is used for their fields every time.

Loughborough University (http://sportsurf.lboro.ac.uk) identified that the binder (glue) percentage strength should ideally be between 12 percent and 16 percent when laying shockpads.

Photo 32: In-situ Shockpad being laid (Source: Polytan)

It is likely to conclude what industry experts have been saying for some time; that if a synthetic system does not have a shockpad, the level of maintenance needs to be higher and more consistent. The shockpad is providing more certainty of achieving the performance targets over time, particularly with the higher level of use.

7.2.7 Civil Engineering Pavement

Pavement

It is critical to ensure that the sub-base and pavement is designed by a civil engineering specialist so that it can support the synthetic surface system. The design should be based against data from the locations/field inspections including topographical survey, geotechnical report, drainage study etc. which needs to be completed by a qualified geotechnical engineer.

The focus of the sub-base and pavement base design must be able to achieve the following:

- Support the vehicle load during the construction, maintenance and replacement phases,
- Integrate with the synthetic surface to ensure that the sports' performance criteria are achieved,
- Support the load on the pitch once in use, including players and maintenance machinery to ensure no negative deformation of the surface, and
- Protect the surface from other sub-grade movement or water.

There should be an appropriately deep bore for each of the light towers in addition to the field analysis which typically would be between 8 and 12 bore holes.

7.2.8 Civil Engineered Drainage Solution

Drainage is critical to the success of a synthetic sports field and many key aspects need to be considered before deciding which approach to take, namely a vertical or horizontal solution. The following conditions need to be explored prior to purchase as they could make a significant impact on the design and therefore the cost and success of the system.

- Sports Guidance

All key grass sports stipulate that water must drain through the surface initially. This means that the waste cannot drain horizontally 'on top' of the field, to avoid the pooling of water. Each sport has different performance standards, with regards to the permeability of the system that the turf needs to be able to demonstrate.

- Site Conditions

The site may influence the type of drainage used. If it's being laid on a concrete base, vertical drainage may not be an option, indeed if the soil base is contaminated, it could be better to use a horizontal drainage solution.

A 'storm rate' needs to be calculated, using the statistics for a 25-year reign period from the weather bureau in each state/territory to identify a projected hourly rain-fall. The drainage needs to be able to cope, retain and or discharge at least this level of rain, particularly if it is higher than the standard for that sport.

[16] NZRA Turf Conference (June 2013)

- Flow Conditions

The flow through the base material or drainage cell and the associated pipe work needs to be able to meet the permeability requirements of either the sports standards and/or the site conditions.

Careful evaluation is needed of the drainage approach, normally by a consultant engineer.

- Vertical Drainage Option

The traditional natural-turf drainage system is commonly used for the synthetic surface by using design combinations with 'AG-drains' positioned under the pavement with a permeable base allowing the water under gravity is permeate the ground until it meets the drains.

The pipe work then feed to collector drains and finally to a larger 'storm-water' drain and connect to either a water-harvesting system or the local drainage.

The concern with this type of system is that in laying the AG-drains, there could be significant movement in the base and the compaction post-laying of the drains accuracy is not always successful without some damage.

- Horizontal Drainage Option

A horizontal drainage option is becoming more popular for synthetic sports turf where the pavement as some believe that the use of AG Drains can present problems longer term with movement and cracks.

Photo 33: Example of horizontal drainage cell under shockpad (Source: Wayne Stuart - City of Swan, WA)

The water permeates through the turf/shockpad system either through a drainage cell or by using the drainage channels in a shockpad. Alternatively, the road base can be designed on an angle, so the water can dissipate to drainage around the outside of the field before being taken away.

7.2.9 Playing Capacity

The carrying capacity of synthetic sports fields is comfortable 50+ hours up to 80+ hours per week. The number of hours' play is linked to the level of maintenance. It is recommended that one hour of maintenance is considered for every 10-20 hours of play, depending on the intensity of use for each hour.

If the field will be used intensively and more than 50 hours per week it is worth ensuring that the durability of the Lisport Test is more than the 20,200 requested by FIFA 1 Star Recommended Pitches. We recommend at least 50,200 cycles.

The usage strategy can vary from 20 hours for a traditional stadium up to more than 70 hours per week for a comprehensively programmed facility. The options may include:

- Stadium usage
  Low use, around 20 hours per week for training a couple of hours per day and matches at the weekend. In this case a FIFA 2 Star, FIH Global, RFL Stadium standard pitch could be used.
- Club (medium) usage
  Medium use, around 30 hours per week and used for training (four hours per day) and weekend matches (five hours each day). The usage would indicate a higher durability need than the one identified in the FIFA 2 Star Standard of 5,200 to 20,200 reps (FIFA 1 Star Lisport Test).
- Club/mixed (high) usage
  Integrating week day, evening times and weekend usage for matches allows organisations such as schools and community groups use - approximately 40 hours' usage.
- Mixed (intense) usage
  Starting around 50 hours per week, requires greater durability with usage being opened to coaching sessions, club use and matches. Normally this diversity of use is programmed by the owner to ensure transparency and a rigour in the allocation of times.
- Intense program
  Programming daily (seven hours plus) including weekend games. Many organisations may have usage that includes schools (at a nominal fee), lunch time recreational competitions, coaching sessions, club training and social competitions on weekdays, and matches on a weekend. Typically, a 60-hour week.
- Comprehensive program
  Developing the previous category to around 70 hours or above. There needs to be an enough time built into the program for maintenance at this level.

7.3 Sports Adoption and Standards

7.3.1 Introduction and Context

Many global sports have embraced the use of synthetic sports surface technology for their sports and have developed standards for the sport for fields/surfaces that could be used for community sport and stadium/elite sport. A summary is shown in Table 8 below.

Sport	Elite/Stadium Level	Community Level
• Athletics	Global and Global Elite	National and Multi-sport
• Hockey	Quality Pro	Quality
• Football (soccer)	Regulation 22	Regulation 22
• Rugby Union	Stadia	Community
• AFL/Cricket Aust	N/A	Community

Table 8: Standards for Sports

7.3.2 Laboratory and Field Testing

Most of sports have a process that needs to be followed before a field is certified or accredited against the sports performance standards. This process, which varies with each sport, generally has the following five stages:

Step 1: Manufacturer Agreement

The manufacturer needs to demonstrate to the world governing body of the sport that they have the credentials to produce a field to the correct standards and can provide quality assurance - either under a license (entry level) or preferred provider/producer status (higher levels of quality assurance needed).

Step 2: Laboratory Test

An accredited laboratory identified by the sport's governing body tests a sample product to ensure it performs according to their 'Testing Handbook/Guide'. If the product passes the laboratory tests it can then be used for installation.

Step 3: Pitch/Field Installation

The manufacturer, or one of their licensees will install the product which has been laboratory tested into the field. Once installed and settled (normally around 40 hours/ up to 1 week) it can be tested.

Step 4: Insitu-Field Test

The independent and accredited laboratory on behalf of the sports peak body (e.g. AFL; FIFA; World Rugby; FIH etc.) will test the field against each

performance criteria and ensure that the field installed, matches the system characteristics that the laboratory test 'passed previously'.

Step 5: Certification

The world governing body of the sport will issue a certificate for the playing field/court and this will be relevant for the duration of that certificate, which can vary from: one year (FIFA 2 star); two years (WR, AFL); Three years (FIFA 1 Star); and up to 10 years (Tennis Court Recognition Program).

The Importance of Testing

The importance of having the field tested is linked to 'Achieving Performance' and 'Risk Mitigation'. The key sports have considered both issues. The AFL and Cricket Australia have partnered with JLT Insurance to ensure that only fields that are tested can be used for competition games. In Rugby Union, Regulation 22 states that the field should be re-tested every two years and the local union should ensure that the member unions and the World Rugby are insured against claims.

The benefits of testing:

- Peace of mind that it meets the required standards,
- The durability of the product should last the planned life expectancy,
- There will be reduced risks associated with the system,
- The maintenance is being carried out adequately, and
- The ongoing performance characteristics are being achieved.

7.3.3 Sports Specific Standards

- **Australian Rules Football / Cricket**

As custodian of the game, the AFL has recognised the need to develop ways to increase the carrying capacity of their surfaces and protect them against weather extremes as more people wish to play their sport. This approach should assist in increased participation rates, reduce injuries and allow more people to play more often.

In 2007 the AFL together with Cricket Australia, Sport and Recreation Victoria and Australia's largest public-sector insurance company, JLT Trustees, collaborated with researchers[19] to develop a set of guidelines for community use of synthetic surfaces on which to play Australian Rules Football and cricket. As the majority of Australian Rules Football grounds are also cricket grounds, it was important for any standards to ensure it was suitable for play by both sports.

The study explored the playing characteristics of quality natural turf and developed the performance criteria that the surface needs to play against, including the mechanical properties of the surface, ball and player interactions with the surface, using internationally recognised testing equipment and procedures.

The results of the study enabled a development of standards for Artificial Turf for AFL and Cricket[20] since this time three AFL pitches have been tested, a number of others have been installed where cricket is played on football (soccer pitches), and the same standards are used. In 2013 the standards were updated with a user-friendly handbook[21] for any sport. The handbook 'fine-tuned' the standards, in light of what has been learnt on synthetic turf since 2008.

Regarding cricket, many councils have used synthetic wickets for years and this has historically been covered by soil during the winter months. This often causes safety concerns and reduces the consistency of play where the soil is located. According to Cricket Australia's guidance[22], the wicket should be 25m long and 2.4m wide, and the turf should be between 9 and 11 mm in length.

- Football (soccer)

Football has been played on synthetic grass for a number of decades with the Federation International de Football Association (FIFA) embracing the benefits of synthetic turf allowing more people to play 'The World Game'.

Photo 34: Football Turf has now been laid in more than 75 fields in Australia

The use of synthetic grass surfaces (designated 'Football Turf' by FIFA) over the past 15 years has resulted in the development of performance standards based on quality natural turf performance standards.

To ensure that the quality of football turf was consistent across the globe FIFA developed the FIFA Quality Programme in 2001 and is continually improved with the latest guidelines[23]. These guidelines have been updated and re-issued late 2015.

The FIFA Quality Programme for Artificial Turf is a rigorous test program for football turf that assesses the ball surface interaction, player surface interaction and durability of the product.

FIFA has two categories of performance standards, namely:

FIFA Quality Mark Field – aimed at high surface use for municipal or sports club level field (recommended for more than 20 hours use per week). This was referred to as the FIFA 1 Star previously

FIFA QualityPRO Mark Field – for professional and stadium usage (recommended for less than 20 hours use per week). This was referred to as the FIFA 2 Star previously.

The performance standards measured are the same for both categories, although the acceptable criteria range differs slightly. This allows the FIFA Quality / FIFA 1 Star Recommended field categories, which only has to be tested every three (3) years to have greater latitude (less than 5 percent difference in most categories) to meet the needs of the intensity that a 40 to 60-hour usage pattern would expect.

The re-testing of fields is FIFA Quality Recommended pitch every three years and FIFA Quality Pro Recommended pitch every 12 months.

- **Gridiron / American Football**

In 1969, Franklin Field, University of Pennsylvania switched from grass to artificial turf. Over the past 40 years some of the National Football League (NFL) teams have changed back to natural grass, with some also deciding to reinvest in the latest generation synthetic technology. The University of Pennsylvania is one example that switched from synthetic (2nd generation) to natural grass before reverting to a 3rd generation pitch.

[19] Ballarat University (now Federation University)

[20] Development Standards for the use or Artificial Turf for Australian Football and Cricket (2008 DIW May; L. Otago; N. Saunders; E. Schwarz; University of Ballarat School of Human Movement and Sport Science

[21] Australian Football League and Cricket Australia Handbook of Testing for Synthetic Turf (Sep 2013 www.aflcommunity.com.au)

[22] Reference: Letter to LGA's in Victoria – dated 2010

[23] FIFA Quality Concept for Football Turf – Handbook of Requirements (January 2012)

In Canada all eight stadiums in the Canadian Football League (CFL) use synthetic sports turf.

There are no standards for gridiron / American football except the Clegg Hammer Test which measures hardness. If an organisation was to consider this in Australia / New Zealand, it is recommended they should consider the World Rugby or AFL/Cricket Australia standards, especially due to the critical head fall criteria.

- **Rugby League**

Rugby league in Australia and New Zealand is controlled under their national governing body, namely the National Rugby League (NRL) in Australia and NZRL in New Zealand.

