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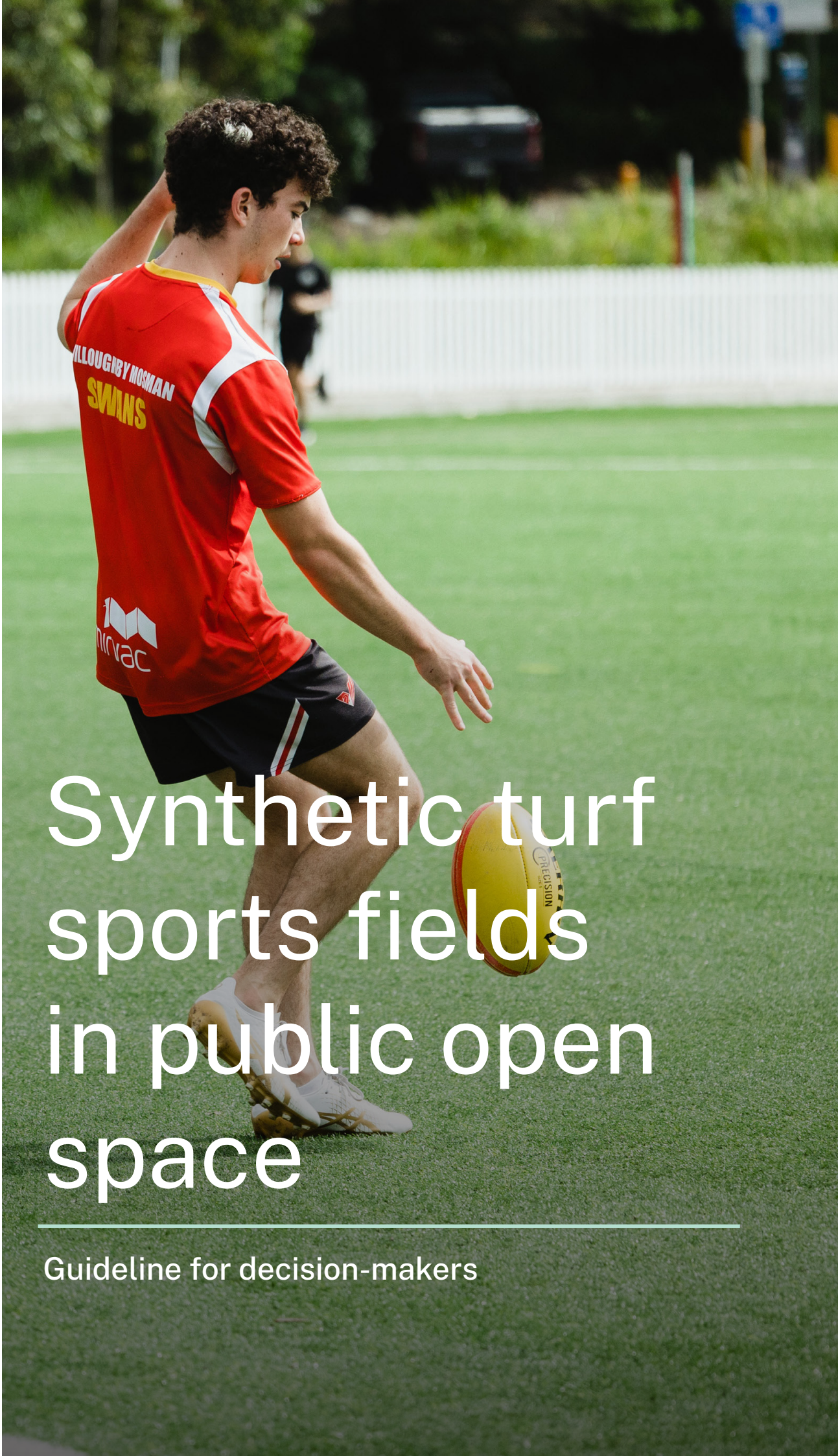

Synthetic turf sports fields in public open space

Guideline for decision-makers

Acknowledgement of Country

The Department of Planning, Housing and Infrastructure acknowledges the traditional custodians of the land and pays respect to Elders past, present and emerging.

We recognise Australian Aboriginal and Torres Strait Islander peoples' unique cultural and spiritual relationships to place and their rich contribution to society.

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Artwork (above) by Nikita Ridgeway

Cover image: Gore Hill Oval, St Leonards, NSW
(NSW Government)

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Introduction

Public open space is the foundation of liveable communities. It is beneficial for community and engagement moments that matter, like festivities, organised sports, informal recreation, and healthy activities. It is a significant component of the identity of a place, reflecting the local community, its heritage and connection to Country. Public open space also plays a significant role in supporting biodiversity, and mitigating the impacts of climate change and urban heat island effect.

It is widely recognised by community and government that public open space, including sports fields, is in high demand. This demand is perpetuated by sustained population growth, changing recreational preferences and the expansion of higher density housing coupled with less private open space, placing greater demand on public open space. Where land for additional public open space is difficult to acquire, alternative solutions and practices are needed to increase the capacity of existing public open space and meet community needs. The increased use of synthetic turf as an alternative to natural grass sports fields in public open space is an example of these alternative solutions.

The use of synthetic turf as a replacement for natural grass sports fields has attracted high levels of interest from a wide range of stakeholder and community groups. Concerns include impacts on the local environment, perceptions of lost open space, and changes to the amenity for the local community.

Alternatively, organised sports groups and users see the value of synthetic turf as a way to meet growing needs and offer consistent surfaces to play on.

Given the ongoing pressure on public open space and the need to adapt to community changes, decision makers need to carefully consider the use of synthetic turf for sports fields in local parks and impacts more broadly on the public open space network. Considerations can include improved maintenance or selection of natural turf type, better design of sports fields, more durable and higher quality materials, better lighting, and the introduction of synthetic or hybrid playing surfaces.

Top image: Kareela Oval, Kareela, NSW.
(NSW Government)

Beaman Park, Earlwood. NSW.
(NSW Government)

When deciding between natural and synthetic turf for sports fields, it is crucial to weigh up factors such as environmental impacts, maintenance costs and community needs. Striking a balance between sustainability and functionality will contribute to the creation of inviting and adaptable public open space that both enhances the wellbeing of community and aligns with long-term goals.

Through thoughtful consideration and consultation, decision makers can ensure their choices align with the values and aspirations of the community, fostering a harmony between nature and innovation in public open space.

Public Open Space Strategy for NSW

NSW Department of Planning and Environment 2022

Public open space is infrastructure that is essential for communities and creating great places to live, and includes parks, natural areas and linkages, waterways and foreshores, informal parklands, sports grounds and courts, playspaces, historical sites, and recreation trails for walking and cycling. It is found in every part of NSW, from regional towns to new suburbs, communities and long-established urban centres. Public open space plays a crucial ecological, social, economic and cultural role in our lives.

The NSW Public Open Space Strategy is a major step to deliver more and better public open space. It sets out a collaborative, coordinated and evidence-based approach to unify planning, investment and delivery.

Decisions for synthetic turf should consider five key objectives within the NSW Public Open Space Strategy that will be achieved through specific, defined and targeted directions which can be adopted across all of Government:

- Better recognition for public open space
- Stronger First Nations involvement
- Coordinated planning governance, policy and funding
- Greater social, environmental and economic value
- Better outcomes for regional NSW

How to use this guide

Developed in partnership with local government, sporting bodies and industry experts this guide is designed to assist those considering synthetic turf as an alternative to natural grass for non-elite sports fields and support the delivery of the best outcome for their community.

The guide focuses on synthetic turf used for sports field purposes only. This guide does not address synthetic turf used in private or residential settings, indoors, streetscapes or playspaces.

The guide includes two key chapters;

- Section 2 'Decision making for sports field surfaces', provides key information, considerations and resources to help inform the decision making process for selecting a sports field surface. This includes the pressures on public open space, the types of surfaces available to meet community needs and the social, environmental, health and economic considerations
- Section 3 'Guide for synthetic turf sports fields' provides advice for projects considering and developing synthetic turf sports fields. It steps through how to achieve best practice when planning, designing, delivering and managing synthetic turf assets

Resources and case studies are also provided to further inform the process.

Stakeholders

This guide has been created to help anyone involved in planning, designing and delivering public open space sports fields. This involves a wide cross-section of stakeholders, including:

- Councils and government agencies
- Landscape architects and designers
- Open space and recreation planners
- Policy makers
- Asset managers
- Community champions
- Non-government agencies
- Construction managers

Previous studies

Independent review into the design, use and impacts of synthetic turf in public open spaces, final report, NSW Chief Scientist & Engineer 2022

The Office of NSW Chief Scientist & Engineer (OCSE) was commissioned to provide expert advice on the use of synthetic turf in public open space in NSW following an initial 2021 study commissioned by the Department of Planning, Housing and Infrastructure.

The 'Independent review into the design, use and impacts of synthetic turf in public open spaces' was completed in November 2022. It presents an overview of key insights and makes recommendations to guide the use of and improve the management of synthetic turf in NSW.

In response to the OCSE report, a NSW Government inter-agency working group prepared the whole-of-government response to the report's recommendations which Cabinet will consider. As those findings progress the outcomes will inform this guideline.

Synthetic Turf Study, NSW Department of Planning and Environment 2021

The Synthetic Turf in Public Open Space Study was produced and noted the need for consistent, statewide guidance to assist councils when considering synthetic turf.

The study recommends potential adaptations to relevant state environmental planning policies (SEPPs) as well as further primary, evidence-based research into the human health and natural environmental impacts of synthetic turf use.

In particular, the study notes the need to analyse:

- The impact of heat on larger fields, and the potential for higher UV reflectivity of synthetic turf
- The appropriateness of natural vs synthetic in bushfire prone areas
- The impact of synthetic materials on human health
- The health and social implications of reduced accessibility for informal enjoyment of public open space

The study recommends consideration of the potential benefits and impacts of the emerging technologies of hybrid and 4G (fourth generation) synthetic technology within an Australian context and research to understand barriers to implementing best practice natural turf fields.

Kareela Oval, Kareela NSW
(NSW Government)

02

Decision making for sports field surfaces

Quality public open spaces make for liveable, sustainable, and healthy neighbourhoods. They provide us with places to exercise, play, rest, participate in social activities, and contribute to healthy, happy, and resilient communities. As NSW experiences sustained population growth and housing density increases, making sure the community continues to enjoy access to quality public open spaces is critical.

Access to quality public open space directly affects participation rates in sport. Participation in sports and active recreation supports people's health and wellbeing, fosters social cohesion, and helps to boost productivity and local economies. Maximising the use of existing sports fields is often the only option for meeting growing demand as there may be no suitable land available to acquire for new sports fields, and the land acquisition costs can be prohibitively high.

Installing synthetic surfaces as an alternative to natural turf sports fields in public open space is one way to meet growing demand and to support greater levels of formal sports participation - synthetic turf fields often allow longer hours of play than natural turf alternatives.

Increased demand

The primary driver of increased demand for public open space in NSW is population growth, with the population of NSW forecast to grow by 85,000 people each year, reaching 9.8 million by 2041.[1]

Population growth is placing pressure on existing public open spaces needing to accommodate increased levels of demand and more diverse community aspirations. In inner city areas, population growth is often occurring in areas already lacking adequate provision of open space.

To accommodate population growth, housing density is increasing, dwelling sizes are becoming smaller and more people are living in apartments with limited or no access to private open space, such as backyards. This means people are increasingly turning to public open space to maintain their physical and mental health and wellbeing , with activities including walking, cycling, dog-walking and formal or informal sports is valuable to local communities.

Top image: Arlington Reserve, Dulwich Hill, NSW.
(Nick Hyde, Dulwich Hill FC)

Petersham Park, Petersham, NSW.
(NSW Government)

Sports fields are a key component of the open space network. Increased population densities are increasing participation numbers in formal sports and demand for fields. At the same time, there is also increasing need for open space to cater for a diverse range of other recreational needs in the community.

In many dense urban areas and areas experiencing housing growth, it can be difficult to provide sufficient parkland for recreation. Finding and acquiring land suitable for sports use is a challenge as there is often a lack of available space, land values are prohibitively high and there are often competing development interests.

Between 2017 and 2022, the number of adults participating in organised sports at least once a week has risen by approximately 160,000 in NSW. Similarly, the number of adults participating in sports at least three times a week has also risen by approximately 120,000, showing a clear need for more sporting facilities, including sports fields. This trend will likely continue as the population of NSW grows.

Furthermore, the number of adults participating in physical exercise (with the most common being recreational walking) has risen by approximately 250,000 between 2017 and 2022, reflecting a need for more public open space.[2]

Greater diversity

The profile of participants in organised sports is also changing. AFL, soccer, rugby, and cricket - once considered male-dominated sports, are seeing a greater diversity of players with an increase in the number of female participants and more participation from people over the age of 35. This broader spectrum of the community participating increases player and team numbers and therefore demand for field access.

Furthermore, the increasing cultural diversity of NSW communities has also driven a change in community preferences and demand for public open space. New communities can have different sport preferences based on their cultural background or prefer to play team sports casually. These needs increase the complexity of open space demand and are often not addressed in current open space design or programming.

Increased and more diversified competition levels also increase the gap between field supply and demand. Some upper competition sports levels can require increased field quality and surrounding infrastructure as well as reduced casual or lower competition access. This reduces the field network supply at the community level and can also limit funding and resourcing for lower competition and community fields.

Finally, sports fields are often used for far more than just formalised sports. They are also places that the community access for dog walking, casual exercise and fitness, picnics, informal and casual team sports and many other activities that can be prohibited on synthetic turf fields.

Constrained field supply

Existing natural turf sports fields in densely populated urban areas frequently do not have the capacity to meet high levels of demand, regardless of the quality of the field. In some instances, clubs turn away potential participants due to a lack of sports field capacity.

Some sports have also begun extending their seasons of play, having a longer pre-season or even playing year-round, resulting in a clash between winter and summer sports that are now competing for the same field.

Poorly constructed and maintained natural turf fields commonly have issues of compaction and inadequate drainage, resulting in a lower quality playing surface and limiting their available hours of use. Well-engineered natural turf fields maintained in good condition can provide significantly higher levels of utilisation than poor condition ones.

Innovative management practices can support greater use of natural turf fields. Strategic lighting to encourage evening use of particular areas of fields and shifting line markings to rotate areas of high wear (e.g. goal area) are an effective way to distribute usage across a natural turf playing field surface. New technologies are also offering facility owners improved data on the status and usage of sports fields, enabling councils to better target maintenance, manage peak use and quiet periods, scheduling, and planning for use.

Hybrid turf and partial use of synthetic turf can also increase durability in natural turf fields. Hybrid turf combines blades of synthetic grass with natural grass or synthetic matting incorporated into the root zone to reinforce the soil profile increasing field durability while reducing use of synthetic materials. In addition, synthetic turf can be used selectively in high wear areas of a sports field such as the goal area.

Capacity

The capacity of synthetic fields to accommodate increased sporting use, compared with natural turf, is commonly cited as the key advantage of synthetic turf. When considering which sporting field surface to use, it is important to understand the real, rather than perceived, level of demand. Strategically planning across a sports field network can allow for strategic targeting of different turf types to suitable locations and use demands.

Best practice natural turf design and maintenance has the potential to improve the capacity of existing natural turf fields to support increased sporting use. Common and affordable practices used to increase the capacity of natural turf are effective and well-maintained irrigation systems, sand slit drainage, re-surfacing and laser levelling.

Preference for synthetic turf

Synthetic turf surfaces are becoming increasingly popular to manage demand. In Australia, several sports traditionally played on grass adopted synthetic turf technologies early including lawn bowls and tennis from the 1980s, and hockey now plays almost exclusively on synthetic fields.

The loss of playable hours on natural turf fields due to wet weather is often cited as a key reason for pursuing synthetic turf sports fields, as it improves sport usability during the winter season when demand is typically at its highest. However, a lack of readily available information on best practice construction and maintenance of natural turf fields constrains decision making on sports fields turf options. See page 22 for most recent guides.

There are community concerns about synthetic turf, including potential polluting effects on air, soil and water from materials and chemicals, adverse effects on thermal comfort, reduced amenity and use for passive recreation, and the impacts of extended hours of use to residents.

Case Study

Gunyama Oval
Zetland / Gadigal Country

Gunyama synthetic sports field was constructed in the high-density urban renewal area of Green Square in 2021. Gunyama Park accommodates both formal sports competitions as well as social, community and accessible sport and recreation activities.

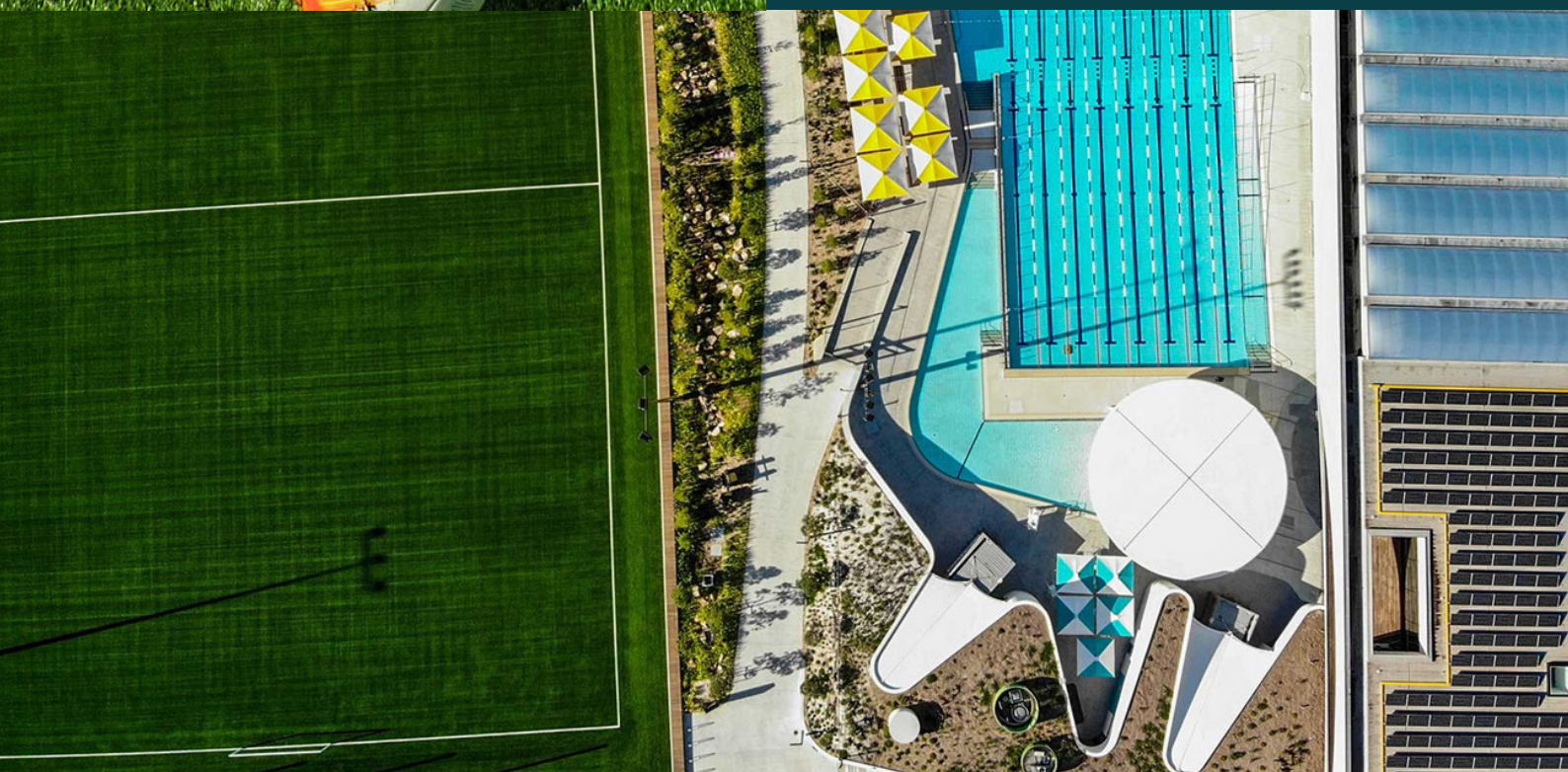
A needs analysis carried out by the City of Sydney to inform the planning for this field identified “there are benefits of providing a synthetic field in this instance, largely due to the high level of demand every day from different types of users, the small space available as well as the ability to use such a field up to 15 hours per day”.

There was little community opposition to a synthetic turf sports field in the proposed location. This may be due to the fields location within a “brownfield”, formerly industrial area, not close to environmentally sensitive areas (e.g. local waterways, national parks) and not replacing an existing natural turf field, displacing other users from the space.

Turruwul Park, Rosebery, was also considered for a synthetic turf sports field by the City of Sydney. In contrast, there was community opposition to the proposal as it would have replaced an existing well-valued green space used for formal and casual sports, and an annual Christmas concert. Ultimately, this field remained natural turf.

Top image: Gunyama Park, Zetland, NSW
(City of Sydney)

Gunyama Oval, Zetland, NSW.
(City of Sydney)



Types of sports field surfaces

The range of sports field turf surfaces has been evolving for almost 60 years. This is a continuously innovating industry with the science providing new options in both natural and synthetic turf. It is important to get independent expert advice when planning and designing public open space sports fields to provide that the most appropriate and up to date options are provided for the site, network, community, environment and budget both for the short- and long-term.

Natural turf

Natural turf is a grass plant field surface that requires soil, sun, water and nutrients for growth. It ranges from a basic untreated soil-based grass field to highly engineered sand-based surfaces used in elite sports settings. Capacity and durability is dependent on the turf species, soil amendments, construction, drainage, irrigation and maintenance regime.

Best practice natural turf for non-elite fields uses existing site soil with applied amendments, drainage, irrigation and maintenance regimes for good turf growth. Engineered sand-based surfaces with profile reinforcement used for elite stadium fields are generally not appropriate for community or local fields as they are high cost, high maintenance assets.

Hybrid turf

A hybrid turf is a union of synthetic and natural materials in a single product which currently has two main types:

Hybrid profile

Where a backing similar to those used in synthetic turf reinforces natural turf growing from the mat. This system combines blades of synthetic grass with natural turf to provide a consistent playing surface. Applied as matting across a field or stitched into an established natural turf profile to improve surface durability and stability.

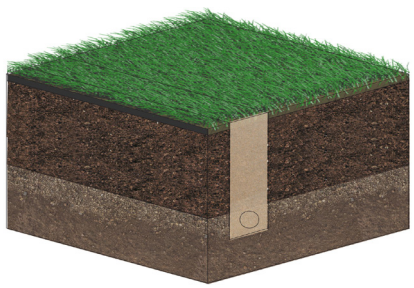
Reinforcement profile

Where natural turf is grown within a base of synthetic turf matting or fibers that does not extend above the growing medium. This improves the durability and stability of natural turf and reduces divots.

Hybrid turf fields are an emerging option that blend elements of synthetic and natural turf together to create fields that are more durable and stable, but may present maintenance and end-of-life issues. Hybrid surfaces are currently used infrequently in NSW, and unless indicated in this guide, should be read as part of synthetic turf.

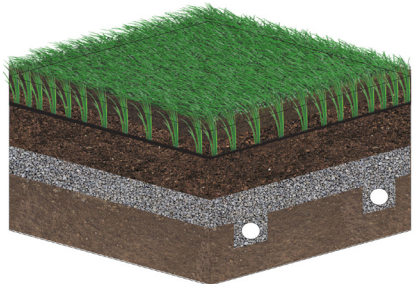
Natural turf

Hybrid turf



- Appropriate natural turf cultivar
- Fully amended top soil min 250mm depth
- Sand slit drain
- Amended subsoil

Diagram 1: Natural turf section



- Natural & synthetic turf
- Open weave matting
- Topsoil
- Gravel
- Drainage pipes
- Subgrade soil

Diagram 2: Hybrid turf section

Synthetic turf

Synthetic turf is made using 100% man-made turf fibres (often composed of polyethylene or polypropylene) stitched into a carpet laid on an engineered constructed base usually including a hard base layer and shock pad. Some synthetic fields have infill materials to help keep the fibres upright and the field functioning properly.

Synthetic turf was developed as an alternative to natural turf to improve durability and play surface consistency, and is used by a range of sport disciplines. This is an evolving industry with emerging technologies creating new or different products. Common synthetic turf types include:

Woven synthetic turf

Woven turf carpet is a non-directional playing surface, designed to provide a consistent surface specifically for lawn bowls.

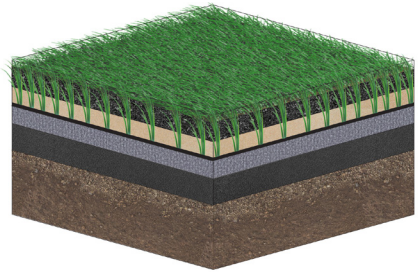
Short pile non-fill synthetic turf

A short pile synthetic turf usually less than 13mm high with no ballast infill, commonly used for cricket pitches and 'wet' hockey pitches.

Short pile synthetic turf

A short, dense pile synthetic turf usually between 13-24mm high with a sand-dressed or sand filled infill ballast to prevent the carpet from moving. Often used for tennis, hockey, multi-use courts and some cricket pitches. Often referred to as *2G synthetic turf*.