The world governing body for the sport, the Rugby League International Federation (RLIF) is currently reviewing the need for a global approach to synthetic surface governance.

The UK's governing body for rugby league, Rugby Football League (RFL) have embraced the technology and set standards which have been used at both community and stadium/professional level. In June 2014 Australia's NRL publicly launched their new NRL synthetic surface standard.

The NRL standard is identical to the UK's Rugby Football League (RFL) standard, which is based on the European Standard EN 15330-1: Surfaces for Sport Areas has been modified for the specific requirements of Rugby League. The standard takes into account the results of a comprehensive study into the performance of natural grass pitches. Typically, a natural grass-synthetic turf hybrid system called Desso Grassmaster is found in major stadium installations around the world alongside root-stabilized fibre-sand or fibre-elastic natural grass systems.

Recognising that many artificial turf Rugby League pitches will also be used for football or rugby union the NRL standard has been aligned with the requirements for FIFA and World Rugby Regulation 22 wherever possible.

Similar to the FIFA Quality Program the NRL adaption of the RFL's performance standard recognises requirements for community and stadium use. Products suitable for Rugby League play have to pass initial laboratory approval before being able to be installed and tested in the actual field application. Whilst community pitches shall be retested every two years, stadium pitches require a field retest on an annual basis.

The NRL standard specifies two categories of performance: The category called 'stadium' is intended to replicate the characteristics of high-level natural grass as found in well maintained stadium settings. Surfaces meeting the 'stadium' category are intended for use in professional matches and training. The second category called 'community' which has a wider acceptance range than the stadium category is supposed to replicate the characteristics of good quality community natural grass fields.

Photo 36: Stadium Perimeter Advertisement (Source: Signgrass)

In general, community grounds have to sustain a much higher level of use compared to stadium pitches that are predominantly used for competition matches and professional training. In this respect, the NRL categories 'stadium' and 'community' are comparable to the FIFA recommended Two Star (Quality Pro) and One Star (Quality) categories respectfully.

7.4 Health, Safety and Risk Management

7.4.1 Introduction

The health and safety of all sports facilities is a concern to the asset owner and the sports program providers. As a result, there tends to be a sophisticated decision-making process to minimise the potential risk to players, etc.

At times there is a perception that if the surface is not natural grass, it is not safe. In Australia, local community groups have expressed concern at the prospect of the natural grass being replaced by synthetic surfaces.

What is not understood by these community groups, is that if many community level natural grass surfaces were tested to the same rigour as synthetic sports surfaces, they would not pass the performance criteria that synthetic turf would. Therefore, the synthetic sports turf is safer than most badly-worn community playing fields.

The key concerns for health and safety are predominantly:

- Player safety and injuries,
- Surface playability,
- Health risks to community,
- Heat management.

This section explores each of these concerns.

7.4.2 Player Safety and Injuries

There is a perception that there are more sports injuries on synthetic grass surfaces than on natural turf. A number of studies show that this is not the case. For example, the New York State Department of Health[24] provides specific guidance from its research:

"There is a common perception that there are more sports injuries on synthetic than on natural turf athletic fields. Many factors influence the rate of sports injuries, including the type of playing surface. The many kinds of synthetic turf surfaces and changes in the turf products over the years complicate the assessment of how the playing surface affects injury rates".

[24] Fact Sheet: Crumb-Rubber Infilled Synthetic Turf Athletic Fields (2008) (NYS DOH Factsheet)

Photo 36: Field with markings for several sports (Source: TigerTurf)

i.) Injury Studies conducted by FIFA and UEFA

The world governing body of football FIFA and the Union of European Football Associations (UEFA) conducted one of the early studies on injuries comparing artificial turf and natural grass. The three-year study covered 18 professional teams with a total exposure of 160,000 hours[25]. The study yielded a slightly lower risk of muscle injuries but showed slightly higher risk on ligament injuries with rate of knee injuries being the same between both surface types (see Table 9). However, the study did not analyse the influence of footwear when playing on both surfaces.

	Artificial Turf	Natural Grass
Muscle Injury		
Strain	4	7
Hamstring	2	3.5
Ligament		
Sprain	7	5
Ankle	4	2.5
Knee	2	2

Table 9: Number of injuries per 1,000 hours' exposure

Following the initial study, FIFA conducted a two-month study with thirty semi-professional players on three artificial turf and six natural grass fields located across Spain, the Netherlands and Norway.[26] For purposes of consistency, all players used the same boots with rounded studs (Adidas Copa Mondial). The study focused on player-surface interaction and player-kicking dynamics using 500Hz high-speed video analysis. During the player-surface interaction a 'single-cut' move (see photos 36 and 37) was analysed in terms of turning time, exit speed and slip pattern. With regards to player-kicking dynamics the backward inclination of the leg (see photo 37), (#1) the kicking foot angle (#2), the knee position (#3), the pronation of the standing foot (#4) as well as the upper body positioning (#5) were analyzed. As performance measures, heart rate, blood lactate levels and movement analysis of the players were used. The results showed no statistical differences in kicking dynamics, no evidence of increased physiological stress or difference in velocity when performing on artificial turf and natural grass. In fact, the climatic differences between the various locations had a bigger influence than the difference between the two surface types.

Photo 37: Single Cut Move

ii.) Injury Studies conducted on behalf of Rugby Union

The risk of injury associated with play of rugby union on artificial turf was the subject of a medical study in 2010[27]. In particular the study looked at lower limb and joint-ligament injuries. The results when comparing artificial versus natural surfaces showed no significant statistical differences in the rate of injuries when comparing the two surface types. In addition, the study yielded no significant difference in the severity of injury sustained. Overall the study concluded that the risk of injury was not different when comparing playing activity on artificial turf with natural grass surfaces.

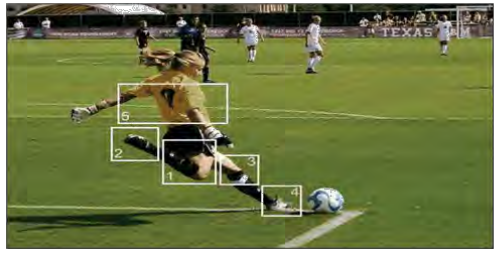


Photo 38: Kicking Dynamics

iii.) NCAA Injury Surveillance Program

The National Collegiate Athletic Association (NCAA) in the United States maintains a comprehensive injury surveillance program which regularly summarises the injuries sustained in various sports. According to the surveillance data collected between the seasons 2004/05 to 2008/09 the majority (more than half) of injuries occur in the lower limb area (see Table 10 following). However, the study did not distinguish between playing surfaces.

Injury	Percentage (in %)
Concussion	7.4
Head, face, neck	4.3
Upper limb	16.9
Torso, pelvis	11.9
Lower limb	50.4
Other	9.1

Table 10: American Football Injuries (Surveillance Program 2004-2009)

A five-year study of American high schools[28] also concluded that more than half of the injuries sustained in American football at a high-school level are recorded in the lower extremity area. This study differentiated between playing activity on artificial turf and natural grass and showed slightly higher rates of injury on artificial grass compared to natural grass (see Table 11). Similar findings were concluded by Hershman et al[29] when looking at specific lower extremity injury rates on grass and artificial turf playing surfaces in National Football League (NFL) games.

[25] Ekstrand, J., Timpka, T., Haegelund, M.; British Journal of Sports Medicine; 40; 975-980; 2006

[26] Nokes, L.; FIFA Study into Player-Surface Interaction on Natural Turf and Football Turf; 2010

[27] Fuller, C., Clarke, L., Molloy, M.; Journal of Sports Sciences; Vol 28; Issue 5; 2010
[28] Meyer, M., Barnhill, B.; The American Journal of Sports Medicine; Vol 32; No. 7
[29] Hershman, E., Anderson, R., Berfield, J., Bradley, J., Coughlin, M.,Johnson, R., Spindler, K., Wojtys, E., Powell, J.; American Journal of Sports Medicine, Online Sep 2012

Body Area	Artificial Turf	Natural Grass
Cranial/cervical	10.1 %	19.2 %
Upper extremity	28.1 %	23.2 %
Thoracic	7.9 %	6.4 %
Lower extremity	53.9 %	51.2 %

Table 11: American High-School Football Injuries

iv.) Independent Evaluation and Research

The Synthetic Turf Council has identified the following research Studies and Technical Papers for consideration:

Epidemiology of Patellar Tendinopathy in Elite Male Soccer Players, Hagglund, Zwerver and Ekstrand (2011).

Patellar tendinopathy is a relatively mild but fairly common condition among elite soccer players, and the recurrence rate is high. This study investigated the epidemiology of patellar tendinopathy in 2,229 elite male soccer players from 51 European elite soccer clubs playing on natural grass and synthetic turf between 2001 and 2009. Objective: To compare the risk for acute injuries between natural grass (NG) and third generation artificial turf (3GAT) in male professional football.

Conclusion: Exposure to artificial turf did not increase the prevalence or incidence of injury.

Risk of injury on third generation artificial turf in Norwegian professional football, Bjorneboe, Bahr and Andersen (2010).

The study aimed at comparing the risk for acute injuries between natural grass (NG) and third-generation artificial turf (3GAT) in male professional football. All injuries sustained by players with a first-team contract were recorded by the medical staff of each club, from the 2004 throughout the 2007 season. An injury was registered if the player was unable to complete the football activity or match play. From a total of 668 match injuries, 526 on grass and 142 on artificial turf the overall acute match injury incidence was 17.1 per 1,000 match hours on grass and 17.6 on artificial turf. Correspondingly, the incidence for training injuries was 1.8 on grass and 1.9 on artificial turf respectively.

Conclusion: No significant differences were detected in injury rate or pattern between 3GAT and NG in Norwegian male professional football.

Comparison of injuries sustained on artificial turf and grass by male and female elite football players, Ekstrand, Hagglund and Fuller (2010).

The objective of this study was to compare incidences and patterns of injury for female and male elite teams when playing football on artificial turf and grass. Twenty teams (15 male, five female) playing home matches on third-generation artificial turf were followed prospectively; their injury risk when playing on artificial turf pitches was compared with the risk when playing on grass. Individual exposure, injuries (time loss) and injury severity were recorded by the team of medical staff. In total, 2105 injuries were recorded during 246 hours of exposure to football. Seventy-one percent of the injuries were traumatic and 29 percent overuse injuries.

Conclusion: There were no significant differences in the nature of overuse injuries recorded on artificial turf and grass for either men or women.

Injury risk on artificial turf and grass in youth tournament football, Soligard, Bahr and Andersen (2010).

The aim of this study was to investigate the risk of acute injuries among youth male and female footballers playing on third-generation artificial turf compared with grass. Over 60,000 players 13 – 19 years of age were followed in four consecutive Norway Cup tournaments from 2005 to 2008. Injuries were recorded prospectively by the team coaches throughout each tournament. The overall incidence of injuries was 39.2 per 1000 match hours; 34.2 on artificial turf and 39.7 on grass. However, there was a lower risk of ankle injuries, and a higher risk of back and spine and shoulder and collarbone injuries, on artificial turf compared with on grass.

Conclusion: There was no difference in the overall risk of acute injury in youth footballers playing on third-generation artificial turf compared with grass.

Very Positive Medical Research on Artificial Turf, FIFA Medical Assessment and Research Centre (2010).

The aim of this research was to compare injuries sustained at the FIFA U-17 tournament in Peru, which was played entirely on "football turf" (synthetic turf) with the injuries sustained at previous U-17 tournaments, which were played mainly on well-manicured grass.

Conclusion: There was very little difference in the incidence, nature and causes of injuries observed during those games played on artificial turf compared with those played on grass.

Risk of injury in elite football played on artificial turf versus natural grass: a prospective two-cohort study, Ekstrand, Timpkin and Hagglund (2006).

The aim of the study was to compare injury risk in elite football [soccer] played on artificial turf compared with natural grass.

Conclusion: No evidence of a greater risk of injury was found when football was played on artificial turf compared with natural grass. The higher incidence of ankle sprain on artificial turf warrants further attention, although this result should be interpreted with caution as the number of ankle sprains was low.

Risk of injury on artificial turf and natural grass in young female football [soccer] players, Steffen, Andersen and Bahr (2007).

The aim was to investigate the risk of injury on artificial turf compared with natural grass among young female football [soccer] players.

Conclusion: The overall risk of acute injury to among young female football [soccer] players was similar between artificial turf and natural grass.

Comparison of the incidence, nature and cause of injuries sustained on grass and new generation artificial turf by male and female football players, Fuller, Dick Corlette and Schmalz (2007).

The aim was to compare the incidence, nature, severity and cause of match injuries (Part 1) and training injuries (Part 2) sustained on grass and new generation turf by male and female footballers. The National Collegiate Athletic Association Injury Surveillance System was used for a two-season (August to December) study of American college and university football teams (2005 season: men 52 teams, women 64 teams; 2006 season: men 54 teams, women 72 teams).

Photo 4: Australia's AIS installed an updated synthetic field prior to the women leaving for the FIFA World Cup in Canada

Conclusion: There were no major differences in the incidence, severity, nature or cause of match injuries or training injuries sustained on new generation artificial turf and grass by either male or female players.

Although each study found some differences in specific injury types, there was no consistent pattern across the studies.

One of the key safety considerations is the potential for head injuries from contact with a synthetic surface, which have been assessed by determining the ability of the surfaces to absorb impact. The force of impact on frozen or well-worn natural turf is typically below the acceptable level but many pitches are not tested against this.

7.4.3 Summary

Of the various independent studies[30] [31] [32] [33] reviewed from 2006 to 2011, the common finding is that there is not an increase in the number of injuries associated with synthetic turf when compared to natural turf. Seemingly the only negative consideration is where sports people alternate between surface types which may result in varied and increased injuries. This may be similar to long distance runners who run on synthetic tracks then on asphalt, which are more susceptible to shin soreness.

Although the ability of the studies to detect differences in the injury rates was limited by the small number of injuries reported, the studies concluded that there were no major differences in overall injury rates between natural and infilled synthetic turf. Although each study found some differences in specific injury types, there was no consistent pattern across the studies.

One of the key safety concerns that have been expressed by sport organisations is the potential for head injuries from contact with a synthetic surface. This concern is assessed by determining the ability of the surfaces to absorb impact using one of two test methods and provides the acceptable level of playing surface for specific sports. By comparison, a recent study of community and stadium natural surface fields in Sydney[34] were typically below the corresponding expected synthetic level. Many natural turf fields are not tested against a standard. (If they were, many fields would fail the standards set for synthetic surfaces). Rugby union has begun to test natural turf surfaces in some States of Australia to protect their players. The abrasiveness of synthetic turf fibres may contribute to the injury risk among athletes, particularly for abrasions or 'turf burns.' The degree of abrasiveness appears to be dependent on the composition and shape of the turf fibres. A study conducted at Penn State University suggests that synthetic turf with nylon fibres is more abrasive than synthetic turf with other fibre types.

Regarding injury, a study conducted by FIFA's Medical Assessment and Research Centre (F-MARC)[35] compared the injuries sustained at the FIFA U-17 tournament in Peru in 2005 which was played entirely on artificial turf, with the injuries sustained at previous FIFA U-17 tournaments which were mostly played on natural turf. The research showed that there was very little difference in the incidence, nature and cause of injuries observed during games played on artificial turf compared with those on grass.

In another study reported in the British Journal of Sports Medicine, Reference results showed there was no evidence of greater injury risk when playing soccer on artificial turf when compared with natural turf in the Swedish Premier League. The researchers did report an increased incidence in ankle injuries on artificial turf; however, the study was limited due to its small sample size.

- The limited results collated by FIFA suggest that the rate of injury on third generation synthetic turf is similar to that of natural turf, but the type of injury may differ.

The Synthetic Turf Council has provided independent research papers for confirmation of injury occurrence when natural grass and synthetic grass is compared.

7.4.4 Surface Playability

1) Playability studies commissioned by FIFA

Probably the most comprehensive studies on playability of any sport comparing artificial surfaces versus natural grass have been commissioned by FIFA. In 2006, FIFA commissioned UK-based Prozone to analyse data from UEFA Cup matches played on both surfaces using a video-based performance analysis system[36]. The aim of the study was to analyse the potential impact that artificial turf may have on the pattern of a game and therefore performance and playability[37]. UEFA cup matches between Red Bull Salzburg and Blackburn Rovers were analysed using the Prozone Match Viewer system.

The analysis yielded that games played on the artificial surface at Red Bull Salzburg and the natural grass surface at Blackburn Rovers showed no significant differences in terms of performance and playability. The number of total passes played was very similar (703 on artificial turf versus 720 on natural grass) with a success rate of more than 80 percent passes completed on both surfaces. In addition, the number of tackles, interceptions, clearances, and the shooting accuracy were similar on both surfaces (see Table 12).

	Artificial Turf			Natural Turf		
Event	Red Bull	Rovers	Total	Total	Rovers	Red Bull
Total Passes	336	367	703	720	405	315
Completion	78 %	81 %	80 %	83 %	85 %	81 %
Tackles	21	23	44	43	17	26
Interceptions	127	113	240	233	126	107
Clearances	16	33	49	44	19	25
Shooting Accuracy	39 %	50 %	43 %	43 %	43 %	44 %

Table 12: Tactical Events Red Bull Salzburg vs. Blackburn Rovers

Similar technical studies have been extended by FIFA to cover Champions League, Dutch Football, the U20's World Cup and the Russian League. The five Studies show similarities between games played on artificial turf and natural grass. To eliminate a potential home-team bias, only the events for the away team were included in these subsequent studies (see Table 13).

Event	Artificial Turf	Natural Grass
Passes	314	313
Passes completed	78 %	80 %
Passes forward	145	148
Balls received	351	353
Headers	64	64
Interceptions	125	118
Tackles	30	28
Crosses	12	13
Shots	14	13

[30] Ekstrand J, Nigg B. Surface-related injuries in soccer. Sports Medicine 1989;8:56-62.

[31] Arnason A, Gudmundsson A, Dahl H. Soccer injuries in Iceland. Scandinavian Journal of Medicine & Science in Sport 1996; 6:40-45.

[32] Stanitski CL, McMaster JH, Ferguson RJ. Synthetic turf and grass: A comparative study. Am J Sports Med 1974;2(1):22-26.

[33] Engebretsen L. Fotballskader og kunstgress. Tidsskrift for den Norske lægeforening 1987;107(26):2215

[34] UST study of NSW community natural grass standards (2011) by Acoustic Scan

35 FIFA Medial Assessment and Research Centre (2006)

[36] Di Salvo, V., Collins, A., McNeil, B., Cardinale, M.; International Journal of Performance Analysis in Sport; 6; 108-119, (2006)
[37] FIFA Technical Study with Prozone, (2006)

Table 13: FIFA 5-Study Technical Overview

7.4.5 Dutch Professional Coaches Survey

The European Synthetic Turf Organization (ESTO) commissioned a survey of members of the Dutch Professional Coaches Association. Even though natural turf in excellent condition remains the preference, the responses given were positive towards artificial playing surfaces (see Table 14).

Question	Yes	No
Are players able to develop better technical skills by training on synthetic turf?	62 %	38 %
Longer term, will players' techniques be better developed by playing and training on synthetic turf?	57 %	43 %
Does training and playing on synthetic turf improve skill acquisition amongst players?	69 %	30 %
Would you like your team to play passing football, and if yes, is this easier to implement on an artificial pitch?	71 %	29 %
Do you see synthetic turf as being the future of the game?	64 %	36 %

Table 14: Survey of Dutch Professional Coaches Association

2) Study commissioned by Rugby Union

When reviewing the artificial turf specification and in particular the pile height requirement of World Rugby Regulation 22, (Formally IRB) commissioned biomechanical studies of the rugby scrum. During machine scrumming, scrum engagement, techniques for effective and safe scrumming and injury risks were reviewed. The study concluded that scrumming on artificial turf is safe and similar to natural grass and as a result the minimum pile height requirement for artificial turf could be lowered from the original 65mm down to 60mm[38].

3) Study commissioned by Australian Rules Football

Due to the limited number of facilities with artificial playing surfaces, there is currently no detailed study regarding playability available for AFL activities. It should be noted that a study conducted by the University of Ballarat[39] was utilised to assist in the development of standards for the use of artificial turf for Australian Football and Cricket.

7.4.6 Health Risk to Community

The Environmental Protection Agency in America (EPA) issued the following statement title "Playgrounds and Synthetic Turf Fields"[40], in which it states:

"There have been concerns about the health implications of the use of recycled tire crumb in playgrounds and in synthetic turf athletic fields. In response to these concerns, EPA conducted a Scoping-Level Field Monitoring Study of Synthetic Turf Fields and Playgrounds."

The final report was issued in 2009 and concluded that on average, concentrations of components monitored in this study were below levels of concern. To supplement this study's limited data, the United States EPA met with state and local representatives in 2010 to review other available field monitoring studies including a 2010 risk assessment of artificial turf fields conducted by four state agencies of the state of Connecticut which concluded that exposures and risks were not elevated (relative to what is commonly found in outdoor air) for either children or adults using the fields.

In 2010, the California Office of Environmental Health Hazard Assessment (OEHHA) issued a safety study of artificial turf containing crumb rubber made from recycled tyres[41]. The study which was founded by the Department of Resources Recycling and Recovery (CalRecycle) and examined the possible human health risks of outdoor athletic fields made from artificial turf containing recycled crumb rubber with respect to skin abrasions, bacteria harbored by the turf, inhalable particulate matter, and volatile organic compounds. The report concluded these fields do not pose a serious public health concern, with the possible exception of an increased skin abrasion rate on artificial turf relative to natural turf.

7.4.7 Infection Risk

Twomey, Otago, Saunders, and Schwarze (2008)[42], on behalf of Cricket Australia and the AFL, researched the issue of health considerations concerning the infill used in synthetic grass. The research asserted that the infill could present health problems if it was inhaled or swallowed.

The New York State Department of Health (NYSDOH) has also explored the concern of infection risk, with the following outcomes from its studies:

"Some people have expressed concern that infections, including Methicillin-Resistant Staphylococcus Aureus (MRSA), may be more common among users of synthetic turf fields than users of natural turf fields. This possibility has not been studied systematically, and no definitive statements can be made about differences in risk between the two surfaces." It continues, "At least two questions are important in evaluating the risk of infection. Does skin damage occur more frequently on synthetic turf than natural turf, thus providing a place where infections are more likely to occur? And are there more germs on synthetic turf than natural turf?"[43]

While injury studies have not consistently identified differences in abrasion and laceration risks between natural and infilled synthetic turf, some types of synthetic turf may result in more skin abrasions. Although very few tests have been performed, data available does not suggest the widespread presence of infectious agents, such as MRSA, on synthetic turf fields. As reported by the New York State Department of Health[44], outdoor or indoor synthetic turf surfaces are no more likely to harbour infectious agents than other surfaces in the same environments. Disease outbreak investigations conducted in response to illnesses caused by a variety of germs (e.g., MRSA, campylobacter, meningococcal, echovirus, herpes simplex virus, hepatitis virus, coxsackie virus) have not identified playing fields, either natural or synthetic, as likely to increase the risk of transmitting infections.

Skin cuts and abrasions that may result from contact with athletic fields, including both natural and synthetic fields, are susceptible to infection. Athletes and others developing skin abrasions should clean the wounds and seek prompt medical attention. There are conflicting reports that the ground rubber materials used for infill may be unhealthy. Yet, most studies on toxicity levels dispel this notion. Most studies show that rubber does not pose any serious risks[45]. The only exception is when people are allergic to latex (6 percent of population), which is sometimes found in tyre rubber.

[38] IRB Regulation 22, Artificial Rugby Turf Performance Specification, One Turf Technical Manuel, (2012)
[39] Twomey, D, Otago, L., Saunders, N.; Development of Standards for the Use of Artificial Turf for Australian Football and Cricket; University of Ballarat; (2007)
[40] Source: http://www.epa.gov/epawaste/conserve/materials/tires/health.htm

[41] California Department of Resources Recycling and Recovery. (2010). Safety study of artificial turf containing crumb rubber infill made from recycled tyres: Measurements of chemicals and particulates in the air, bacteria in the turf, and skin abrasions caused by contact with the surface. Sacramento, CA.
[42] Twomey, D., Otago, L., Saunders., & Schwarz, E. (2008). Development of standards for the use of artificial turf for Australian Rules Football and Cricket. University of Ballarat

[43] Fact Sheet: Crumb-Rubber Infilled Synthetic Turf Athletic Fields (2008) (NYS DOH Factsheet)
[44] Fact Sheet: Crumb-Rubber Infilled Synthetic Turf Athletic Fields (2008) (NYS DOH Factsheet)
[45] A Scoping-Level Field Monitoring Study of Synthetic Turf Fields and Playgrounds. U.S. Environmental Protection Agency, November (2009)

Photo 39: Rubber granular infill for a synthetic surface

Some infill's are now voluntary being tested against the German Standard Mark (GS) which is the mandatory test requirement of polycyclic aromatic hydrocarbons (PAH) connected to the voluntary GS (Geprüfte Sicherheit (Safety Tested)) Mark was updated on November 29th 2011. According to the new requirements 18 PAH substances need to be tested in the future to grant the GS Mark.