Long pile synthetic turf



- Synthetic turf
- Performance infill (Crumb)
- Stabilising infill (Sand)
- Backing system Shock pad
- Porous asphalt
- Subgrade soil

Diagram 3: Long pile synthetic turf section

Long pile synthetic turf

A long pile synthetic turf ranging from 35-70mm high with sand infill keeping fibres upright and crumb infill to fulfil performance requirements. The crumb infill has commonly been rubber materials, with innovation now developing alternatives such as cork and coconut fibre performance infill. Used for football, AFL and rugby fields. Commonly referred to as *3G synthetic turf*.

Long pile non-fill synthetic turf

A long pile synthetic turf ranging from 35-70mm high utilising different yarn blends without performance crumb infill but still meeting performance requirements. These surfaces are in the early stages of development and have not yet been recognised by sport governing bodies. Commonly referred to as *4G synthetic turf*.

Long pile non-fill synthetic turf

Combination turf fields

Combination turf fields are created when natural turf fields are incorporated with hybrid or synthetic turf patches in areas of greater wear, such as at the goal mouth, to improve durability and capacity without needing to upgrade the entire field.

Combination turf cricket field

Surface selection considerations

Selecting a turf field surface is complex and will need to consider a range of aspects, issues and benefits to provide the best outcome for the site, field network, community, environment and budget in both the short- and long-term. Below is some information on the social, health, environmental and economic aspects of natural and synthetic turf field surfaces to help inform decision-making. As this industry is continuously evolving it is also strongly recommended that independent expert advice be sought out when planning and designing public open space sports fields to establish that the most appropriate options are provided for the situation.

Social considerations

Both natural turf and synthetic turf sports fields can be designed, configured and managed in a range of ways to support different levels of performance and user groups, and support positive social outcomes.

Availability and playability

Synthetic turf sports fields are reliable and have good surface quality throughout the year and during wet weather. Synthetic turf sports fields can sustain significant damage or disintegration during extreme rainfall events or flooding, depending on age, siting and condition.

Best practice natural turf can provide reliable playing surfaces even during the winter months. This requires ameliorated top soils and appropriate soil depths, drainage, irrigation, and good maintenance regimes to reduce the impact of excess rainfall on natural turf performance. Poorly located, constructed or maintained natural turf fields can become damaged, waterlogged or unusable during wet weather resulting in field closures and 'lost hours'.

Natural turf sports fields are good in warm and hot weather as they have low radiant heat, with irrigated fields providing a cooler surface temperature than the surrounding air temperature making them comfortable to play on.

Synthetic turf sports fields can become very hot even in warm weather making it uncomfortable and even unsafe to use and play on during summer. They will have 'lost hours' from heat load and the need to protect players.

Capacity

Sports field capacity is the theoretical higher limit of use hours a field can tolerate or is likely to sustain before wear and impact begin to deteriorate the surface and impact play.

Sports fields capacity is complex and various industry information can provide some insight, however, specific use times and total hours per week are dependent on various factors (weather, surface material type, drainage etc) along with physical time-use restrictions throughout an average week.

Councils should consult widely and undertake their own audits and assessments to clearly ascertain the anticipated sports fields capacity likely to be generated

Recovery from use

Rotation from winter sports which is generally high wear to summer sports which is generally low wear provides field recovery time for natural turf fields. Time needed post-winter sports depends on several factors: the amount of wear, soil health, the type of turf cultivar, management practices and user practices (e.g. distributing play/training across the field).

Synthetic sports fields do not need recovery time and have reduced maintenance times compared with natural turf.

However, maintenance and repair regimes for all turf types do require regular field closures and damage to synthetic fields can have more significant impacts.

Flexibility of use

Natural turf sports fields are typically flexible and can be used by different sporting codes with simple modifications such as line marking or mowing heights which can easily be changed.

Natural turf sports fields also cater for more diverse uses that includes organised sporting and passive recreation activities such as picnicing, walking, jogging, and dog walking.

Synthetic turf sports fields are often designed for a particular sport, which reduces the field's flexibility. Line markings are more permanent and pile height and other features are specifically designed for certain codes. For example, AFL, football and rugby all have specified performance features to certify synthetic turf as suitable for their sport.

Access

Access onto and use of synthetic turf sports fields can often be restricted by asset management processes or product warranties to protect the field from damage. This can be due to difficulties recovering a synthetic turf surface once damaged or the high cost of repairs. These restrictions can limit community and casual recreation access to fields.

Many sporting codes have specific sports field and facility requirements as part of their sport conditions especially at higher competition levels. See page 53 for sports resouces. This can include fencing, limiting public access, and permanent goal posts. These infrastructure requirements are not dependent on the field surface type but rather the competition level and the sporting code using the space. These infrastructure requirements can potentially also limit multi-sport use and community and casual recreation access to fields.

Community impacts

The increased capacity of synthetic turf sports fields can support greater intensity, duration and extended hours of use including at night. These changes can impact surrounding residents with;

- increased noise impact and duration,
- extended night-time lighting and
- increased local traffic, congestion and pressure on parking.

The aesthetic of synthetic turf is very different to natural turf and can be perceived as much less attractive. This can impact the perceived social value of the space.

Gore Hill Oval, St Leonards NSW.
(NSW Government)

Health considerations

There are health considerations that need to be considered when choosing a surface option. These can impact physical and mental health and wellbeing in both the short- and long-term.

Heat stress

During very hot summer days in Western Sydney, synthetic surfaces reached average surface temperatures of 70-75°C, compared with 37°C for irrigated natural grass.[3] Irrigated natural turf can have lower surface temperatures than the surrounding air temperature, providing cooling to the space and players. Natural turf also take longer to be affected by extreme heat conditions.

Synthetic turf can have significantly higher surface temperatures than the surrounding air temperature that can impact on player and user comfort even in moderately hot weather. In very hot weather, play can rapidly be cancelled on synthetic turf due to heat stress. Alternative materials for the infill crumb can improve the surface heat temperatures.

Injury

The high surface temperatures of synthetic turf can cause burns, especially to children.[4]

Sports-related injuries may occur on both synthetic and natural turf sports fields with synthetic turf possibly generating greater stress on the players' feet. Good field maintenance regimes for all field types is required to insure player safety.[5]

Noise, glare and smell

Natural turf surfaces provide good levels of noise abatement, reduced glare and UV reflectivity. Natural turf can produce natural odours from soil and mown grass.

Gaseous chemicals are emitted from synthetic turf sports fields in low concentrations. Air pollutants from synthetic turf require more research to determine risks to vulnerable portions of the population and any potential long-term effects.[6] Odours from synthetic turf have been reported to impact the quality of life and experience for players on the field and the local community.

Toxins

Research has suggested that biological pathogens, toxic chemicals, and micro-plastic ingestion are all potential human health risks associated with synthetic materials. The NSW Chief Scientist and Engineer's final report noted that these health risks are likely to be very low, however progressive restrictive measures to limit potentially harmful chemicals in synthetic turf components can reduce unforeseen consequences to health.[7]

Natural turf treatments such as fertilisers, weed control and pesticides can increase risk to human health. These are mitigated by restricting access to fields during application times.

Physical activity

Sports fields for recreation activity is important for physical and mental health and wellbeing outcomes. This includes for organised sports, casual team sports and community recreation. Some activities are better suited to natural turf such as picnicing and community recreation. Others can be equally serviced by either natural or synthetic turf surfaces as long as the field remains accessible to the community.

Reliable access to sports fields is important to provide these benefits. See access and availability issues in the Social Considerations section above.

Connection to nature

Natural turf provides a natural environment that is inhabited by insects, organisms, flora and fauna. These aspects of nature provide people with connection that is shown to provide important health benefits.

Synthetic turf sports fields do not provide the benefits of connecting to nature compared with natural turf.

Coffs Harbour sports facility, NSW.
(NSW Government)

Environmental considerations

The environmental impacts for all sports field surface types need to be considered. The extent of the impacts and whether they can be mitigated will be dependent on the location of the project and the details of the design and materiality of the surface being considered.

Plastic migration

There is no plastic migration associated with natural turf.

Plastic migration from synthetic turf sports fields, particularly into waterways and bushland, is a key concern. There is evidence that both rubber infill and turf fibre blades from synthetic turf fields are found in waterways in NSW. It has been estimated that a synthetic turf field without structures to reduce infill loss will wash tens to hundreds of kilograms of infill per year into stormwater systems or waterways. The amount of turf fibres lost from a synthetic turf field is likely to be in the hundred's of kilograms per year, with the amount increasing for fields near the end-of-life or poorly maintained.[8]

International studies have also found a large difference between the amount of microplastics shed from different types of synthetic turf with weathering and UV exposure.[9]

Soil health

Soil and soil health is the foundation of all ecosystems and underpins all other important environmental assets.

Synthetic turf installation impacts on soil health are usually from compaction, sealing and contamination. The impact of synthetic turf installation on the soil below has not been studied, however research examining soil under impermeable surfaces has found an anerobic environment, which reduces soil health and can increase pathogens harmful to human health.

Weed killers and pesticides used for natural turf treatments can harm soil health, however, the soil is not sealed and remains a living and working part of the ecosystem.

Soil and water pollution

Pesticides, weed killers and fertilisers typically used for maintaining natural turf fields can be a source of water and soil pollution depending on the products used. Fertilisers have been associated with waterway algae blooms.

Chemical and compound leachate and particles from synthetic turf materials and plastics as well as pesticides and fungicides used for maintaining the surface are likely to pollute and contaminate local and surrounding waterways, soils and air as they travel through the environment. However, the highest risk of pollution is during installation and when it is first installed.[10]

Urban Heat Island effect

Irrigated natural turf creates a cooler surface temperature than the surrounding air temperture providing cooling to the field and area.

Unirrigated turf can provide some radiant heat hotter than irrigated natural turf but both are cooler than synthetic turf.

Synthetic turf sports fields can have significantly higher surface temperatures than the surrounding air temperature even in moderately hot weather and will have a significant heat island effect impacts to the surrounding environment. Alternative materials for the infill crumb can improve the surface heat temperatures.[11]

Water use

Natural turf requires more water during the summer months to maintain plant growth and provide fit-for-purpose surfaces. In areas where water is scarce, irrigation can have negative effects on the environment. The ability to irrigate may also be impacted by water restrictions imposed during drought events.

Good quality drainage, smart irrigation and water capture systems can reduce water use requirements while improving natural turf growth, durability and resilience. See page 22, '*Best practice guidelines for natural turf irrigation*', (2024) NSW Govt

Most synthetics require minimal or no irrigation however some surfaces require watering before use.

Carbon footprint

Natural turf areas provide carbon sink opportunities with natural plant CO^2 absorption, while maintenance and renewal processes will create CO^2 emissions.

Synthetic sports fields contribute to CO^2 emissions due to the materials and manufacture of these products and the removal of carbon absorption within the site.

Biodiversity

While natural turf sports fields have reduced biodiversity value, they do provide some habitat and food for local flora and fauna, insects and organisms. Natural turf also maintains soil systems, water and oxygen infiltration. Natural turf pesticides can impact insect populations.

Synthetic turf sports fields remove all biodiversity value within the field site, due to soil neutralisation and removal of plant life. Contamination from synthetic turf materials, treatments and additives also have potential to adversely impact surrounding environments as they travel through the soil and water.

End-of-life

There are significant environmental challenges for disposing of synthetic turf at the end of its 8–10-year life cycle, with no recycling facilities currently available in NSW when refurbishing assets, and therefore requiring removal to landfill. It is purposefully designed to not breakdown quickly, and has the potential to stay in landfill for a significant amount of time after disposal. Synthetic turf can cause chemical leachate from landfill into soils and waterways. There is also potential for pollution during the management of removal offsite due to breakage and crumb content.

There is future possibility to manage this issue, with Victoria recently providing funding for Australia's first synthetic turf recycling hub. This has the prospect for up to 98% recovery of raw material for repurposing and distribution. Also, a circular economy within the synthetic turf industry has been created in Europe.[12]

Natural turf that is removed can be either composted for organic mulch or sent to landfill. Composting will significantly limit the end-of-life environmental impacts. Landfill will require space to house it and may create methane during decomposition. All options will require trucking off site.

Mailand Park, Maitland, NSW.
(NSW Government)

South Park Oval, Chipping Norton, NSW.
(Liverpool City Council)

Case Study

South Park Oval, Chipping Norton / Dhurag Country

Several council-owned sports fields within the Liverpool LGA, used by sporting clubs, exceed 400 players across a week. Council found at the start of 2021's winter season that field surfaces were showing significant signs of wear, which worsened following the flood events in March 2021, washing away soil that had been previously added to the fields to restore them.

To improve the fields playing quality in the short time before the winter season began, Liverpool City Council trialed the installation of hybrid turf sections within the high use sections of the goal mouths of the fields.

Council chose this option due to the fast turnaround of installation. and its relative cost effectiveness ($14,000 to install), compared with the high cost associated with full synthetic turf installation. The hybrid turf patches were installed over 2 days, and the pitch was playable the following weekend.

The response from the local soccer association was positive due to the increased consistency in playing surface quality, and other local clubs lobbied Council to introduce more combination fields.