The GS Mark certification is applicable to ready-to-use consumer products of various kinds and accepted as a benchmark product safety certificate by consumers. Besides relevant safety tests the determination of chemical contaminant group PAH is required since 2008.

Parameter	Category 1 Materials indented to be put in the mouth or materials of toys for children aged < 36 months with intended skin contact [2]	Category 2 Materials not covered by category 1, with foreseeable skin contact for longer than 30 seconds (long-term skin contact)	Category 3 Materials not covered by category 1 or 2 with foreseeable skin contact up to 30 seconds (short term skin contact)
Benzo[a]pyrene mg/kg	Not detectable (< 0.2) [1]	1	20
Sum 18[3] PAH mg/kg	Not detectable (< 0.2) [1]	10	200

Table 15: Limits for PAH content for material of (GRIP) surfaces, which are to be categorized on account of the results of the risk analysis

Developed over recent years the requirements as described in the ZEK 01-08 document family is meanwhile accepted as a working standard by state authorities, trade and NGOs in Germany. Even if no legal requirement, it became a benchmark standard to limit PAH in all kind of consumer products in the German market. It is applied even on those products which are not certified with the GS Mark.

[1)] If the limits of Category 1 are surpassed but the limits of Category 2 still met, the confirmation of suitability of contact with foodstuff or the oral mucosa can be verified by an additional specific migration test of the PAH components according to EN 1186ff and § 64 LFBG 80.30-1. The results of the migration test shall be evaluated according to law criteria for foodstuff. [2)] According to the regulations of the EK2. [3)] Enlarged substance list of AtAV based on EPA according ZEK 04-11.

7.5 Heat Stress

The temperature of artificial surfaces rises significantly more than natural turf surfaces, especially on a hot sunny day (20 – 40 percent hotter). Reported surface-to-air temperature ratios are approximately one for both natural turf and artificial turf under overcast conditions[46]. According to one research on synthetics the mean (range) of ratios for natural grass was 1:41 (1.38 to 1.44) whilst the mean (range) for artificial turf was 1:62 (1.3 to 1.81).

In this study, the results of the temperature measurements obtained from the fields studied in Connecticut indicate that solar heating of the materials used in the construction of synthetic turf playing surfaces does occur and is most pronounced in the polyethylene and polypropylene fibres.

Maximum temperatures of approximately 68.9°C were noted when the fields were exposed to direct sunlight for a prolonged period of time. Rapid cooling of the fibres was noted if the sunlight was interrupted or filtered by clouds. Significant cooling was also noted if water was applied to the synthetic fibres in quantities as low as one ounce per square foot. The elevated temperatures noted for the fibres generally resulted in an air temperature increase of less than five degrees even during periods of calm to low winds.

The rise in temperature of the synthetic fibres was significantly greater than the rise in temperature noted for the crumb rubber. Although a maximum temperature of 68.9°C was noted for the fibres, a maximum temperature of only 38.3°C, or approximately 9 degrees greater than the observed ambient air temperature, was noted for the crumb rubber.

FIFA as the international federation for Football has identified that they will be classifying the heat of synthetic surfaces from 2015 onwards so that the consumer and pushier can relate to the heat risk from a particular purchase.

Photo 40: Synthetic Baseball Diamond, where heat policy means no play during peak sun, as directed by the sport

Draft guidelines have been in available from 2014 – a formal issue of the anticipated standards is not available from FIFA presently.

The heat issue is being considered by many of the synthetic grass manufacturers. At the 2011 FSB Synthetic Surfaces Tradeshow in Cologne, Germany this was a key topic with a number of initiatives being promoted, including:

i. Cool grass technology
   A number of synthetic system manufacturers have worked with the yarn manufacturers and using specific polymers to offer cool grass technology that can reduce heat by up to 20 percent compared with traditional synthetic grass.
ii. Infill
   There was a clear move from many infill suppliers to provide options that move away from the very cost effective recycled SBR. The move to infill's such as coated SBR (Styrene-Butadiene-Rubber), virgin or coated infills such as EPDM (Ethylene-Propylene-Diene-Rubber), TPE (Thermoplastic Elastomers) and natural organic infills.

[46] Milone and Macbroom, Environmental Effects of Synthetic Turf Athletics Field (2008)

In advance of FIFA product test data becoming available as products are tested to the new FIFA requirements test data from various sources suggests the following ranking:

Natural Turf - irrigated

Geo infills requiring watering

Cork infills – subjected to watering

Lightly coloured EPDM infill treated with a polymer coating & watering

Cork infills – without watering

Lightly coloured EPDM or TPE infills

Black SBR treated with a polymer coating.

Coated SBR

Black SBR

7.6 Conclusion and Recommendations

The following recommendations are made:

Strategy	Actions
The decision-making process on the priorities of which sport and fields should be used for synthetic sports surface technology should be holistic to achieve the Strategic Focus of this Study.	a) The discussion points should be monitored annually to identify if circumstances have changed.
	b) A three-year review should assess priorities against playing capacity/condition of each field; standards of play needed; economic conditions; growth of the participation and strategic alignment.
	c) The type of synthetic surface technology should be aligned with the needs of the sport, the durability /sustainability and technology available at the time.
Where possible multi-sports fields should be adopted to allow maximum community usage.	a) Where possible Football (all codes) should be considered for any future design unless there is so much usage in one venue that it would only warrant a single sport.
	b) Design fields for Football (Soccer) where the field can encourage match, training and recreational needs by including lines for half; quarter and 5-a-side football pitches
	c) The standards for the football codes should be: i.) Football – FIFA Quality ii.) Rugby Union – World Rugby Regulation 22 iii.) Australian Rules – AFL/Cricket Australia community facility iv.) Rugby League – NRL Community Surface standard v.) Hockey – FIH National Standard vi.) Lacrosse – agree a standard with Lacrosse Australia, either a Football or AFL should satisfy playing characteristics
Utilize the natural turf/hybrid turf technology for higher wear areas of key fields to allow all fields to be used for a minimum of 25 hrs per week.	a) Explore the various Hybrid/Root reinforced systems for the identified fields:
	b) Develop a three-year strategy for adoption of hybrid/root reinforced technology to assist with the development of the fields to cope with continued demand.
	Conduct an EoI process with current and new companies who are looking to enter into the market during 2018/19 financial year to maximise the interest and cost to Council
Develop fields that are environmentally friendly.	a) When procuring synthetic turf where possible request virgin rubber that will negate the negative perceptions around recycled SBR tyres.
	b) Ensure that the infill has been tested against the 'toy ingestion standard' EN71-03 Table 2 Category III.
	c) Encourage heat reduction technology to be part of the scoping strategy for the procurement of a synthetic system.

SECTION 8: SUSTAINABILITY CONSIDERATIONS

Balancing open space with synthetic turf needs a good understanding of how the synthetic technology of the system effects the natural environment. This section provides Council with that knowledge.

8. SUSTAINABILITY CONSIDERATIONS

8.1 Introduction

For some time now, governments at all levels in Australia and globally have been considering how they can balance the challenge of competing pressure from the community, the environment and the economy. Commonly known as the 'Triple-Bottom Line' approach.

The challenge for local government with regard to sustainability is recognising, valuing and balancing these three aspects on behalf of the society for which they govern.

Many local Governments have invested in the development of Sustainable Action Plans for their municipality. The Plans reflect their commitment towards a sustainable future for their City and explains the key aspects that are impacting on their sustainable society which is normally around growing community populations, the associated impact on their environment and the economic cost of managing the community.

8.2 Impact of Climate Change on Sport

In early 2015 the Climate Institute published their Sport and Climatic Impacts: "How much heat can sport handle?" document which identifies the importance of sport to society and especially in Australia[47]. Within the report there are some very interesting facts that recognise the impact of climate change on sport, including:

- Sport is fundamental to Australian society, culture and the economy. Participation in sport improves mental and physical health[48], enhances community cohesion and wellbeing[49] and contributes to employment[50]
- Sport contributes to over $12.5 billion to the economy[51], employs over 75,000 people[52] and helps to boost Australia's GDP by as much as 1% annually[53]
- Temperature directly affects athletic performance in outdoor sports. Drought and changes in rainfall patterns affect ground surfaces and increase costs ranging from direct costs such as insurance to cover the increased cost of injury due to harder grounds
- Extreme rainfall threatens short-term ground closure due to water logging of not allowing adequate time to recover for play
- Average temperatures in Australia have warmed by approximately 0.9°C since 1910[54], with seven of the 10 warmest years on record have occurred since 2002[55], with 2013 being Australia's hottest year on record[56]. The frequency of extremely hot days (over 35°C) has doubled since 1960[57].
- Heatwaves rank as Australia's deadliest natural threat to human life. Putting this in perspective, it is more than all the bushfires, cyclones, earthquakes, floods and storms combined[58].
- If the world continues on its current path, global average temperature will raise by at least 4°C, so with the change in climatic conditions in the last 55 years from just 0.9°C, imagine the challenges ahead
- Heat policies of sport need to change to cope with the situation
- Use of synthetic sports turf is being embraced by all of the sports on a World, National and State level to both allow for the growing demand, as the population increases and to cope with the Climate challenges

8.3 Climate Change / Weather Patterns

8.3.1 Climate Change

Climate change has resulted in more extreme weather patterns over the last few decades. Indeed, since the 1950's most of eastern and western Australia has seen significant rainfall reductions while the north west of Australia has become wetter during the same period.[59]

On a global front the mean global temperature has increased 0.76°C since 1850. Australian Governments have already had to take drastic action and issue water bans for sports fields as part of drought interventions in Victoria and Western Australia over the past decade. Facilities need to consider the consequences of reduced water availability on natural turf. With reduced rainfall and dwindling water resources in key parts of Australia, synthetic turf technology is being considered as the solution by many organisations such as LGA's and Sports Bodies.

8.3.2 Urban Heat Island Effect[60]

The urbanisation of Australia has radically transformed environments from native vegetation through farmland to present day's urban footprints of towns and cities with an urban sprawl. Away from the coastal areas, where they receive a moderating influence of cooling sea breeze, population heartlands in urban areas are now showing 'Urban Heat Island' effects.

This Urban Heat Island (UHI) shows that the area is significantly warmer than its surrounding rural areas due to number of direct and indirect causes including:

- Absorption of short-wave radiation, in concrete, asphalt and buildings and then slow release during the night
- Change in surface materials which do not have evapotranspiration properties (e.g. concrete v grass vegetation);

[47] Sport and Climate Impacts: How much heat can sport handle (ISBN 978-1-9211611-33-0) The Climate Institute, 2015

[48] VicHealth, 'Encouraging regular physical activity', http://www.vichealth.vic.gov.au/our-work/encouraging-regular-physical-activity

[49] NSW Department of the Arts, Sport and Recreation, Sport and recreation and community building, June, 2008, http://www.dsr.nsw.gov.au/assets/pubs/industrystudy_communitybuilding.pdf

[50] Australian Sports Commission, The future of Australian sport, 2013, http://www.ausport.gov.au/information/ais/the_future_of_australian_sport/reports

[51] Australian Bureau of Statistics, Op Cit.

[52] Australian Sports Commission, Op Cit.

[53] Ibid

[54] Bureau of Meteorology and CSIRO, State of the Climate 2014, 2014, http://www.csiro.au/Outcomes/Climate/Understanding/State-of-the-Climate-2014.aspx

[55] Bureau of Meteorology, 'Annual Climate Statement 2014', January 6, 2015, http://www.bom.gov.au/climate/current/annual/aus/

[56] S. Lewis and S. Perkins, 'Human hands are all over Australia's hottest ever year', The Conversation, September 30, 2014, https://theconversation.com/human-hands-are-all-over-australias-hottestever-year-32267

[57] L. Hughes and T. McMichael, The Critical Decade: Climate Change and Health, Climate Commission, November, 2011, https://www.climatecouncil.org.au/communication-climate-change-and-health

[59] Australian Bureau of Meteorology, Annual Climate Summary 2011, 2012, http://www.bom.gov.au/climate/annual_sum/2011/index.shtml

[60] Information used from previous SCC report for Penrith City Council

- Increase of carbon dioxide, through increases in traffic pollutants and people, with reduced trees capturing carbon dioxide in cities;
- Use of building materials – pavements and roofs has significantly different thermal bulk properties and surface radiative properties (e.g. shade and evaporation). Also, high buildings normally reduce wind penetration, which also acts as a coolant and assists in the disbursement of pollutants.

Urban Heat Island (UHI) Case Study

A recent research project which is now offered as part of this project as a Case Study is attached as a reference point:

According to Greening Australia[61], who has examined the temperatures for Western Sydney found that:

- Over the last 40 years all Western Sydney weather stations have experienced a rise in annual temperatures over and above what would be expected through global warming
- The effect is strongest currently in Blacktown but is also clearly apparent in Richmond, Camden, Liverpool and Parramatta.
- The gap between coastal Sydney temperatures and western Sydney temperatures has widened.

The number of extreme temperature events has risen dramatically

The following analysis is taken from the climate records from Prospect Reservoir (Western Sydney) and Observatory Hill (Coastal Sydney).

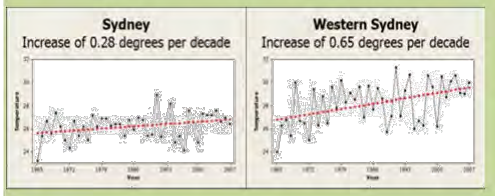


Figure 7: January Mean Maximum Temperatures

Figure 7 indicates that the January mean maximum temperatures for Western Sydney have increased more than twice the rate experienced by coastal suburbs. It is also more than twice the rate expected from global warming.

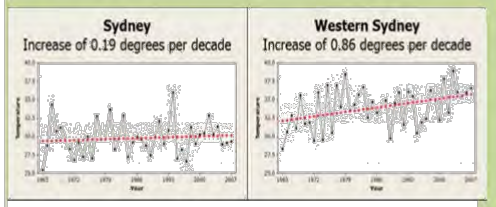


Figure 8: Temperature of a hot January day (80th percentile)

Figure 8 indicates that the temperatures on a 'hot day' in Western Sydney have increased dramatically. In this case a 'hot day' is defined as the highest temperature that occurs three times a month.

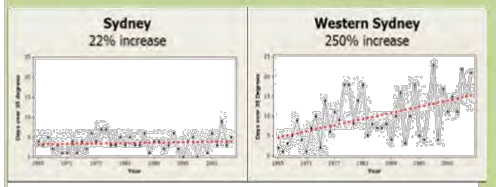


Figure 9: Number of very hot (above 35C) days per year

Figure 9 outlines the dramatic increase in the number of days that have occurred each year that has been over 35 degrees Celsius for Western Sydney.

The Urban Heat Island Effect has the potential to adversely impact a city's public health, air quality and energy use, including:

- Poor Air Quality: Hotter air in cities increases both the frequency and intensity of ground-level ozone (the main ingredient in smog). Smog is formed when air pollutants such as nitrogen oxides (NOx) and Volatile Organic Compounds (VOCs) are mixed with sunlight and heat. The rate of this chemical reaction increases with higher temperatures.
- Risks to Public Health: The Urban Heat Island effect intensifies heat waves in cities, making residents and workers uncomfortable and putting them at increased risk for heat exhaustion and heat stroke. In addition, high concentrations of ground level ozone aggravate respiratory problems such as asthma, putting children and the elderly at particular risk.
- High Energy Use: Hotter temperatures increase demand for air conditioning, increasing energy use when demand is already high. This in turn contributes to power shortages and increasing carbon dioxide emissions.

(Source: http://www.hotcities.org/ and www.bom.gov.au/info/leaflets/urban_design.pdf)

Other documented impacts as a result of the Urban Heat Island Effect include impacts to agriculture, biodiversity, increased water demand, decreased productivity and even increased rates in domestic violence.

From the Report 10 steps for addressing the UHI's were identified including:

1) Conserve all large patches of vegetation
2) Increase vegetation cover across landscape
3) Maintain green open space
4) Street trees with shade
5) Light coloured roofing
6) Landscaping to reduce solar radiation
7) Water sensitive urban design (WSUD)
8) Street designs to align with shade and light
9) Reduce energy use
10) Mass transport to public transport – or non-pollutant forms (e.g. bikes and walking)

The considerations for this project may include the use of light coloured infill, WSUD and water harvesting, use of trees for shade around the field and connection to Councils bike paths.

8.3.3 Heat Management

Section 5 of this Report explores the playing of sport on high temperature days and the guidance that this is available from Sports Management Australian Heat Policy Guidance.

8.3.4 Carbon Footprint

It is thought that the carbon footprint for natural grass is lower than that of an artificial surface. This is when you compare the installation and maintenance of grass (e.g. fertiliser production, mowing and maintenance) with the

[61] Greening Australia Urban Heat Island Effect Report (2013)

synthetic surface option and what's involved in its production, transportation and disposal of materials.

8.3.5 Carbon Offset

Significant research has been completed about the comparisons, for example:

- A Canadian Study[62] found that a 9,000m^2 synthetic facility over 10 years, recorded a total CO^2 emission of 55.6 tonne and the tree planting offset requirements was 1,861 trees.
- Natural grass helps remove carbon dioxide (carbon sequestration) from the atmosphere via photosynthesis and stores it as organic carbon in soil, depending on factors such as land practices and climatic conditions. Therefore, grass contributes to soil organic matter, mainly through its root system, which makes it an important carbon sink. A carbon sink is something that can store some carbon-containing compound for a period of time. A typical lawn of 232m^2, converts enough carbon dioxide from the atmosphere to provide adequate oxygen for a family of four[63].
- According to the University of Ballarat study, only growing forests produce a net gain of oxygen because they store carbon in wood in the trees themselves, whereas grass stores carbon in the form of sugars, starches and cellulose. However, the important point is that natural grass is often cut - particularly on a playing field - which releases the carbon as it breaks down and rots, plus the reduction in blade length reduces the amount of absorption. This is compared with trees, which drop leaves while the wood components are more likely to stay intact. It should be noted that plants continue to release carbon dioxide and water into the atmosphere through the process of cellular respiration. Therefore, the net production oxygen in grass is very small in comparison to trees and bushes.
- Research[64] from the United States suggests greenhouse gas emissions from natural turf production and maintenance is greater than the amount of carbon that can be stored in them. This study also found that athletic sports fields do not store as much carbon as ornamental grass due to soil disruption by tilling and resodding. However, this methodology of research has since been reviewed and modified to suggest that it is a net sequester or carbon dioxide. Essentially, the difference is to do with the ability to counter balance emissions through the carbon sink.

In 2010, the BASF Corporation Eco-Efficiency Analysis[65] compared synthetic fields with professionally installed and maintained grass fields. It concluded that the use of synthetics can lower consumption of energy and raw materials and the generation of solid waste depending on field usage. BASF also found that the average life cycle over 20 years of natural grass fields are 15 per cent higher than the synthetic alternatives.

8.4 Water Management

8.4.1 Council Commitment

Water management for sports fields is critical in both assisting the growth of natural grass and the restoration of fields after 'a hard day's usage'. If adequate water is not available, fields soon disintegrate, become hard and lose the thatch of grass on top that assists with ball and player interaction.

In addition, the risk of safety concerns increases and player comfort decreases. If synthetic sports turf is used, a water harvesting strategy can be adopted, collecting the water from the synthetic field and using it for the natural turf pitches nearby.

Water harvesting is the capture and recycle of rain through field irrigation and drainage. Many Local Governments are opting to implement water harvesting and contemporary irrigation methods to maintain the ground when faced with climatic conditions and high demand overuse issues.

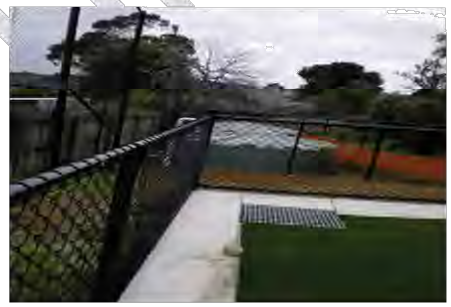


Photo 41: Water harvesting from a tennis court into nearby tanks (Source: Grassports)

There are significant advantages in grouping synthetic fields (1-2 fields) and possibly even having them co-located with natural turf so that the synthetic fields can be used to water harvest irrigation supplies for the ongoing maintenance of natural turf surfaces. Recent case studies in Melbourne show that water harvesting can collect enough rain water to water one cool grass and two warm grass natural turf fields, simply by building adequate size holding tanks.'

8.4.2 Ecosystem Impacts of Synthetic Surface Infills

To support the idea that ground rubber materials are unhealthy, questions have been raised as to whether the materials in artificial turf surfaces mix with water run-off and put contaminants into ground water, adversely affecting the air quality and eco-system. The NYS DOH[66] factsheet show that the water run-off has no effect on toxicity when compared with the key test criteria or other environmental impacts to organisms and meets all the state and federal water quality standards. Reports also reinforce that runoffs from fields into rivers, lakes, creeks, ponds, etc. contain chemical fertilisers and pesticides that are used on grass fields, as opposed to synthetic turf fields, where the runoff will be mostly pure water, drained through percolation rock and collected in catches under the field.

There have been a number of studies on the impact of synthetics on the local ecosystem including ones from the California Environmental Protection Agency, the Norwegian Institute of Public Health, the French National Institute of Environment and Risk and probably the most comprehensive study, the Swiss Ministry of Environment, Traffic, Energy and Communications (2005-2007).

[62] Meil, J and Bushi L, 2007. 'Estimating the Required Global Warming Offsets to Achieve a Carbon Neutral Synthetic Field Turf System Installation'. Athena Institute, Merrickville, Ontario, Canada
[63] TurfGrass Producers International, 2010. "Natural Grass and Artificial Turf: Separating Myths and Facts' published by Turf Grass Resource Centre, www.TurfResourceCentre.org viewed August 2011
[64] Townsend-Small, A Czimczik, C.I, 2010. 'Carbon Sequestration and Greenhouse Gas emissions in Urban Turf' University of California (Irvine). Published in: Geophysical Research Letters (USA) Vol 37, 22 January 2010)

[65] Submission for Verification of Eco-efficiency Analysis Under NSF Protocol P352, Part B Synthetic Turf, Eco-Efficiency Analysis Final Report – August 2010. BASF Corporation, NJ.
[66] New York State Department of Health, Bureau of Toxic Substance Assessment (2008). Fact Sheet: Crumb rubber infilled synthetic turf athletic fields. New York

Photo 42: Swiss Study collecting rain water through various synthetic sports surface systems

The Swiss Study[67] Ministry of Environment, Traffic, Energy and Communications reported results of a field study on the Environmental Compatibility of Synthetic Sports Surfaces. The study explored the secretion of synthetic surfaces from three sources:

i. Disintegration by UV radiation;
ii. Mechanical destruction by abrasion, and
iii. Diffusion of ingredients and washing off by rain water.

The secreted substances included:

- Rubber chemicals: aromatic amines, benzothiazoles, anilin, cyclohexylamin,
- PAH's: Polycyclic Aromatic Hydrocarbons (16),
- Total organic nitrogen compounds,
- DOC, and
- Zinc.

The testing was in a controlled environment with rain washing through the synthetic and natural turf systems over a two-year period then collected and measured for the secreted substances. The results are summarised as follows:

PAH's – PAH's are ubiquitous substances and are present in sewage water in similar concentrations as in water draining from sports surfaces. The report summarises that there is no risk for the environment.

Zinc – The zinc is mainly absorbed by the mineral base layer with the concentration of zinc in rainwater actually higher than the seeping water collected underneath the sports surface. The general result of the research was that there is no risk to the environment if production of synthetic sport surfaces and their installation follows recognised rules of technology.