Given the relative ease of provision, low costs and the reduced environmental and social impacts, this strategy could be an option to meet demand while minimising associated impacts.

Economic considerations

No turf sports field surface type is 'low cost', nor will any surface type perform well without regular maintenance, repair and care. Life cycle costs need to be considered to understand the cost benefit of each surface type including upfront new install, maintenance, repairs, management, end-of-life and replacement expenses and resourcing. Consideration of future climate change impacts also need to be factored into the overall costs.

Economic benefits

The economic benefits of sports fields include health, wellbeing, and environmental resilience outcomes, and attractiveness of the area for business and house buyers. Both natural and synthetic fields provide the health benefits of physical activity if the field remains accessible to the public for community sports and recreation. It is noted that these benefits may be reduced for other user groups not participating in organised sports, and preferring natural turf for their physical activity.

Natural turf fields provide environmental resilience benefits with increased natural landscape and habitat, stormwater infiltration, site cooling and surrounding heat island effect mitigation, limiting climate change impacts.

Synthetic turf fields do not provide environmental resilience outcomes and can add to heat island effect and flood impacts, creating long term climate change costs.

Climate change

Climate change will result in future extremes of flooding, heat, drought and fire risk impacting durability and resilience of both synthetic and natural turf, affecting the performance and costs. Intense rainfall and flood may impact the durability of turf surfaces in the longer term, impacting costs for repairs and replacement.

Increased heat effects also impact all turf fields. For natural turf this may increase irrigation requirements and drought periods may exacerbate this issue. High surface temperatures on unshaded synthetic fields that may reduce playable hours during warmer weather limiting economic benefits and asset cost recovery.

With increased temperatures and drought also comes increased fire risk. Synthetic turf fields may become located within future high fire risk areas increasing risk of damage to the asset.

Capital cost

Well constructed natural turf sports fields consisting of a natural turf surface layer, rootzone top soil layer and sand slit drainage channel and system is typically less than a third the cost of a synthetic turf sports field.

Relative capital costs associated with synthetic turf sports fields can vary depending on site establishment and specifications such as provision of a shock pad and drainage systems.

Maintenance and repairs

Both natural and synthetic turf sports fields require regular and continuous maintenance. These costs and resourcing need to be included in the budgeting for the field. Natural turf requires more maintenance than synthetic turf and includes irrigation, aeration and mowing to sustain a playable surface. Applications of fertiliser as well as ongoing weed, pest and disease management are also needed.

Synthetic turf needs regular cleaning, grooming, and for some topping up the infill material, often requiring specialist skills and equipment. Frequency of maintenance depends on how often the sports field is used and weather conditions. For sand or organic infills, occasional weeding and removing of algae is required. Synthetic turf sports field repair and renewal costs are higher than natural turf as the product will need to be replaced often with specialist skills and equipment. For natural turf, the repairs and renewal will usually be done in-house by land managers with less costly materials.

End-of-life

End-of-life management and disposal can be expensive, and needs to be factored into the lifecycle costs. While design excellence and good maintenance practices can increase the lifespan of synthetic turf products, reducing waste produced, end-of-life disposal costs are still a key issue which must be considered and planned for.

Best practice guidelines for natural turf surfaces

Natural turf sports fields constructed and maintained according to best practice have a high carrying capacity and are cost effective when considering the use and life cycle of the field. Projects undertaken over the last decade to improve construction and management of natural turf fields indicate that significantly more can be done to improve their playability, availability and longevity.

The current key guidelines available are:

Best practice guidelines for sporting fields; A guide for climate-resilient playing surfaces in New South Wales, NSW Govt 2025

The NSW Government has prepared in parallel to this guideline a best practice irrigation guideline for natural turf. This will assist as a best practice guide for government, water utilities, councils, and industry in developing and delivering quality community sporting fields that are water efficient and sustainable.

The performance of turf sporting fields (e.g. water requirements, playing surface quality, carrying capacity and climate resilience) are strongly influenced by a range of technical elements (e.g. soils, drainage, turf variety, irrigation system, climate conditions) as well as processes and decision making during the asset lifecycle (e.g. planning, design, construction, maintenance, budgets). The current performance and water requirements of a field today may be a direct result of decisions made years earlier.

Best Practice Sporting Fields; A guide for turf surfaces in the Lower Hunter, Hunter Water 2023

The most recent guidelines is a comprehensive series of books developed to address the knowledge gap for best practice natural turf fields for deliverers and land managers of sports fields. This was developed as part of an EPA Waste Less Recycle More grant, with Hunter Water commissioning and co-funding the project.

The 7 books cover;

- Defining best practice
- Soils and turf
- Drainage
- Irrigation
- Planning
- Project delivery and
- Maintenance

The guidelines are detailed and discuss real situations with images to help understand decision outcomes. This guide is specific to the Lower Hunter region however a lot of the information is not site specific and is helpful for understanding how to approach the construction, maintenance and repair of natural turf sports fields.

Best practice guidelines for holistic open space turf management in Sydney, NSW Govt 2011

The Sydney Water guideline provides a scientific understanding of best practice natural turf and issues associated with use in the greater sydney area. This analysis provides case studies to illustrate issues and solutions, and is broken into the areas of;

- Soil
- Turf
- Irrigation and drainage and
- Holistic management

Best management practices for sustainable and safe playing surface of Australian Football League sports fields, QLD Govt 2007

This guide provides scientific research into best outcomes for various amelioration, irrigation and other upgrade opportunities for AFL fields in Queensland.

Case Study

Middle Head Oval, Mosman / Borogegal and Cammeraigal Country

Middle Head Oval in Mosman, is used for both formal sports and informal community recreation. It was considered to perform poorly and required extensive re-surfacing each year.

Mosman Football Club and Mosman Swans lobbied Mosman Council to have Middle Head Oval replaced with a synthetic turf surface to expand their programs and enable more play in wet weather conditions. A recreation needs analysis undertaken by Council identified a need to increase the sports field capacity at the site, which a change in surface type offered.

There was significant resistance from local environmental groups as the oval is located in a sensitive harbour foreshore environment and close to bushland. These groups were concerned about the impact of micro plastic pollution on local waterways, within the food chain, and other environmental impacts as well a the loss of public access to field.

In response to community opposition, Mosman Council invested in a complete natural turf redevelopment in 2018, including a new irrigation system for the oval, at a cost of less than $500,000. At the time of construction Middle Head Oval was considered a best practice natural turf oval. The upgraded natural turf sports field now receives 42 hours per week sporting use during winter, as well as informal community use throughout the year, without significant loss of surface quality.

Middle Head Oval, Mosman, NSW.
(Mosman Council)

03

Guide for synthetic turf sports fields

The process of planning, designing, delivering and managing a public open space is dependent on the size, scale, and complexity of the project. It's often iterative, and should always be collaborative, taking into account a broad range of ideas and perspectives. This guide has been developed to assist you through these four important steps that can be reviewed and referenced at anytime through the journey.

Good planning insures that our public open spaces meet current and future needs of communities. Some projects can be complicated and require significant time and resources. Taking the time to plan and design can assure your project is delivered within the budget and time constraints, to a high quality so that it is able to function effectively and efficiently throughout its lifecycle. Engaging stakeholders early promotes transparency, accountability, collaboration, and cooperation.

Proper planning and strong management principles can mitigate risk and protect the safety of the public. Managing public open space becomes less challenging when good practice has been undertaken upfront.

The following section provides guidance through all the project stages for developing open space, and will assist you in creating great public open spaces for your community to enjoy.

Plan

Think about the bigger picture; network planning, facility type, location, diverse and multipurpose uses, management. Speak with the community to find out their needs.

Design

Key project details that need to be considered by decision makers and designers to provide high quality outcomes.

Deliver

Set yourself up for success with a good project brief, management practices, construction and quality control.

Manage

Ensuring lifecycle is built into project longevity, along with ongoing maintenance, monitoring and evaluation.

Top image: Gunyama Park, Zetland, NSW (City of Sydney)

Gore Hill Park, St Leonards (NSW Government)

Plan Design Deliver Manage

The first step will be to consider demand at the local government level – for today and for the future. Any investment in a sporting facility must provide for the community over the long term.

Get in touch with the NSW Office of Sport, local councils, state sporting organisations and consider approaching specialist sport data providers to understand demand or trends for sport in your area, which could influence demand.

It is important when embarking on a synthetic turf sports field project, to understand the complex steps that will need to occur across the project lifespan.

The plan stage can include:

- Strategic planning
- Sports field strategic considerations
- Synthetic turf sports field siting
- Community engagement
- Lifecycle planning

It is critical to recognise that creating a quality space requires long-term commitment to collaborating with different stakeholders.

Engage with the community and stakeholders, and review existing strategies to identify opportunities, shortfalls and gaps for what the community demands of sports fields in your local area.

Planning stage deliverables:

- Strategic review of legislation and planning pathways
- Sports Field Strategy and review of open space and recreation strategies
- Lifecycle business case, establish a budget and identify potential funding sources
- Preliminary site assessments and due diligence studies
- Communication and engagement plan

Who's involved at this stage:

- Local Aboriginal land council or community representatives and landowners
- Council including planners, open space and recreation planners or consultant planners
- Independent sports field specialists.
- Environmental planners and ecologists
- Risk managers.
- Community groups, clubs, local Member of Parliament and other key stakeholders

Strategic planning

Sports field network strategic approach

A sports field strategy is a framework and action plan to guide how council provides well built and maintained sports fields and facilities. Sports field provision needs to consider both the regional and LGA wide network of fields as well as more general recreation and open space needs to provide an equitable and well planned approach to infrastructure and assets.

- Develop a *recreation strategy* and an *open space strategy* to best understand and plan the open space network and infrastructure. From this research a *Sports Field Strategy* can be developed to inform current and future field needs.

- Consult region councils to confirm strategic needs and consider facilities in neighbouring LGAs that may be visited by surrounding residents and any regional-level facilities that could be shared.

The strategy will inform the management of demand with existing assets and consideration of upgrades and new development. This should consider multipurpose fields and facilities to maximise benefit to the community.

Upgrades across the network and locations for future sites should be identified in line with Council's environmental and social commitments. Use a strategic network approach when considering what surface to choose for public sports fields to maximise the cost/benefit and identify appropriate locations.

Strategic and project decision-making for sports field surfaces should:

- Undertake verifiable need and condition assessment audit to validate if existing surfaces can support future requirements
- Understand what fit-for-purpose will mean for different sports and competition levels
- Investigate different surface options and upgrades, their benefits and limitations and a cost/benefit analysis including lifecycle costs to provide best fit for the site and context
- Understand the maintenance and management requirements for the surface type
- Consider community needs and preferences for synthetic turf over natural turf for sports

Open space strategy

An open space strategy provides an understanding of open space supply and demand to identify deficiencies, secure new provision and improve quality through better management. It allows you to prioritise and plan assets, support the case for resources and will help create and protect a network of quality open spaces

Recreation strategy

A Recreation Strategy will identify recreation uses, types and demand in the area as well as plan for future impacts on sporting and field infrastructure for non-elite competitions. It can provide planning to balance infrastructure provision across a range of recreation types and sports to access and equity of use by the whole community.

Recreation facilities include sports fields, courts, skate parks, swimming pools, indoor recreation centres, playgrounds, shared pathways and fitness stations. Devising a strategy (sometimes also considered as part of an open space strategy) will establish a diversity of fit-for-purpose, affordable and accessible formal and informal recreation programs, services and infrastructure. Understand the different requirements for each recreation type. See page 53 for sports resources.

Supporting infrastructure

Many sporting codes have specific field and facility requirements as part of their sport conditions especially at higher competition levels. This can include lighting, fencing, limiting public access, club and change rooms, permanent goal posts, field edge structures and seating.

These infrastructure requirements are not dependant on the field surface type but rather the competition level and the sporting code using the space. Synthetic turf surfaces are often used for higher competition levels. These infrastructure requirements can potentially limit multi-sports use and community and casual recreation access to fields. These issues need to be considered at a strategic field network level to assess the best use and access to facilities for the community.

Sports field strategic considerations

Provision

Start by understanding rates of population growth and change, as well as sports participation and professionalism to understand the benefit of different surfaces.

- Understand the days and times of use, training and play, which may allow for the demand to be spread across existing facilities or may reinforce the need for new or upgraded facilities in particular locations.
- Consider the player-to-facility ratios as different sports will inherently have different space use requirements.
- Speak to the NSW Office of Sport or sporting organisations, or see if the council has its own data through its inventory of sporting facilities and population and player data.

Capacity and availability

Provide analysis to determine the capacity and availability of existing sports field sites. Assess the different options to upgrade these fields to improve capacity and availability including better irrigation and maintenance, best practice natural turf, and synthetic turf G4 and hybrid options.