The rules of technology include the Swiss and German Regulation DIN 18035 parts 6 and 7 and ESM105. These state that the requirements of metals need to be less than:

- Mercury ≤ 0.01 mg/l,
- Lead ≤ 0.04 mg/l,
- Cadmium ≤ 0.005 mg/l,
- Chromium ≤ 0.008 mg/l,
- Zinc ≤ 3.0 mg/l, and
- Tin ≤ 0.05 mg/l.

The New York State Department of Health[68] recognised these requirements and a paragraph in its 'chemical exposure' section states:

"Exposure to a chemical requires contact with it. Contact with a chemical occurs in these ways: swallowing it (ingestion exposure), breathing it (inhalation exposure), and having it come in contact with the skin (dermal exposure) or eyes (ocular exposure). The potential for harmful effects from exposure to a chemical depends on the amount of the chemical a person contacts, how the chemical enters the body (ingestion, inhalation, dermal, or ocular), how often contact occurs, and the toxic properties of the chemical. The ability of a chemical to be released from a substance (e.g. crumb rubber) is an important factor in determining how much exposure actually occurs. Other factors that can influence a person's risk for adverse health effects from environmental chemicals include age, gender, general health, genetic differences, exposure to other chemicals and lifestyle choices."

Car tyres are manufactured from natural and synthetic rubbers and contain numerous chemical additives, including zinc, sulphur, carbon black, and oils that contain polyaromatic hydrocarbons (PAHs) and volatile organic chemicals. Crumb rubber is manufactured from used tyres, so it is safe to say that although there are chemical additives in crumb rubber, they are no more toxic than a car tyre.

A French study[69] measured the concentration of organic chemicals emitted as gases (known as volatile organic compounds or VOCs) from crumb rubber under laboratory conditions. The data was used by the French National Institute for Industrial Environment and Risks to evaluate possible health effects from inhaling VOCs released from synthetic turf. The researchers concluded that the concentration of organic compounds emitted did not pose a health concern for athletes, officials or spectators.

Some types of synthetic turf fibres contain elevated levels of lead (e.g. in the range of about 2,000 to 9,000 parts per million). Degradation of these fibres can form a dust that presents a potential source of lead exposure to users of the fields. The Centre's for Disease Control and Prevention (USA) and the Agency for Toxic Substances and Disease Registry (France) addressed the potential for lead exposures from synthetic turf fibres in a June 2008 Health Advisory.[70]

The tests identified that older fields that were made of nylon fibres or a nylon/polyethylene blend contained levels of lead that pose a possible public health concern. Tests of only polyethylene fibres showed that these fields contained very low levels of lead.

The report continues, "The risk of harmful lead exposure is low from new fields with elevated lead levels in their turf fibres because the turf fibres are still intact, and the lead is unlikely to be available for harmful exposures to occur".

8.5 Building Design and Green Engineering

8.5.1 Council Commitment to Sustainability

Council's commitment to sustainable Asset Management Practices is reflected in their Asset Management Strategy (2013) Parks and Recreation which also reflects Councils strategic direction and specifically relates to the environment:

OUR ENVIRONMENT - Healthy and Green

- A sustainable natural environment
- Reduction in our ecological footprint
- An environmentally aware community
- Compliance with public and environmental health standards

8.5.2 Green Engineering

Green Engineering is the process of designing or operating systems in a manner that uses energy and sustainable resources (e.g. at a rate that doesn't compromise the natural environment) or the ability for future generations to meet their own needs. It explores how products are manufactured, the materials used and the disposal of them, in a feasible, economical and therefore sustainable manner, which results in minimising the pollution impact for generations to come. The basic concept of green engineering is based around the ability to offset or reduce the carbon footprint by choosing a specific product that may have a less harmful impact because it's recycled, recyclable or even renewable/reusable. By exploring these three concepts, purchasers can consider the impacts on their synthetic surface strategy.

[67] Results of a Field Study on Environmental Compatibility of Synthetic Sports Surfaces by Edwin Müller, dipl.Chem

[68] New York State Department of Health, Bureau of Toxic Substance Assessment (2008). Fact Sheet: Crumb rubber infilled synthetic turf athletic fields. New York.

[69] French National Institute for Industrial Environment and Risks 2010

[70] http://www.cdc.gov/nceh/lead/artificialturf.htm

Photo 43: 27,000 tyres are saved from landfill by using them in a typical sized football field

Recycled – means that the synthetic surfaces are made out of (at least 25 percent) recycled content. The benefit of this is that they are not drawing on 'virgin or prime' resources, which may be limited or by creating them would have a significant impact on the carbon footprint. Within most synthetic surface systems (e.g. a single football/soccer field – 8,000m^2):

- The recycled infill material is made from an estimated 27,000 tyres,
- The shock pad can be made out of recycled running shoes,
- The 'grass' can be made from recycled plastic drink bottles – saving 240,000 bottles from the tip.

Recyclable – means that the synthetic surface system where possible can be used again, and may mean:

- Re-using the compartments of the system – as recently shown in the 2013 London Olympics Games hockey field (STI),
- Recycling the concrete base for other building products and needs,
- Recycling some grasses (presently only in USA/Europe) into plastic pellets which can then be used for plastic recycled bins, plastic park furniture etc.

Photo 44: London Olympic Games reused their fields as part of their legacy program in facilities outside the Olympic Park

Reusable – means that the components can be changed and reused.

- The infill, and in some circumstances the shockpad, are examples of reusable components of synthetic sports turf systems.

8.6 Conclusion and Learnings

The impacts of climate change have been understood by Council and are reflected in their Asset Management Strategy.

The four key considerations for sustainability are around:

- Urban Island Heat Effect
- Carbon Footprint
- Water Management
- Green Engineering

The conclusions are:

i) Urban Island Heat Effect

This is becoming more important inland than on the coast, such as Monash, that said if there is going to be significant urban growth through high apartment blocks, Council will need to consider the effects in the future.

ii) Carbon Footprint and Offset

In 2010, the BASF Corporation Eco-Efficiency Analysis[71] compared synthetic fields with professionally installed and maintained grass fields. It concluded that the use of synthetics can lower consumption of energy and raw materials and the generation of solid waste depending on field usage. BASF also found that the average life cycle over 20 years of natural grass fields are 15 per cent higher than the synthetic alternatives.

iii) Water Management

Water management with synthetic sports turf means no need for watering of the field and offers the benefit of using the 9-13,000m^2 surface as a collector of water to then water harvest water for other uses such as the golf course or up to two standard sized football (soccer) fields.

Tests in Europe and Auckland have identified that there is no water contamination through the use of SBR rubber infills in synthetics fields.

iv) Green Engineering

The key considerations should include the use of green engineering practices including:

- recycled and recyclable products;
- water harvesting to re-use the water in the natural environment;
- cool grass and infill to reduce heat absorption and reflection; and
- landscape the area for significant tree foliage coverage to provide shade for spectators and reduce any carbon footprint.

v) Chemical Usage

There would be a significant reduction in the use of herbicide and pesticide on synthetic fields compared to the natural fields.

[71] Submission for Verification of Eco-efficiency Analysis Under NSF Protocol P352, Part B Synthetic Turf, Eco-Efficiency Analysis Final Report – August 2010. BASF Corporation, NJ.

SECTION 9: DESIGN CONSIDERATIONS

With the trends in participation changing, so is the thinking around the designs for sports fields. Embracing synthetic turf technology allows for designs to be more imaginative to meet these new opportunities. This section explores these design opportunities.

9. DESIGN CONSIDERATIONS

9.1 Introduction and Context

With the challenges facing Australia's society around the increased number of people adopting sedentary lifestyles, resulting in a desire by governments at all levels to entice the community to be more active and provide greater opportunities to play, recreate and participate in community sport.

In addition, there is a move away from participating in traditional sports provision to modified games/participation to encourage older people back into sport and keep the attention of the younger generation. The industry is witnessing an exciting time with creative design flair being matched with how facilities are being used. The majority of fields are exploring the following design principles:

- To encourage play, recreation and informal usage;
- Multi-sport formats between either seasons or various modifications on single sports (e.g. AFL and AFL 9's; 11 and 5-a-side soccer; Hockey and Hockey 5's etc.);
- Improving programming opportunities through infrastructure design;
- Targeting specific audiences through design imagination;
- Increased technical performance outcomes to cope with intensity of usage;
- Environmental improvements to reflect community concerns; and
- Flexible usage outside sport to meet broader community needs (e.g. events, markets, etc.).

9.2 Encouraging Play and Informal Recreation

9.2.1 Playgrounds

To encourage children to be more active through play, many schools are covering their asphalt with the bright colours of synthetic turf.

The turf can be designed to reflect primary school games such as 'snakes and ladders; checkers, etc.' or have multi-sports areas.

These could include a variety of sports, for winter and summer; large ball (e.g. netball/football); small ball (e.g. tennis/hockey/rounders etc.).

The colour technology and imagination from these fields can be integrated into community sports fields, such as using jogging tracks around football fields or boxes for passing drills etc.

9.2.2 Active Zone Sports

These multi-sport games areas are being embraced in local neighbourhood parks to encourage greater informal usage. Very popular overseas, they are now becoming more popular in Australia with baser structures being used for goals, fences etc. with a myriad of sports being played and self-managed informally.

Photo 45: Franklin Recreation Park ACT

These Multi-Use Sports Zones are being installed in neighbourhood parks, next to playgrounds and part of sports-hubs. Conversion of disused tennis courts or bowling greens are also being identified as ideal venues for such investments.

Photo 46: Crace Community Recreation Park

9.3 Multi-sport

Facilities that be use for various sports at a community level are becoming more popular, thus maximising the use of the playing surfaces. This normally means identifying complementary sports that can be played on specific surfaces with as the pairings below:

Football – multi-surface

Allowing for all Football codes to be played on the same surface. This means that the surface needs to be a minimum of 60mm to meet World Rugby's Regulation 22 performance criteria. The other codes that play on this surface include Soccer, Rugby Union, Rugby League and AFL. Such facilities can be seen at:

Photo 47: Moore Park Synthetic Field – Football, 5-a-side, Rugby Union, Rugby League and AFL (training)

Photo 48: Blackman Park – Football, Rugby Union, Cricket and AFL

Hockey/Tennis

The short grass of the hockey field lends itself to be used for tennis in the off season. It would also work well for netball and reduce the impact on young children's growing limbs. Very common in progressive schools, which open up their facilities to community usage in evening, at weekends and during the holiday periods.

Photo 49: School Hockey and Tennis Field

9.4 Traditional/Modified Surfaces

The growing demand for modified games and traditional layouts continues to grow and the designs are reflecting this. Some of the designs have included:

Photo 50: Lilys Football Centre – 5-a-side during the week and 11-a-side at weekends

9.5 Infrastructure for Flexibility

The importance of flexibility is reflected in the design of the surrounding infrastructure, including:

- Nets – Netting across the width and length of fields so that they can be divided accordingly
- Net cage – Specific cages with manual and motorized mechanisms are being seen more
- Lines – To ensure that lines are subtle for each sport various options have been embraced
- Lights – Lighting design allows for key parts of fields to be sued with the adoption of LED becoming more popular and affordable.
- Technology Cameras – Use of cameras on net posts allow vision in clubhouse and also sports analysis to improve performance.

APPENDICIES

APPENDIX 1: 10 YEAR CAPEX ACTIVE SPORTING RESERVES BUDGET

		Indicative Cost (per Sports Turf Report) / Timeframe of Delivery										Anticipated Funding Profile				
Location	**Scope of Works**	**2017/18**	**2018/19**	**2019/20**	**2020/21**	**2021/22**	**2022/23**	**2023/24**	**2024/25**	**2025/26**	**2026/27**	**State Grant**	**Council**	**AFL**	**Shortfall**	**Total**
Sewell Reserve	Drainage	$150,000										$ -	$150,000	$ -	$ -	$150,000
Gillon	Drainage / grass conversion	$150,000										$ -	$150,000	$ -	$ -	$150,000
Balfe	Irrigation	$100,000										$ -	$100,000	$ -	$ -	$100,000
Sumner Park	Lighting Upgrade	$110,000										$100,000	$110,000	$ -	$ -	$210,000
Raeburn Reserve	Drainage / levelling		$345,000									$ -	$300,000		$45,000	**$345,000**
Clifton Park West	Lighting Development		$100,000									$100,000	$100,000	$20,000	$40,000	**$260,000**
City Oval	Full Reconstruction			$300,000	$300,000							$450,000	$600,000	$140,000	$ -	$1,190,000
City Oval	Lighting Upgrade			$100,000	$100,000							$10,000	$200,000			$210,000
Hosken North	Synthetic and sub-surface				$1,200,000							$400,000	$800,000	$ -	$1,200,000	**$1,200,000**
Hosken South	Full Reconstruction					$300,000	$300,000					$300,000	$600,000		$100,000	**$1,000,000**
Sewell Reserve	Lighting Upgrade					$100,000						$100,000	$100,000			$200,000
Cole Reserve South	Lighting Development						$100,000					$100,000	$100,000			$200,000
Allard Park	Full reconstruction and lighting upgrade							$300,000	$300,000			$270,000	$600,000	$120,000.00		**$90,000**
Allard Park	Lighting Upgrade							$100,000				$110,000	$100,000			**$10,000**
Wylie Reserve	Lighting Development								$100,000			$100,000	$100,000			$200,000
JP Fawkner Reserve	Irrigation / drainage / grass conversion									$300,000		$50,000	$300,000	$ -		**$350,000**
JP Fawkner Reserve	Lighting Upgrade									$100,000		$50,000	$100,000		$50,000	**$200,000**
Campbell Reserve	North and South grounds drainage / levelling and grassing										$300,000	$ 50,000	$300,000	$ -		**$350,000**

Campbell Reserve	Lighting Upgrade										$100,000	$50,000	$100,000		$50,000	$200,000
Total CAPEX (Irrigation and Drainiage)		$400,000	$345,000	$300,000	$300,000	$300,000	$300,000	$300,000	$300,000	$300,000	$300,000	$ 2,240,000	$4,910,000	$280,000	$1,485,000	$7,715,000
Total Lighting Projects		$110,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000			%		
Total Stand-Alone Projects					$1,200,000							Grant Reliance	$2,520,000	33		
GRAND TOTAL		$510,000	$445,000	$400,000	$1,600,000	$400,000	$400,000	$400,000	$400,000	$400,000	$400,000					

APPENDIX 2: CLUB MEMBERSHIP DATA

Australian Rules Football

AFL

2015		Male		Female		TOTAL
		Players	Teams	Players	Teams	
Brunswick Auskick	Auskick	140		8		
	TOTAL	148		8		156
Brunswick Masters	Masters (35+ years)	110	3			
	TOTAL	110		0		110
Coburg Districts Football Club	Auskick	44		6		
	Sub-junior (U6-U11)					
	Junior (U12-U18)					
	Seniors (19+ years)					
	Masters (35+ years)	0		0		
	Indigenous	0		0		
	Disability	0		0		
	TOTAL	44		6		50
Coburg Football Club	Auskick	69		5		
	Sub-junior (U6-U11)					
	Junior (U12-U18)	0		0		
	Seniors (19+ years)					
	Masters (35+ years)	125	3			
	Indigenous					
	Disability					
	TOTAL	194		5		199
Glenroy FC	Auskick	18		2		
	Sub-junior (U6-U11)	50	2	1	0	
	Junior (U12-U18)	170	6	2	0	
	Seniors (19+ years)	80	2	0	0	
	Masters (35+ years)					
	TOTAL	318		5		323
Hadfield FC	Auskick					
	Sub-junior (U6-U11)	18	1	1	0	
	Junior (U12-U18)	63	2	0	0	
	Seniors (19+ years)	75	2	0	0	
	Masters (35+ years)					
	TOTAL	156		1		157
North Brunswick FC Incl. NBJFC	Auskick	49		3		
	Sub-junior (U6-U11)	42	2	3	0	
	Junior (U12-U18)	44	2	0	0	
	Seniors (19+ years)	65	2	25		
	Masters (35+ years)					
	Disability					
	TOTAL	200		31		231
North Old Boys Incl. BJFC	Sub-junior (U6-U11)	83	4	4	0	
	Junior (U12-U18)	96	4	14	1	
	Seniors (19+ years)	101	3			
	Masters (35+ years)					
	TOTAL	280		18		303
Northern Saints FC	Auskick	15		2		
	Sub-junior (U6-U11)	23	1	0	0	
	Junior (U12-U18)	33	3	0	0	
	Seniors (19+ years)	55	2	0	0	
	Masters (35+ years)	30	1	0	0	
	Indigenous					
	Disability	0				
	TOTAL	206		2		208
Oak Park Centrals Auskick	Auskick	58		8		
	TOTAL	58		8		66
Oak Park FC	Auskick	50		8		
	Sub-junior (U6-U11)	35	2	1	0	
	Junior (U12-U18)	107	5	0	0	
	Seniors (19+ years)	57	2	0	0	
	Masters (35+ years)	0		0		
	TOTAL	249		9		258
Pascoe Vale Sports Club	Auskick	39		6		
	Sub-junior (U6-U11)	46		2		
	Junior (U12-U18)	172		21	1	
	Seniors (19+ years)	65		27	1	
	Masters (35+ years)	0		0		
	Indigenous	0		0		
	Disability	0		0		
	TOTAL	322		56		378
St Francis Junior FC	Sub-junior (U6-U11)	0		0		
	Junior (U12-U18)			0		
	Seniors (19+ years)					
	Masters (35+ years)					
	TOTAL	0		0		0
Therry Penola FC	Sub-junior (U6-U11)					
	Junior (U12-U18)					
	Seniors (19+ years)	108	3	0		
	Masters (35+ years)			0		
	TOTAL	109		0		109
West Coburg Football Club	Auskick	41		5		
	Sub-junior (U6-U11)	68	4	2	0	
	Junior (U12-U18)	177	7	1	0	
	Seniors (19+ years)	78	2	0	0	
	Masters (35+ years)					
	TOTAL	364		8		372
	Total senior male/fem	946		52		998
	Total junior male/fem	1810		105		1915
	Total indigenous	0		0		0
	Total disability	0		0		0
	TOTAL	2756		157		2913

AFL

2016		Male		Female		TOTAL
		Players	Teams	Players	Teams	
Brunswick Auskick	Auskick	140		29		
	TOTAL	140		29		169
Brunswick Masters	Masters (35+ years)	110	3			
	TOTAL	110		0		110
Coburg Districts Football Club	Auskick	44		6		
	Sub-junior (U6-U11)	89	4	10	0	
	Junior (U12-U18)	19	2	0		
	Seniors (19+ years)	85	2	0		
	Masters (35+ years)					
	Indigenous					
	Disability					
	TOTAL	237		16		253
Coburg Football Club	Auskick	67		10		
	Sub-junior (U6-U11)	9				
	Junior (U12-U18)	0		0		
	Seniors (19+ years)	65		0		
	Masters (35+ years)	125	3	0	0	
	Indigenous	3		0		
	Disability	25		0		
	TOTAL	294		10		304
Glenroy FC	Auskick	25		4		
	Sub-junior (U6-U11)	92	3	1		
	Junior (U12-U18)	153	7	2		
	Seniors (19+ years)	88	2	0		
	Masters (35+ years)					
	TOTAL	358		7		365
Hadfield FC	Auskick	17		0		
	Sub-junior (U6-U11)	23	1	2		
	Junior (U12-U18)	1	0	0		
	Seniors (19+ years)	72	2	0		
	Masters (35+ years)					
	TOTAL	113		2		115
North Brunswick FC Incl. NBJFC	Auskick	54		15		
	Sub-junior (U6-U11)	28	1	2	0	
	Junior (U12-U18)	69	3	0	0	
	Seniors (19+ years)	73	2	0		
	Masters (35+ years)	0		0		
	Disability	0		0		
	TOTAL	223		17		240
North Old Boys Incl. BJFC	Sub-junior (U6-U11)	162	9	7	0	
	Junior (U12-U18)	114	5	50	2	
	Seniors (19+ years)	72	2	20	1	
	Masters (35+ years)	0		0		
	TOTAL	348		77		425
Northern Saints FC	Auskick	13		1		
	Sub-junior (U6-U11)	38	1	6	0	
	Junior (U12-U18)	98	4	0	0	
	Seniors (19+ years)	64	2	0	0	
	Masters (35+ years)	30	1			
	Indigenous					
	Disability					
	TOTAL	243		7		250
Oak Park Centrals Auskick	Auskick	72		3		
	TOTAL	72		3		75
Oak Park FC	Auskick	38		16		
	Sub-junior (U6-U11)	40	2	1	0	
	Junior (U12-U18)	80	4	0	0	
	Seniors (19+ years)	79	2	0	0	
	Masters (35+ years)					
	TOTAL	237		17		254
Pascoe Vale Sports Club	Auskick	48		3		
	Sub-junior (U6-U11)	73	3	1	0	
	Junior (U12-U18)	132	7	24	1	
	Seniors (19+ years)	75	2	27	1	
	Masters (35+ years)	0		0		
	Indigenous	0		0		
	Disability	0		0		
	TOTAL	328		55		383
Therry Penola FC	Sub-junior (U6-U11)					
	Junior (U12-U18)					
	Seniors (19+ years)	95	2	0		
	Masters (35+ years)					
	TOTAL	95		0		95
St Francis Junior FC	Sub-junior (U6-U11)	32	1	2		
	Junior (U12-U18)	13	1	0		
	Seniors (19+ years)					
	Masters (35+ years)					
	TOTAL	45		2		47
West Coburg Football Club	Auskick	83		15		
	Sub-junior (U6-U11)	108	5	3	0	
	Junior (U12-U18)	102	7	1	0	
	Seniors (19+ years)	75	2	0	0	
	Masters (35+ years)					
	TOTAL	335		17		352
	Total senior male/fem	1107		47		1154
	Total junior male/fem	2043		212		2255
	Total indigenous	3		0		3
	Total disability	25		0		25
	TOTAL	3178		259		3437

AFL

2017		Male		Female		TOTAL
		Players	Teams	Players	Teams	
Brunswick Auskick	Auskick	128		27		
	TOTAL	128		27		155
Brunswick Masters	Masters (35+ years)	110	3			
	TOTAL	110		0		110
Coburg Districts Football Club	Auskick	52				
	Sub-junior (U6-U11)	114	6	16		
	Junior (U12-U18)	42	2			
	Seniors (19+ years)	84	2			
	Masters (35+ years)					
	Indigenous					
	Disability					
	TOTAL	262		16		278
Coburg Football Club	Auskick	72		9		
	Sub-junior (U6-U11)	25	1			
	Junior (U12-U18)					
	Seniors (19+ years)	60	2			
	Masters (35+ years)	84	3			
	Indigenous					
	Disability	25	1			
	TOTAL	266		9		275
Glenroy FC	Auskick	17		6		
	Sub-junior (U6-U11)	75	3	5		
	Junior (U12-U18)	132	5	25	1	
	Seniors (19+ years)	88	3			
	Masters (35+ years)					
	TOTAL	312		36		348
Hadfield FC	Auskick	11		5		
	Sub-junior (U6-U11)	46	2			
	Junior (U12-U18)					
	Seniors (19+ years)	65	3			
	Masters (35+ years)					
	TOTAL	122		5		127
North Brunswick FC Incl. NBJFC	Auskick	42		14		
	Sub-junior (U6-U11)	28	1	2		
	Junior (U12-U18)	69	3			
	Seniors (19+ years)	60	2			
	Masters (35+ years)					
	Disability					
	TOTAL	199		16		215
North Old Boys Incl. BJFC	Sub-junior (U6-U11)	162	9	7	0	
	Junior (U12-U18)	114	5	50	2	
	Seniors (19+ years)	72	3	50	2	
	Masters (35+ years)					
	TOTAL	348		107		455
Northern Saints FC	Auskick	24		5		
	Sub-junior (U6-U11)	48	2			
	Junior (U12-U18)	72	3			
	Seniors (19+ years)	74	3			
	Masters (35+ years)	25	1			
	Indigenous					
	Disability					
	TOTAL	243		5		248
Oak Park Centrals Auskick	Auskick	36		2		
	TOTAL	36		2		38
Oak Park FC	Auskick	32		10		
	Sub-junior (U6-U11)	72	4			
	Junior (U12-U18)	75	3			
	Seniors (19+ years)	54	2			
	Masters (35+ years)					
	TOTAL	233		10		243
Pascoe Vale Sports Club	Auskick	51		9		
	Sub-junior (U6-U11)	105	5			
	Junior (U12-U18)	152	6	62	3	
	Seniors (19+ years)	67	3	60	2	
	Masters (35+ years)					
	Indigenous					
	Disability					
	TOTAL	375		131		506
Therry Penola FC	Sub-junior (U6-U11)					
	Junior (U12-U18)	10				
	Seniors (19+ years)	130	3	25	1	
	Masters (35+ years)	3				
	TOTAL	143		25		168
St Francis Junior FC	Sub-junior (U6-U11)	65	3			
	Junior (U12-U18)	30	1	20	1	
	Seniors (19+ years)					
	Masters (35+ years)					
	TOTAL	95		20		115
West Coburg Football Club	Auskick	82		15		
	Sub-junior (U6-U11)	144	6			
	Junior (U12-U18)	108	6	32	1	
	Seniors (19+ years)	75	3			
	Masters (35+ years)					
	TOTAL	379		47		426
	Total senior male/fem	1021		135		1156
	Total junior male/fem	2205		321		2526
	Total indigenous	0		0		0
	Total disability	25		0		25
	TOTAL	3251		456		3707