- Understand the availability of different field surfaces including down time for maintenance and repairs. A synthetic field may remain available after a significant rain event, but use may be reduced during higher temperatures. Comparatively, a neighbouring natural turf field may be closed during wet weather but would receive more play during summer months compared with a synthetic field. A natural turf sports field will be less impacted by rain events and have a greater capacity if it is well-built and well maintained.

Types of field use

Consider the demographic and cultural make up of the LGA both existing and future populations. Certain cultural groups have strong preferences for specific sports, and this should be considered when planning for infrastructure and facilities.

Turf sports fields are used for a number of different activities. These can include sport team training, informal community games, organised sports games at a range of competition levels including grass root community teams through to higher semi-professional games and casual community recreation.

- Consider how the proposal will balance the demands of multiple stakeholders and uses and whether there are alternative solutions for training that can minimise demand.

For many sports, training can take place in a different location or facility to the games, such as cricket nets, off-field warm-up areas or smaller soccer fields.

- Understanding how this and the provision of different facilities across your LGA will help you to fulfil demand more holistically.

Multipurpose fields and shared facilities

Multipurpose synthetic turf fields can be constructed and designed so that the surface is safe and suitable for use by multiple different sports. Table 1 on page 53 provides information regarding sports field turf requirements.

Where fields and facilities can be used by multiple sports codes they provide a larger field network to access. This helps with wet-weather game re-scheduling and provides funding to public open space fields provides benefit to a broad community.

- Consider what proportion a synthetic facility may take up in an existing public open space. Some council policies determine this allocation.

Management and maintenance

Each turf surface type will have different management and maintenance requirements. These need to be considered when planning for sports field infrastructure to secure ongoing budget and resources are available. All turf surface types will also need regular down time for upkeep and repairs.

Synthetic turf fields have warranty and guarantees for the product and materials. These will be conditional on use, maintenance programs, and specialist resources.

- Check what the conditions are and insure they allow for the use and access objectives of the project and are budgeted and programmed for.

Climate change

- Climate change impacts and resilience measures and durability will need to be considered as part of the strategic planning of sports field infrastructure and networks. Future extremes of flooding, temperatures, drought and fire risk will affect the performance of both synthetic and natural turf.

The impact of intense rainfall and flood on the durability of both natural and synthetic turf surfaces will need to be anticipated and planned for in the longer term. These events can also increase the water runoff pollution of synthetic fields as it bypasses stormwater management systems.

Increased heat effects will also impact both natural and synthetic turf fields. For natural turf this may increase irrigation requirements and drought periods may exacerbate this issue. As well, synthetic turf lacks the cooling and latent heat loss of natural turf creating high surface temperatures on unshaded synthetic fields that may not be safe to play on.

With increased temperatures and drought also comes the increased fire risk. Synthetic turf fields may become located in future high fire risk areas increasing risk to the asset.

Synthetic turf sports field siting

Selecting a site for synthetic turf sports fields must take into account the strategic network needs, as well as other site aspects that may impact or be impacted by the development. These include the site and surrounds heritage, cultural values, environmental values and natural disaster risks.

Site analysis and due diligence needs to be carried out to assess if the site is appropriate for synthetic turf assets or if the impacts are irremediable. Assessments need to determine impacts, how impacts can be mitigated, or recommend a more appropriate site is found.

Intensification of use

- Provide appropriate assessment of amenity impacts in the review of environmental factors (REF), including noise, traffic, user numbers, hours of use, light and odour, and if the site is appropriate for the proposal.

Heritage areas

- A *heritage impact statement* should be prepared when a synthetic turf sports field is proposed within or adjacent to a heritage conservation area or listed heritage item, including Aboriginal cultural heritage sites.

An assessment should be made regarding if the site is appropriate for the proposal. This should be included in the REF.

Natural areas and waterways

- Undertake *biodiversity impact assessment* to identify impacts of a synthetic turf project, including impacts of habitat loss, heat and light spill effects, and chemical and compound leachate. The biodiversity impact assessment should consider impacts both within and beyond the project site area included in the REF.

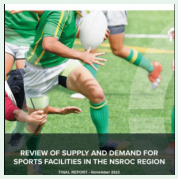
Synthetic turf sports fields proposed in proximity to sensitive ecosystems, natural areas and waterways should be independently assessed and not located in areas of high environmental risk.

- An assessment of the impact of the proposed synthetic turf project, undertaken by an appropriately experienced specialist, should be included in the REF.

Bushfire & flood prone areas

- Undertake risk assessment for bushfire and flood impacts and include in the REF. Synthetic turf sports fields should not be located in bushfire prone areas and areas of higher likelihood of flooding.

Review of supply and demand for sports facilities in the NSROC region



In 2023, the Northern Suburbs Region of Councils (NSROC) updated their strategy which quantified and demonstrated a current and future shortfall in the supply and capacity of sports grounds, finding an increase in supply/capacity of 40% by 2036 (around 120 standard rectangular fields).

This strategic collaborative approach to provision identified actions to increase supply and capacity of sports grounds across 7 LGAs.

Case Study

Tempe Recreation Reserve, Tempe / Gadigal Country

The decision to install synthetic turf at Tempe Reserve was driven by best industry practices and the need for a high-capacity surface. The Inner West Council's Recreation Needs Study and Recreation Strategy highlights the significant capacity issues with an acute shortage of sporting grounds within the Inner West local government area contributing to the overuse of existing natural turf fields. The strategic focus undertaken by Council is to increase the capacity of existing sports grounds to meet community needs and accommodate additional sporting capacity for training and games. The soil profile required removing the top 500mm of high clay sub-soil and reconstructing it to engineers' specifications. FieldTurf 360XL was chosen for its quality, and silt pits with catch bags were installed for water runoff filtration. The field accomodates 41 hours of bookings per week, plus general use.

The synthetic turf installation at Tempe Reserve has been successful, resulting in a well-utilised, multipurpose sports field. Regular maintenance includes weekly inspections, surface cleaning, and quarterly deep cleaning with cork backfilling. The field is accessible to the public as it is not fenced. However, unforeseen issues arose with storm events exceeding the design capacity, causing cork infill to pond on the field. The main users include local football and rugby clubs, schools, and the general public. The project has demonstrated the benefits of synthetic surfaces in high-demand areas, addressing the community's needs effectively.

Top image: Tempe Reserve cricket nets, Tempe NSW. (Inner West Council))

Tempe Reserve synthetic field
(Inner West Council)

Community engagement

Engaging with communities who use or want to use the parks and sports infrastructure provides an understanding of how the community experiences the space now and can in the future.

It is important to engage community throughout the planning and design process. Engagement steps include:

- Prepare an engagement plan for the strategy and project life cycle, from strategic early ideas-gathering to feedback on design proposals. An engagement plan should identify Why you are engaging, What you are engaging about, Who you want to engage with, and How you will engage. The IAP2 Spectrum includes inform, consult, involve, collaborate and empower levels of engagement and can be applied in developing the plan.
- Identify key stakeholders, both end users and non-users, particularly hesitant or concerned groups, and local residents. For example, park users, sports or community organisations, clubs and associations, volunteer groups, schools and local businesses
- Set up a project information page on council and community websites to keep the community informed of project progress
- Include them in the engagement processes to discuss needs, challenges and potential involvement in designing, delivering, managing and maintaining the facility
- Close the loop to let participants know how their input directly impacted decision making and so they feel that the engagement process was transparent and accountable

Lifecycle planning

Lifecycle considerations regarding the delivery, management, maintenance and end-of-life processes of synthetic turf should be planned to manage the overall processes, resourcing and budget impacts of the asset.

Delivery

- Provide high quality construction and materials to insure longevity for the investment into a synthetic turf field. Some materials break down quicker than others reducing the lifespan and increasing potential environmental impacts of the asset.
- Investigate alternative and innovative materials and design that reduce environmental and health impacts such as biodegradable materials.

Management

- Provide good quality infrastructure management that increases field longevity and outcomes while still maximising community benefits.

Maintenance

Maintenance and repairs may need specialist resources or training and need to be programmed to provide good outcomes and minimise impacts on availability.

- Make sure maintenance programs are budgeted and resourced for over its lifespan.

End-of-life

The disposal process will be dependent on the materials the synthetic turf is made of and the facilities available to process disposal at the time. At the moment most materials used in synthetic turf are not biodegradable but can be recycled, however, there are currently no facilities in Australia that manage recycling synthetic turf. Funding has been provided for a synthetic turf recycling hub in Victoria and the project is in progress.

- Research what options are available for your field. Plan for end-of-life disposal as part of the fields Asset Management Plan, see page 47.
- Budget for recycling or disposal costs including trucking to recycling or landfill sites.
- Anticipate and mitigate any environmental impacts that could be caused during the removal and disposal process.

Plan **Design** Deliver Manage

The design stage focuses on the quality, suitability and type of public open space available for recreation and synthetic turf varies from an ideal site through to a challenging site. Ideal sites will have less or no inherent physical, social or environmental challenges while challenging sites will have many.

Challenging sites will require more consultation, design work, controls and mitigations if they are selected for development. The design process needs to incorporate flexibility and involve the community including passive users like parents, carers and spectators and older people. With the right design features, a sports field can become a hub for the community, promoting fitness, connection and an active lifestyle.

The design process can include:

- Division 5.1 assessment
- Site evaluation
- Community engagement
- Materials and innovation
- Synthetic turf options and uses
- Social considerations
- Health and safety considerations
- Environmental considerations
- Stormwater management
- Management and maintenance

Engage with expert advisers and work across council to consider the full project life cycle, including operations and maintenance costs and resourcing, to establish the asset Is it fit for purpose and operational once constructed.

Design stage deliverables:

- Detailed site analysis
- Engagement outcomes
- Review of environmental factors
- Concept design
- Design development
- Costing
- Design risk assessment and management plans

Who's involved at this stage:

- Local Aboriginal land council or community representatives and landowners
- Council including planners, open space and recreation planners or consultant planners
- Landscape architects and synthetic turf design specialists
- Project and design managers
- Civil and structural engineers
- Environmental planners and ecologists
- Quantity surveyor
- Communications specialist
- Risk managers
- Community, groups, clubs and stakeholders

Review of Environmental Factors assessment

Due to the significant change in asset and impacts that a synthetic turf field project brings it will require a Division 5.1 assessment prior to development or approval for development. This requires a Review of Environmental Factors (REF) report and may also require an Environmental Impact Statement (EIS), Species Impact Statement (SIS) and/or Biodiversity Development Assessment Report (BDAR).

These need to be done in accordance with the *Guidelines for Division 5.1 Assessments* and the *Addendum for Synthetic Turf Sports Fields.* The report will need to include but is not limited to:

- All available information relevant to the assessment of the project and its environmental impacts to the fullest extent possible
- Summarised findings of any consultation and technical assessment of the impacts
- A straightforward evaluation of the direct, indirect and cumulative impacts of the project
- Mitigation measures identified to remove or adequately reduce the detrimental effects of the activity
- An end-of-life management plan

NSW Planning approval pathways

Further detail can be found at NSW Department of Planning, Housing and Infrastructure website.

Site evaluation

Location review and analysis

Preliminary site analysis helps with understanding the present condition, site history and general suitability for development or upgrade before more extensive investigations. Check if this work has been done for greenfield or planned sites identified in strategies.

- ☐ Fully evaluate the proposal within the wider sports field network context to evaluate whether the site is appropriate for synthetic turf. Check if the site and the project aligns with the Sports Field Strategy.

Site analysis will provide a review of the;

- Site heritage and history
- Surrounding natural areas and waterways
- Flood and bushfire impacts
- Zoning overlays
- Underground services and easements
- Future climate change impacts and environmental risks

Site aspects may eliminate a location from selection and further investigation, or they may trigger the need for design solutions to mitigate project impacts. Some required design responses may impact the budget and make the proposal financially unviable.

- ☐ Assess the budget implications against the original business case for the proposal.

Site uses and users

Public open spaces are used by diverse communities and groups throughout the day and across the year determining demand and need.

- ☐ Assess the current formal and casual uses and users in the site to understand the benefits and impacts for both current and future populations.

You may need to capture data from bookings, formalised sports or from site visits to capture casual, intermittent or transient users of the space such as dog walkers, people who only use the site on school holidays or weekends and early morning or dusk activities. Increases in population in some areas will influence future demand.

- ☐ Evaluate the current proportion of active and passive recreation against the proposed opportunities to understand impacts of the proposal. There could be major implications if the usage of the site changed, for example from 50/50% active and passive use to 80/20%. Assess if changes are problematic, beneficial or necessary and if alternative options can minimise negative impacts. Some council determine the proportion a synthetic facility may take up in a public open space.

- ☐ Consider the site's landscape features, community values, views and local history to understand what is appropriate for the site context. Consider if the proposal and its impacts will fit with the character of the surrounding area and land uses.