Football (Soccer)

SOCCER 2015		Male Players	Male Teams	Female Players	Female Teams	TOTAL
Brunswick City SC	Sub-junior (U6-U11)	59	6	2		
	Junior (U12-U18)	107	6	1		
	Seniors (19+ years)	42	2	0		
	Masters (35+ years)	0		0		
	TOTAL	208		3		211
Coonan's Hill SC	Sub-junior (U6-U11)	19		0		
	Junior (U12-U18)	32	1	0		
	Seniors (19+ years)	0		0		
	Masters (35+ years)	0		0		
	TOTAL	51		0		51
Coburg City FC	Sub-junior (U6-U11)	17		0		
	Junior (U12-U18)	46		0		
	Seniors (19+ years)	21		0		
	Masters (35+ years)	1		0		
	TOTAL	85		0		85
Brunswick Zebras SC	Sub-junior (U6-U11)	143	5	9		
	Junior (U12-U18)	96	5	49	4	
	Seniors (19+ years)	43	3	20	2	
	Masters (35+ years)	2		6		
	TOTAL	286		84		370
Fawkner SC	Sub-junior (U6-U11)	83	7	19		
	Junior (U12-U18)	106	6	43	3	
	Seniors (19+ years)	38		17		
	Masters (35+ years)	1		0		
	TOTAL	228		79		307
Moreland City SC	Sub-junior (U6-U11)	119	9	3		
	Junior (U12-U18)	108	6	1		
	Seniors (19+ years)	29	2	0		
	Masters (35+ years)	1		0		
	TOTAL	257		4		261
Moreland Eagles SC	Sub-junior (U6-U11)	20	2	6		
	Junior (U12-U18)	35	3	0		
	Seniors (19+ years)	39		0		
	Masters (35+ years)	0		0		
	TOTAL	94		6		100
Moreland United SC	Sub-junior (U6-U11)	27	3	0		
	Junior (U12-U18)	52	3	19	1	
	Seniors (19+ years)	43	2	0		
	Masters (35+ years)	4		0		
	TOTAL	126		19		145
Sporting Moreland (Merger North City Lions and Moreland Wolves)	Sub-junior (U6-U11)	48	3	0		
	Junior (U12-U18)	73	6	5		
	Seniors (19+ years)	51	4	12	1	
	Masters (35+ years)	15		0		
	TOTAL	182		17		199
Oak Park SC	Sub-junior (U6-U11)	18	2	4		
	Junior (U12-U18)	26	1	10	1	
	Seniors (19+ years)	15	1	0		
	Masters (35+ years)	2		0		
	TOTAL	61		14		75
Pascoe Vale SC	Sub-junior (U6-U11)	113	9	7	2	
	Junior (U12-U18)	111	9	30	2	
	Seniors (19+ years)	20	2	0		
	Masters (35+ years)	0		0		
	TOTAL	244		37		281
Moreland Zebras SC	Sub-junior (U6-U11)	103	9	24	2	
	Junior (U12-U18)	106		29		
	Seniors (19+ years)	28	2	21		
	Masters (35+ years)	0		0		
	TOTAL	237		74		311
Melbourne Uni Women's SC	Sub-junior (U6-U11)					
	Junior (U12-U18)			4		
	Seniors (19+ years)			80	5	
	Masters (35+ years)			1		
	Indigenous					
	TOTAL	0		85		85
	Total senior male/female	350		157		507
	Total junior male/female	1662		265		1927
	Total indigenous	0		0		0
	TOTAL	2012		422		2434

SOCCER 2016		Male Players	Male Teams	Female Players	Female Teams	TOTAL
Brunswick City SC	Sub-junior (U6-U11)	53	6	1		
	Junior (U12-U18)	127	6	20	1	
	Seniors (19+ years)	35	2	0	1	
	Masters (35+ years)					
	TOTAL	215		21		236
Coonan's Hill SC	Sub-junior (U6-U11)	27	3	0		
	Junior (U12-U18)	30	3			
	Seniors (19+ years)	18				
	Masters (35+ years)	3				
	TOTAL	78		0		78
Coburg City FC	Sub-junior (U6-U11)	31	3			
	Junior (U12-U18)	55	4			
	Seniors (19+ years)	18	1			
	Masters (35+ years)	3				
	TOTAL	107		0		107
Brunswick Zebras SC	Sub-junior (U6-U11)	94	7	7		
	Junior (U12-U18)	147	8	56	3	
	Seniors (19+ years)	43	3	28	2	
	Masters (35+ years)					
	TOTAL	284		86		370
Fawkner SC	Sub-junior (U6-U11)	116	10	9	1	
	Junior (U12-U18)	132	8	40	3	
	Seniors (19+ years)	45	2	15	1	
	Masters (35+ years)	0	1			
	TOTAL	293		64		357
Moreland City SC	Sub-junior (U6-U11)	98	10	2		
	Junior (U12-U18)	126	6			
	Seniors (19+ years)	26	2			
	Masters (35+ years)					
	TOTAL	250		2		252
Moreland Eagles SC	Sub-junior (U6-U11)	10	5	1		
	Junior (U12-U18)	49	5			
	Seniors (19+ years)	42	2			
	Masters (35+ years)					
	TOTAL	101		1		102
Moreland United SC	Sub-junior (U6-U11)	13	2			
	Junior (U12-U18)	41	3	15	1	
	Seniors (19+ years)	49	2			
	Masters (35+ years)	3				
	TOTAL	106		15		121
Sporting Moreland (Merger North City Lions and Moreland Wolves)	Sub-junior (U6-U11)	54	3	0		
	Junior (U12-U18)	72	5	7		
	Seniors (19+ years)	47	3	21	1	
	Masters (35+ years)	2	0			
	Disability					
	TOTAL	175		28		203
Oak Park SC	Sub-junior (U6-U11)	25	2	4		
	Junior (U12-U18)	11	2	15	1	
	Seniors (19+ years)	14		3		
	Masters (35+ years)					
	TOTAL	50		22		72
Pascoe Vale SC	Sub-junior (U6-U11)	110		17		
	Junior (U12-U18)	114		29		
	Seniors (19+ years)	26				
	Masters (35+ years)					
	Disability					
	Indigenous	6				
	TOTAL	255		46		301
Moreland Zebras SC	Sub-junior (U6-U11)	114	9	10	1	
	Junior (U12-U18)	112	6	21	2	
	Seniors (19+ years)	29	2	21	1	
	Masters (35+ years)	2				
	TOTAL	257		52		309
Melbourne Uni Women's SC	Sub-junior (U6-U11)					
	Junior (U12-U18)			4		
	Seniors (19+ years)			78	5	
	Masters (35+ years)			2		
	Indigenous			1		
	TOTAL	0		85		85
	Total senior male/female	361		140		
	Total junior male/female	1761		258		
	Total indigenous					
	Total disability					
	TOTAL	2122		398		

SOCCER 2017		Male Players	Male Teams	Female Players	Female Teams	TOTAL
Brunswick City SC	Sub-junior (U6-U11)	52	7	0		
	Junior (U12-U18)	114	6	17	1	
	Seniors (19+ years)	31	2			
	Masters (35+ years)					
	TOTAL	197		17		214
Coonan's Hill SC	Sub-junior (U6-U11)	25	7	6	1	
	Junior (U12-U18)	31	2			
	Seniors (19+ years)	19	1			
	Masters (35+ years)	2				
	TOTAL	73		6		79
Coburg City FC	Sub-junior (U6-U11)	10	2			
	Junior (U12-U18)	49	3			
	Seniors (19+ years)	19	1			
	Masters (35+ years)	2				
	TOTAL	80		0		80
Brunswick Zebras SC	Sub-junior (U6-U11)	99	10	11		
	Junior (U12-U18)	127	8	54	3	
	Seniors (19+ years)	59	3	35	3	
	Masters (35+ years)	16		9		
	TOTAL	301		108		409
Fawkner SC	Sub-junior (U6-U11)	118	12	18		
	Junior (U12-U18)	148	9	46	3	
	Seniors (19+ years)	35	2	13	1	
	Masters (35+ years)	1		1		
	TOTAL	302		78		380
Moreland City SC	Sub-junior (U6-U11)	82	6	9	1	
	Junior (U12-U18)	117	6	16	1	
	Seniors (19+ years)	22	2			
	Masters (35+ years)	1				
	TOTAL	222		25		247
Moreland Eagles SC	Sub-junior (U6-U11)	18	3	1		
	Junior (U12-U18)	43	4			
	Seniors (19+ years)	34	2			
	Masters (35+ years)					
	TOTAL	95		1		96
Moreland United SC	Sub-junior (U6-U11)	9	3			
	Junior (U12-U18)	26	1			
	Seniors (19+ years)	73	3			
	Masters (35+ years)	3				
	TOTAL	111		0		121
Sporting Moreland (Merger North City Lions and Moreland Wolves)	Sub-junior (U6-U11)	19	1			
	Junior (U12-U18)	35	4			
	Seniors (19+ years)	51	3			
	Masters (35+ years)	18				
	Disability					
	TOTAL	123		0		123
Oak Park SC	Sub-junior (U6-U11)	17	2	3		
	Junior (U12-U18)	17	1	12		
	Seniors (19+ years)	17	1	10	1	
	Masters (35+ years)	4				
	TOTAL	55		25		80
Pascoe Vale SC	Sub-junior (U6-U11)	120	8	13	1	
	Junior (U12-U18)	119	6	58	3	
	Seniors (19+ years)	24	2	2	1	
	Masters (35+ years)	1				
	Disability					
	Indigenous					
	TOTAL	264		73		337
Moreland Zebras SC	Sub-junior (U6-U11)	60	8	21	2	
	Junior (U12-U18)	118	6	29	2	
	Seniors (19+ years)	26	2	20	1	
	Masters (35+ years)	1				
	TOTAL	205		70		275
Melbourne Uni Women's SC	Sub-junior (U6-U11)					
	Junior (U12-U18)			5		
	Seniors (19+ years)			80	5	
	Masters (35+ years)			4		
	Indigenous					
	TOTAL	0		89		89
	Total senior male/female	380		130		
	Total junior male/female	1573		319		
	Total indigenous					
	Total disability					
	TOTAL	1953		449		

Lacrosse

LACROSSE						
2015		Male		Female		TOTALS
		Players	Teams	Players	Teams	
Moreland Lacrosse Club	**Sub-junior** (U6-U11)	4	1	4		
	Junior (U12-U18)	30	3	5		
	Seniors (19+ years)	27	2			
	Masters (35+ years)					
	TOTAL	61		9		70
	Total senior male/female	27		0		27
	Total junior male/female	34		9		43
	TOTAL	61		9		70

LACROSSE						
2016		Male		Female		TOTALS
		Players	Teams	Players	Teams	
Moreland Lacrosse Club	**Sub-junior** (U6-U11)	4	1			
	Junior (U12-U18)	25	3			
	Seniors (19+ years)	30	2			
	Masters (35+ years)					
	TOTAL	59		0		59
	Total senior male/female	30		0		
	Total junior male/female	29		0		
	TOTAL					

LACROSSE						
2017		Male		Female		TOTALS
		Players	Teams	Players	Teams	
Moreland Lacrosse Club	**Sub-junior** (U6-U11)	4	1			
	Junior (U12-U18)	25	2			
	Seniors (19+ years)	30	2			
	Masters (35+ years)					
	TOTAL	59		0		59
	Total senior male/female	30		0		
	Total junior male/female	29		0		
	TOTAL					

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