Community engagement

Predesign phase

Site specific community engagement is an important aspect of the design process as the asset is, first and foremost, a community asset in public open space. When researching their needs and preferences ask the community:

- How do they use the space now including for sports and active recreation?
- What do they need and want in the future?
- What are their preferred outcomes?
- How do they think different uses can be accommodated in the site?
- What changes will significantly impact the amenity of the space both positively and negatively? For example, heat, aesthetics, noise, glare and UV reflectivity

- □ Use participatory engagement processes such as onsite walkshops to understand issues, challenges and experiences.

- □ Respect the experiences and knowledge of public open space users as experts in their own lives with insights and knowledge about a place that cannot be researched in other ways.

- □ Make sure all of the community including vulnerable, isolated, under-represented and quiet groups are heard, understood, enabled and represented in the design process.

- □ Provide community with the information and tools they need to participate effectively, and build trust that the time they give to the process will be respected and implemented.

Concept and detail design phase

- □ Inform the community of the project proposal and information is publicly available for comment through the project engagement and development phases regarding the project scope and details.

- □ Provide ongoing updates to inform the community of the process and progress of the project. This can be through Council project webpages, emails to stakeholder groups, on site posters or community information sites.

Materials and innovation

Selecting appropriate materials, infill and synthetic surface application impacts the long-term management and maintenance of the field as well as potential social, health and environmental impacts.

- □ Research or get independent, specialist advice for the latest innovations in materials and design for synthetic turf fields.

Synthetic turf

Synthetic turf is an evolving product with new and different materials, profiles and qualities. There are new materials being used that can provide longevity, better accessibility and multi-sport use or reduce environmental impacts.

- □ Be sure to understand the short-term and long-term impacts of all aspects of the product and materials being specified.

Combination

Combination solutions using synthetic turf in hard wearing areas of a field such as the goal area with the rest natural turf provides an option to address areas of excessive wear. This can lead to a more stable playing surface while reducing the amount of synthetic turf being installed.

Note that management of environmental considerations related to the synthetic turf will still need to be planned and designed for.

Hybrid turf

This system combines blades of synthetic grass within natural turf to provide a consistent playing surface, improved surface durability and stability, providing traction even if natural grass is worn.

However, hybrid turf can impede typical maintenance practices required for natural turf (deep aeration/decompaction), as well as microplastic management required for synthetic turf (unless biodegradable materials are used). The hybrid system is still relatively new to Australia with only a few installations including the Melbourne City Football Club training facility.

Synthetic turf options and uses

Once established that the site and the project is appropriate for a synthetic turf sports field there are a number of details to be considered and researched to provide the best project outcomes. These include the:

- Surface and underlay design and materials
- Surface type useability
- Stormwater management design
- Social, environmental, health and safety mitigation measures
- Climate change impacts
- Field management and maintenance requirements
- End-of-life management

Most sports have requirements for synthetic turf surfaces and performance criteria – obtain this information from the relevant sporting bodies. The surface performance criteria will determine the surface construction profile to provide a consistent surface for the sport.

As well, when considering the synthetic surface type and design provide an understanding of the use and maintenance requirements for that particular surface as they differ depending on the surface type. These requirements can restrict or remove public access, specific sport code uses, require additional infrastructure or specialist maintenance and may not align with the strategic use for this site or has not been budgeted for.

Where fields are catering for use by multiple sporting codes research the most compatible options and surfaces.

- ☐ Seek out independent, specialist advice to determine which sports can use the same surface design.

- ☐ Consider the end-of-life options for the synthetic turf product or materials. Does the manufacturer provide this service and are there facilities for recycling? Does it align with the intent and provisions of the *NSW Waste and Sustainable Materials Strategy* and the *NSW Plastic Reduction and Circular Economy Act 2021*?

Social considerations

Accessibility

Access onto and use of synthetic turf sports fields can often be restricted by asset management processes, sport code conditions and product warranties to protect the field. This can be due to the high cost of synthetic turf field construction and repairs, the competition grade use or the particular product specified. These requirements can potentially limit community and casual recreation access to fields and need to be considered at both a strategic field network and site specific level to assess the best use and access to facilities for the community.

- ☐ Assess if this is the case for your project and if this will impact the project objectives and outcomes, community access and uses. Work with land managers, sports organisations and suppliers to understand the issues and find solutions. Investigate if the restrictions are always necessary and if there are product, design, use or management alternatives that can reduce these restrictions.

Longer hours and lighting

Synthetic turf fields allow for more hours of use, creating the incentive to install lighting and manage longer hours of use into the evening. Impacts from both lighting and longer hours of use need to be managed to limit the impacts on neighbouring residents and the local community.

- ☐ Consider how longer hours of use will create additional noise and traffic, and how it impacts residents and can be mitigated.

Lighting can have a detrimental impact on neighbouring residents but when well designed these impacts can be mitigated very well. To insure a built-for-purpose lighting design provide:

- Community consultation
- Review of the needs of field users including lux levels
- A lighting design and light spill plan
- Options that limit light spill and impacts on residents, fauna and night sky
- Options that limit maintenance requirements and ongoing costs

Health and safety considerations

Heat stress

Synthetic turf absorbs, radiates and reflects heat, impacting users' thermal comfort.[13] Sports Medicine Australia's *Extreme Heat Policy* provides guidance for protecting users from the potentially ill effects of extreme heat in the summer. Peak sporting bodies also provide advice on maximum levels and protocols to follow at various temperatures.

- ☐ Investigate how the heat impacts of synthetic turf fields can be reduced. Consider alternative materials and design layouts. As well, when developing larger or multiple facilities in one location, mitigate the cumulative heat island effects of increased reflection and hard stand areas.
- ☐ Consider evaluating local weather data to determine whether any microclimates in the LGA would provide a location with lower summer temperatures or cooling winds.
- ☐ Manage the impacts of heat with infrastructure such as shaded spectator and player areas, water refill and drink fountains, and appropriate shade tree planting for respite.

Air and aerosols

Odorous and noxious gasses can significantly impact the use and amenity of public open spaces.

- ☐ Understand the materials specified in the synthetic turf proposal, their potential to contain volatile or odorous chemicals or compounds and whether these will impact nearby residents, players and open space users. Investigate opportunities to use alternative materials that reduce the chemicals or compounds.

The National Environment Protection Measure for Ambient Air (Air NEPM) sets national standards for the 6 key air pollutants to which most Australians are exposed: carbon monoxide, ozone, sulphur dioxide, nitrogen dioxide, lead and particles.

Reserve 811, Fyfe Road, Kellyville Ridge
(NSW Government)

Standards refer to maximum concentrations of the pollutants set by Air NEPM. Goals refer to allowable exceedances of these maximum concentrations during a year.

Materials contact

Synthetic turf with loose infill material may pose a risk through ingestion, lodgement, inhalation and skin contact. Develop procedures to limit these risks and provide first aid kits and information.

- ☐ Understand the materials specified in the synthetic turf proposal, and limit potentially harmful chemicals in the turf components wherever possible to reduce unforeseen health consequences.

Injury

- ☐ Establish shock pads are designed for the proposed sports codes the field is planned for and takes into account differences such as tackling rather than trip impacts.

Good field maintenance regimes for shock pads, infill and turf surface will be required to provide player safety over the fields lifetime.

Best practice project management

Best practice projects separate the design process from construction. All sports fields, both natural and synthetic, should be based on best practice performance standards criteria with the design process fully independent of the construction process.

This independence, along with appropriately experienced and qualified design consultants and construction contractors, provides the best advice and quality outcomes to address the unique needs of each project and each site.

Environmental considerations

Plastic migration runoff and walk-off

Synthetic turf fields can create microplastics from infill material and turf fibre shedding and breakage. These elements can migrate off site through both user walk-off and water runoff causing environmental pollution. Designing in preventative measures is essential to mitigate these impacts.[14]

- Research alternative materials that are not as polluting or offer lower environmental risk if polluted such as using cork infill rather than crumb rubber.
- Design localised, enclosed drainage systems and kerbing to control and minimise rain and washing runoff, directing water to microplastic filtration and pollutant traps. The systems should be easy to clean and maintain. See *Stormwater management* below and the Australian Standard technical report SA TR CEN 17519:2021 'Surfaces for sports areas - Synthetic turf sports facilities - Guidance on how to minimise infill dispersion into the environment' for more advice.
- Provide shoe cleaning devices such as brushes or foot wells connected to a filtered drainage system to prevent loose material going offsite. Amenities showers may also need microplastic filtration systems.

Stormwater and flooding

Synthetic turf fields can be significantly impacted by stormwater and flooding events damaging the structure and eroding the infill materials. These materials can then pollute surrounding areas and waterways both directly and via stormwater drains.

- Risk assessment and due diligence research of stormwater on a site is essential to understanding the extent and movement of water, and the probability of flood events. The environmental impacts due to flooding and stormwater will need to be assessed and will inform if a synthetic turf project is feasible and can meet the environmental requirements for the project. In some locations the flood risk will be prohibitive to the development.[15]

Many natural turf sports fields act as retention and detention basins protecting nearby areas from flood events or are in flood prone locations. Locations with these constraints may not be feasible for conversion to a synthetic turf surface.

Bushfire

Polymers used in synthetic turf fibres are classified as easily flammable and can be ignited in bushfire settings. They may also cause additional risks due to toxic gasses and noxious emissions being released once ignited.[16]

Materials used in other layers and the infill vary in flammability – sand reduces heat release rates while crumb rubber in-fill exhibits higher peak heat release rates and flammability. There are currently no ignition or fire testing standards for outdoor synthetic turf experiencing bushfire wind and temperature conditions. Synthetic turf, especially those consisting of rubber crumb in-fill, should not be considered in bushfire prone areas.[17]

Carbon dioxide

The installation, materials and maintenance of sports fields all contribute to carbon emissions. As many councils move towards a more sustainable future consider how the proposal impacts these objectives and how carbon can be offset.

- Assess the contribution of the synthetic turf installation to greenhouse gases through its lifecycle from manufacture to disposal.
- Consider options for materials, construction, lifespan and maintenance equipment that can reduce the carbon impact of the project.

Soil and water health

Soil and water contamination by particles and leachate from synthetic turf materials, treatments and additives have potential to adversely impact surrounding environments as they travel through the soil and waterways.

- Assess the potential impact of the proposed synthetic turf installation on soil and water health by an appropriately qualified and experienced scientist.
- Develop mitigation measures to address soil and water impacts including toxicant filtration.

These could be sand or calcite-rich bases or water sensitive design strategies.

- Consider alternative and innovative materials and treatments that do not impact soil and water heath. These may be biodegradable and/or non-toxic products.

Biodiversity

- Undertake a biodiversity impact assessment to identify potential impacts of the synthetic turf development, including impacts of habitat loss, and heat effects and light spill on fauna. The biodiversity impact assessment needs to consider impacts beyond the footprint of the project site.

- Identify appropriate management measures to reduce impacts such as strategic planting of vegetation around synthetic turf sites and replacement of removed trees.

- Develop a lighting design and light spill plan that identifies how adverse impacts on fauna and biodiversity will be minimised.

Climate change

- Changing climate trends need to be considered in all asset future planning as they impact the durability and resilience of infrastructure and urban ecosystems.

- Future extremes of flooding, temperatures, drought and fire risk will affect the performance of different types of synthetic turf. Consider these future trends and potential impacts when assessing the location, design and lifespan of synthetic turf fields.

- Assess the contribution of a synthetic surface to increased heat at a local climate scale and research mitigation measures. Suggestions include using particular infill, mixing organic components or liquid to the surface and the use or retention of shade where possible.

Trees and shade

Trees provide shade, offer biodiversity benefits and provide natural cooling to the area. Existing trees within the site maybe impacted by the development.

- Seek advice froman appropriately experienced arborist to understand impacts, how they can be mitigated, and the design can be adjusted to maintain healthy growth.

Tree planting, both new and existing, around the perimeter of synthetic turf sports fields especially on the northern, western and eastern edges, can provide shade during summer months and may reduce heat stress to the players and the environment.

- Ascertain the solar aspect to establish shade in summer and sunshine during winter to reduce any potential of algal build up.

- Consider the stormwater impacts of leaf, bark and branch drop onto the field as the stormwater system will need to manage these issues. For new plantings use tree species without aggressive root systems to minimise maintenance and consider engineering solutions such as root barriers or structural root cells to assist in root control.

Gore Hill Oval, St Leonards NSW
(NSW Government)

Case Study

Coffs Coast Regional Sports Hub, / Gumbaynggirr Country

The decision to install synthetic turf at the Coffs Coast Regional Sports Hub was driven by the need for increased field usage and weather resilience. Coffs Harbour's status as a sports city hosting large-scale events required durable surfaces, and synthetic turf allowed for much higher usage compared with natural grass. With frequent wet weather, synthetic turf provides a playable surface year-round, reducing interruptions and increasing participation, particularly for second-tier competitions like the National Premier League.

Strategic planning considerations focused on flood impact, stormwater management, and traffic flow. The synthetic fields were built on a 1.5m-high pad to prevent flooding, and water runoff is collected through the shockpad into a stormwater pit. This complements the natural turf of C.ex Coffs International Stadium, the primary venue for top-tier events, offering a reliable wet-weather backup. While the stadium remains the focal point for premier events, the synthetic fields play a critical role in talent development and regional competitions, boosting sports tourism.

The synthetic fields have proven successful. In the last 12 month period the synthetic turf sports fields have accepted 1624 hours of bookings, averaging at 31 hours per week.

The Gen 3 Ligaturf HB250 surface, with SBR infill and Proplay Sport 23 shock pad, has demonstrated resilience, though improvements in water filtration could be considered for future projects. Maintenance includes grooming three times a fortnight, annual deep cleaning, and top-dressing low areas as necessary (centre corridor, sidelines, penalty spot).

Overall, the synthetic turf has provided consistent playability, supported tourism, and aligned with long-term city planning strategies.

Coffs Coast Regional Sports Hub, NSW.
(Coffs Harbour Council)

Stormwater management

Synthetic turf sports fields have the potential to result in water contamination and adverse impacts on soil health from rubber infill and turf fibre particles, and chemical leachates.

- ☐ It is advised that a stormwater management system be designed by an appropriately experienced and qualified engineer with experience in pollution management systems to provide a high quality system that responds to the site and project needs.

- ☐ Construction should also be carried out by experienced contractors to establish quality outcomes.

Currently best practice stormwater management often includes constructing synthetic turf sports fields with:

- A surrounding solid curb to prevent microplastic loss and overland runoff entering or exiting the field
- An enclosed drainage system that collects all water from the field and surrounds, designed so as not to be overwhelmed by typical rainfall events
- Includes stormwater treatment devices with a minimum 200 micron filter terminal screen size, fitted within the drainage system to collect microplastics as they leave the field
- A system that can also manage leaf litter and other debris that may collect on the field,
- Is easy to clean and maintain
- A resourced and budgeted cleaning, monitoring and regular maintenance plan that can be adjusted to suit field needs and filtration capacity

- ☐ Initial and ongoing device performance should be independently tested and verified, both in controlled conditions and in the field. Such testing undertaken by an appropriately experienced, equipped and independent organisation.[18]

- ☐ Testing should also include regular water sampling downstream of the filtration system for physical contaminants such as microplastics and material dependent chemical analytes.

Also refer to the Australian Standard technical report - SA TR CEN 17519:2021 for more advice.

Management and maintenance

Management and maintenance practices differ depending on the type of surface installed and the manufacturer's instructions and guidelines, warranties and guarantees. These may include conditions of use, maintenance programs, and specialist resources.

- ☐ Check what the conditions of use are and if they allow for the use and access objectives of the project and are budgeted and programmed for the ongoing life of the product.

Common maintenance practices that often require specialist skills to maintain include:

- Grooming (brooming and/or drag matting to lift the fibres)
- Annual treatment for moss and/or algae;
- Weed removal
- Stain removal; regular checking of joints and seams
- Frequent checking of infill levels (for filled surfaces only)
- Six monthly power brushing (to insure the crumb remain mobile and the carpet fibres upright)
- Deep cleaning (depending on usage levels and surrounding environment – if surface contamination is suspected)

Long-term management of the asset will need to be considered as part of the design and the REF assessment.

- ☐ Develop an asset management plan including all required environmental impact mitigation measures, and the end-of-life management plan.

- ☐ If the field is accredited (such as, FIFA accredited), consider annual inspections to maintain this accreditation.

Australian Standard technical report

SA TR CEN 17519:2021 'Surfaces for sports areas - Synthetic turf sports facilities - Guidance on how to minimise infill dispersion into the environment'

Plan Design **Deliver** Manage

In order to deliver a quality project that reflects people's needs and the project objectives, provide high quality research and information. To insure it is fit for purpose, it is important to consider and detail the right decisions prior to construction and embed them in robust construction and procurement documentation. A well-planned and managed project in turn will help provide a smooth procurement and construction process, resulting in a quality project.

The skills necessary to undertake certain delivery tasks are often available within council's staff. However, in certain cases, external expert consultants may be required under the management of a council landscape architect or project manager. The procurement process will require clear briefs with expert advice.

It is important a council communications officer is involved in the project. They can make sure community and relevant stakeholders are well informed and engaged about what is happening with the project.

The delivery process can include:

- Documentation
- Procurement
- Construction
- Built for purpose and quality control
- Establishment period and warranties

This will insure the project delivery aligns with broader project objectives and is built for purpose.

Delivery stage deliverables:

- Detailed design and construction documentation
- Cost review and budget monitoring
- Risk assessment
- Procurement documents
- Construction
- Construction management plan
- Quality control program
- Warranties and guarantees
- Defects inspection report
- Communication with community clubs and stakeholders

Who's involved at this stage:

- Landscape architect or synthetic design specialist
- Civil and structural engineer
- Environmental planner/ecologist
- Project manager
- Council procurement officer
- Council open space planner, project and design manager
- Construction contractor

Documentation

Detailed documentation and specification are vital to the outcome of the project. These should be based on a clear and rigorous design brief, grounded in earlier analysis of the site, impacts, project performance outcomes and objectives.

- Allow for design development and testing to provide the right settings and outcomes for a synthetic turf field including environmental issues and site conditions.
- Establish appropriate supporting specification and technical information is provided. Include clearly detailed processes, testing requirements and hold points.
- Provide high quality detailed design documentation to safeguard the project and construction outcomes and reduce risks through the procurement and construction phases including:
  - Setout for infrastructure, shade, drainage and stormwater capture
  - Materials and finishes detailed for their quality, health, safety, and environmental properties and alternative replacement clauses
  - Drainage and stormwater capture and filtration management details and performance criteria
  - Design for management and maintenance issues

Procurement

- Best practice projects separate the design process from construction by providing independant construction contractors to provide the best advice and quality outcomes.
- Procurement documents should clearly state the performance criteria of the design, site layout, construction, drainage, environmental outcomes and materials to insure design objectives of the project are embedded.
- Provide clear protocols regarding alternative or replacement design, items and materials. Any replacement should clearly perform the same function as well or better than the original.

Construction

High-quality construction and management are essential for robust, sustainable project delivery including investment in high-quality construction governance and communications.

- Involve open space managers, landscape architects or specialist/expert consultants throughout the construction phase to insure the project meets its objectives and is implemented as designed.
- Establish strong and clear communication protocols regarding all changes including to design, scope, layout, placement, materials and items, so that decisions do not adversely impact the project objectives.
- Provide clear conditions and protocols regarding existing trees, planting and soils, including protection from compaction and contamination.
- Consider how environment impacts, such as storm water run-off, will be managed during the construction period. Toxicant pollution risk is greatest during installation or when first installed, therefore, it is recommended that mitigation measures at the site are operational from the beginning of construction.[19]
- Insure health, safety, environment and quality (HSEQ) requirements are agreed with the contractor before works begin. For example environmental outcomes, and quality assurance (QA) documentation.

Built for purpose and quality control

- Establish strong quality control measures and testing to achieve a high quality synthetic turf sports field that is safe and fit for purpose.
- Factor in quality control across production, delivery, risk management and cost.
- Establish selected materials are robust, sustainable, fit-for-purpose and available, including for maintenance in the future.

- Establish hold points for supervising and checking at key design stages including;
  - Set out
  - Tree protection
  - Materials delivery
  - Completion of base works
  - Installation of drainage, and stormwater filtration system
  - Base layer installation
  - Turf installation

- Insure that the construction is executed according to the performance criteria and approved design and documented plans. Any proposed changes by the contractor should be approved by the designer to maintain consistency and eliminate potential risks.

- Obtain the necessary contractor quality control documentation to meet council's requirements and align with the design specifications.

- Establish and carry out a testing program for the project, asset and critical infrastructure with independent specialist oversight and review to insure they perform as described and fulfil the performance criteria.

- Undertake a practical completion walk to identify and effectively manage defects.

Establishment period and warranties

- Synthetic turf projects should require an establishment period of preferably 12 months to allow for a defects period and establishment of maintenance protocols.

Purchasers of synthetic turf fields are covered by consumer guarantees under Australian Consumer Law when buying goods and services. These rights are automatic and continue for a reasonable time dependent on the product or service.

Suppliers for synthetic turf products also have warranty and guarantees for the product and materials. These will vary depending on the supplier and may be conditional on use, maintenance programs, and specialist resources.

- Check what the conditions are and establish they are budgeted and programmed for.

Hefron Park, Maroubra, NSW.
(NSW Government)

Case Study

ELS Hall Park, Ryde / Wallumedegal Country

ELS Hall Park is part of a large 15 hectare public open space area within the Ryde LGA. This area provides formal sports facilities, open grassed areas, playground, picnic facilities and an indoor sports centre. It is identified as a regional open space which supports grass roots and higher level sporting competition. The site is within close proximity to Macquarie Park commercial centre and train station, and is an important space for residents and workers who use the facility for active and passive recreation.

To support increased population in Ryde and changing recreation preferences, Council identified ELS Hall Park as a potential location for a new synthetic turf field. The existing sports fields at ELS Hall Park were accommodating high levels of use. between 37-42 hours a week, and a *Synthetic Surface Action Plan* identified this site as an appropriate location for a new synthetic turf sports field.

In 2017, one of the three sports fields in ELS Hall was converted to a multi-purpose synthetic sports field, replacing an existing natural turf field at a cost of $3 million. It was the first synthetic sports field in Australia to utilise cork instead of rubber for its infill.

Replacing rubber crumb with cork infill has the potential to reduce the microplastic pollution on surrounding ecosystems and waterways including in an extreme weather event, and reduces the field's heat retention.

There was limited community opposition to the conversion of natural turf to synthetic turf at this site. This may be attributable to the:

- Use of cork infill, rather than rubber crumb, reducing potential pollution impacts to surrounding local waterways
- Continued access to two other natural turf sports fields and other public open space amenities at the site, ensuring that non-sporting users are not displaced from ELS Hall Park.
- Extensive strategic planning for ELS Hall Park and the broader sports field network, including community consultation while the *Sports and Recreation Strategy 2016–2026* and *Synthetic Surfaces Action Plan 2016–2026* being drafted and placed on public exhibition.

ELS Hall Oval, Ryde, NSW
(NSW Government)

Plan Design Deliver **Manage**

All synthetic turf sports field projects should align with the strategic recreation plan, regardless of whether it is a proposal to facilitate the development of a club or sporting code, response to user demand, or for other reasons.

Develop comprehensive management plans and regularly audit the site to capture issues early and understand the reasons behind any defects. Often the users themselves discover management issues so a direct line of communication between site users and management is helpful to reduce impacts and management issues.

Users should be provided with information about how to use the facility, encourage broad usage of the site, take responsibility for using the space responsibly and uphold the rules and guidelines.

Regular maintenance and management is crucial to keep the asset working to capacity and manage environmental mitigation measures.

Evaluate completed projects to consider the aspects of safety, user experience, sustainability, community impact, maintenance, social and economical influence for future lessons leant.

The manage stage can include:

- Asset management plan
- Asset maintenance
- Environmental management and monitoring
- Evaluation and reporting

This can insure the asset continues to align with broader project objectives and recreation strategies.

Manage stage deliverables:

- Asset management plan
- Environmental management plan
- Liability management plan
- Risk management plan/operations risk plan
- Space activation and promotion plan
- Emergency response plan
- Maintenance plan
- Evaluation framework

Who’s involved at this stage:

- Open space and asset manager
- Risk manager
- Asset maintenance team
- Community clubs, residents and stakeholders

Asset management plan

Develop an Asset Management Plan for the synthetic turf sports field and assets including:

- Use
- Access
- Hours of use
- Environmental management
- Maintenance and repairs
- Testing and monitoring
- Replacement and end-of-life

Refer to the strategic planning documents and project objectives to insure the management plan reflects and fulfils the intended uses and community outcomes that the field has been designed to deliver. Also include the Section 5.1 assessment requirements for asset and environmental management.

Management and maintenance practices for synthetic turf will differ depending on the type of surface installed. These criteria will have been considered in the early plan and design stages of the project to enable the objectives of the project for access, longevity and performance outcomes.

- ☐ Establish management and maintenance protocols in the management plan that embed the projects performance criteria.

- ☐ Consider the on-going management of heat stress created by the asset and plan for managing the impacts. This should include monitoring the surface temperature levels, providing heat mitigation actions and field closure protocols. Plan how heat mitigation measures and infrastructure, included as part of the project delivery, will be maintained to provide the best outcome.

- ☐ Consider orientation of line markings and goal posts to fully utilise the sports field and provide the planned flexible use by multiple sports.

- ☐ Take care choosing goal posts and other infrastructure, especially if they are removable, as synthetic turf is difficult to repair and replace. Investment in wheelable or easily movable goal posts are recommended. Storage near goal lines is also recommended.

- ☐ Adequately budget for maintenance, repairs, replacement and end-of-life upfront for ongoing life of the asset.

End-of-life will need to have been considered and planned for as part of the Section 5.1 assessment to reduce the environmental impact of the asset. The end-of-life management plan should be consistent with the intent and provisions of the NSW Waste and Sustainable Materials Strategy and the *NSW Plastic Reduction and Circular Economy Act 2021*.

- ☐ Research the current recycling opportunities as they may have changed since the asset was designed or installed. If the preferred end of life option is unconfirmed, a contingency plan should also be prepared.

Asset maintenance

To achieve optimum performance of the synthetic turf field, appropriate maintenance is critical to provide a full lifespan. The installer's guarantee or warranty will usually be conditional on the recommended use and maintenance requirements being carried out.

- ☐ Specialist contractors or staff trained in the required knowledge and skills maybe required to carry out this work.

Common maintenance practices often requiring specialist skills include:

- Grooming (brooming and/or drag matting to lift the fibers)
- Annual treatment for moss and/or algae
- Weed removal
- Stain removal; regular checking of joints and seams
- Frequent checking of infill levels (for filled surfaces only)
- Six monthly power brushing (to insure the crumb remain mobile and the carpet fibers upright).
- Deep cleaning (depending on usage levels and surrounding environment – if surface contamination is suspected)

- ☐ To achieve optimum performance of the stormwater capture and filter infrastructure, regular and appropriate maintenance is critical to establish best practice outcomes.

Maintenance should include:

- Regular checking, cleaning and if necessary replacement of the filter
- Regular cleaning, maintenance and repairs of the stormwater system as required to keep it in good working order
- Inspections of the stormwater system prior to rain events and seasons

Environmental management and monitoring

Managing and monitoring the environmental issues of a synthetic turf asset will be part of the Section 5.1 assessment conditions in which it was assessed.

- ☐ The mitigation measures outlined in the REF will need to be captured in the asset management plan and established as part of an ongoing management and monitoring process.

Office of the Chief Scientist and Engineer recommends that monitoring of the environmental management be done independently by an appropriately experienced and qualified specialist to provide best practice, ongoing outcomes and transparency.[20]

- ☐ Insure an end-of-life plan has been developed to manage the environmental impacts of material disposal. Include updates that research the current recycling opportunities as they may have changed since the asset was designed or installed.

Evaluation and reporting

Ongoing and systematic evaluation of the synthetic turf asset is important to understand and manage this new technology.

- ☐ Allow for data gathering and analysis of both qualitative and quantitative data at regular intervals.

- ☐ Determine what factors you wish to measure and how, when and where the data will be collected.

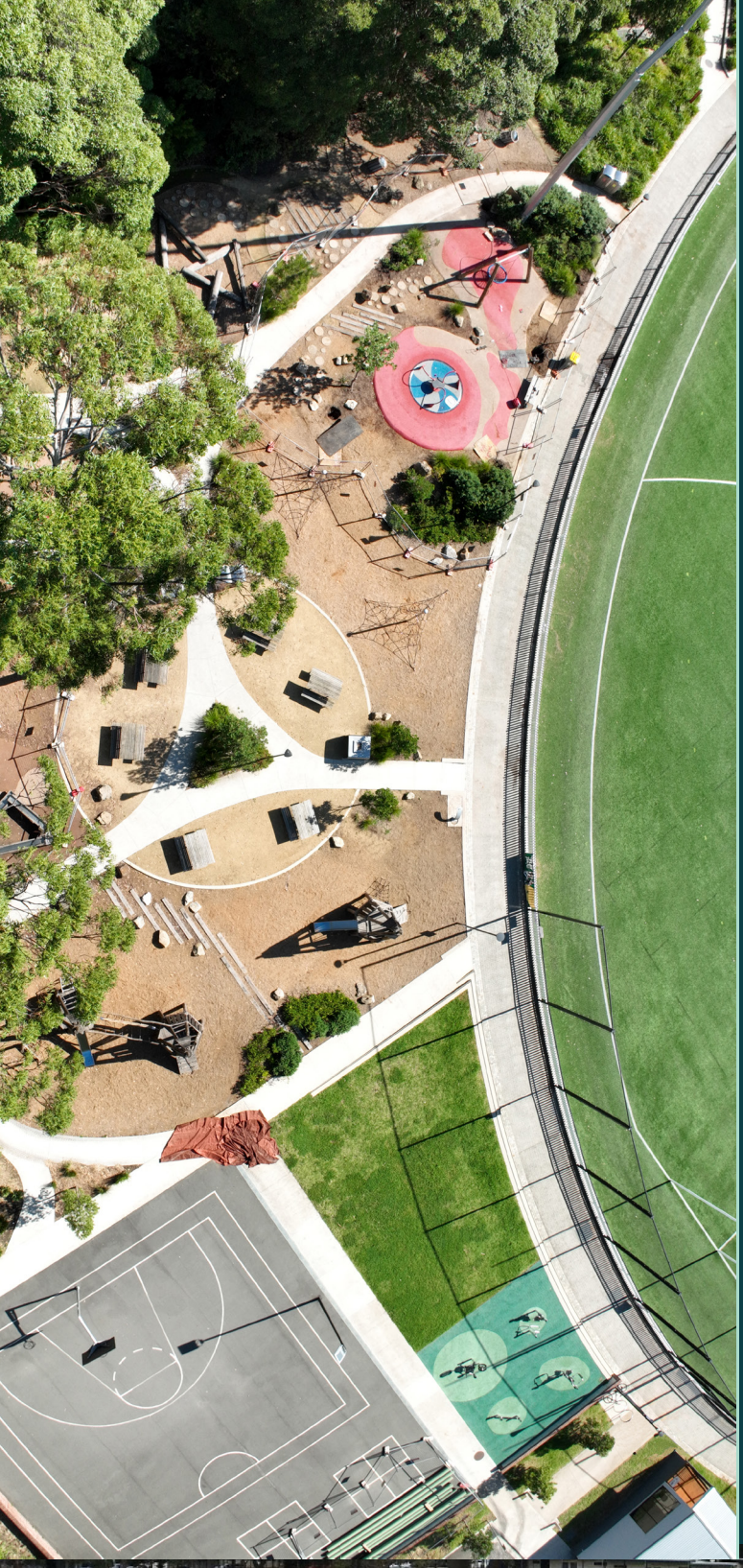
Data can include:

- Community satisfaction
- User numbers
- Activity types
- Hours of use
- Capacity
- Availability including down time due to repairs or weather
- Effectiveness of environmental mitigation systems
- Heat impacts
- Type and number of injuries
- Amount, frequency and cost of management maintenance and repairs

Periodic surveys can monitor and gather feedback on performance. These will range from surveys of the sporting clubs and other user groups to the general public using open space for casual recreation activities. Sports field surveys or data analytic monitors can capture visitor numbers at various times of the year, week and day. It is also recommended to develop effective systems that capture the cost of managing, maintaining and repairing synthetic turf fields over their lifetime.

The NSW Chief Scientist & Engineer final report recommends independent reviews of the asset's financial and governance arrangements between local government and other entities in relation to synthetic turf sports fields.[21] This can provide an open and transparent process to provide balance and public confidence in the management of these public assets.

- ☐ Reporting should summarise what was measured and conclusions of outcomes, successes and failures. Reporting should also provide recommendations for improvements for ongoing management of the asset as well as lessons learnt for future facilities.



Case Study

Willoughby City Council's Synthetic Sportsgrounds Management Plan

Willoughby City Council's Synthetic Sportsgrounds Management Plan 2023 applies to Council's 4 synthetic sports fields and aligns with Council's Our Future Willoughby 2028- Community Strategic Plan and its core principles of sustainability and social justice.

It documents how the facilities are managed and covers:

- Maintenance schedules
- Minimisation of traffic and parking
- Equity of access for local teams and female sport
- Hours of use, including public holiday community use
- Player and spectator code of conduct

The plan balances the sports and club hiring needs of the facilities with the potential social impacts through use of a Community Liaison Contact. This agent, who is easily identifiable to players and residents is present during all periods of competitive play. They are available to discuss any community or visitor concerns, and to resolve or report any parking or conduct issues. The plan also states that the synthetic grounds are not available for competitive hire on major public holidays. The plan is adopted by Council and provides a uniform and comprehensive way to manage their four synthetic sporting facilities.

Top image: Gore Hill Oval, St Leonards, NSW.
(NSW Governmentl)

Gore Hill Oval, St Leonards, NSW.
(NSW Government)

Checklist

The checklist is provided to help users of this guide to move along the different phases to deliver a synthetic turf sports field. This is a list of points in the project timeline that can be considered.

Plan

- ☐ Develop a sports field network strategy. This should be informed by LGA and regional public open space and recreation reviews and strategies.
- ☐ Identify sports code and competition level use across the network and the impacts on access and infrastructure requirements.
- ☐ Identify best outcomes for the community in line with Council's environmental, social, health and safety commitments including surface types and impacts. Refer to the surface selection considerations on page 14, Section 2.
- ☐ Consider provision, capacity, availability, types of use, multipurpose options, management and maintenance requirements.
- ☐ Understand the impacts of climate change and develop resilience measures for the sports field network.
- ☐ Identify locations that can and cannot accommodate different turf surface options especially in regard to flood and bushfire prone areas, natural bushland and waterways and heritage areas.
- ☐ Develop a community and stakeholder engagement plan including local and neighbouring residents, potential user groups, open space managers and staff, and local Aboriginal communities. All have the potential to provide key insights for projects and the strategy.
- ☐ Provide lifecycle planning for all synthetic turf assets from project initiation through construction, site management, and maintenance to end-of-life management.

Design

- ☐ Assess the site's current uses and users and how the project will impact this both positively and negatively.
- ☐ Evaluate the project and location for environmental, social, health and safety impacts created by a synthetic turf field.
- ☐ Is the site within or adjacent to a drinking water catchment zone, flood or bushfire prone area, natural bushland or waterway, or heritage area? Determine if the site is suitable for a synthetic turf field development based on expert advice.
- ☐ Identify mitigation measures to remove or adequately reduce the detrimental impacts and effects of the development including heat stress.

Design

- Develop a project specific Community Engagement Plan that informs the community of the project progress and allows for input and feedback regarding the proposal throughout development.
- Assess synthetic turf field design options to best address the objectives of the project including end-of-life management.
- Investigate alternative materials and innovations that have been developed that could be used in the project. This can be provided by an independent specialist.
- Consider the surface temperature impacts of the synthetic turf proposal and mitigate these issues in the design to reduce potential heat stress and heat island effect.
- Review the warranties, guarantees and Council management and maintenance requirements for different synthetic turf options.
- Review the accessibility opportunities of the project and different synthetic turf options.
- Investigate opportunities for multipurpose fields and infrastructure.
- Engage an appropriately experienced and qualified stormwater engineer to design the stormwater filtration system to capture and filter runoff and walk-off microplastics.
- Develop designs and detailing that address stormwater and asset management and mitigation requirements.
- Review and mitigate the carbon impacts of the development proposal.
- Plan and design for lifecycle, material and maintenance impacts.
- Develop a review of the environmental effects report plus any other required reports for the Section 5.1 assessment.

Petersham Park, Petersham, NSW.
(NSW Government)

Deliver

- Test environmental mitigation measure ideas to establish they behave as predicted.
- Provide detailed documentation and specifications that fulfils the project brief including technical information.
- Procurement documents to provide performance criteria for synthetic turf and environmental management elements.
- Develop clear rigorous change protocols and communications. Establish quality sign-off points for key construction items, materials and phases.
- Establish rigorous quality control and testing program measures to provide high quality and built for purpose.
- Protect existing trees, future garden bed soils and water sources.
- Schedule establishment and defects period of minimum 12 months.

Manage

- Develop an asset management plan including environmental management.
- Prepare a site specific maintenance manual Include synthetic turf maintenance, stormwater capture and filter infrastructure maintenance.
- Provide independent monitoring of the environmental management by an appropriately experienced specialist.
- Plan for consistent maintenance staff to provide high quality asset management.
- Schedule ongoing performance monitioring and reporting. Review performance data for insights that can be used for improvements and upgrades in this or other sites.
- Provide independent reviews of the synthetic turf asset, and the financial and governance arrangements between the local government and other entities.

Glossary

Elite sports fields

Fields which regularly host rounds of one of the various national sports competitions. These grounds are subjected to limited use (up to 50 matches plus 30 training events per annum) and sometimes limited or no open public access.

Heat strain and heat stress

Heat stress is the heat load that a body is exposed to. Heat strain is the physical response to heat stress such as sweating and increased heart rate. If the body cannot manage the heat stress it results in heat-related illness such as heat stroke, exhaustion, cramps or even death.

Hybrid turf

A combination of natural turf (usually ~95%) that is reinforced with synthetic fibres (~5%). This has a higher resilience than natural turf but does not have the capacity of a synthetic turf.

Infill

The fine granular material that sits on top of the 3G synthetic turf but at the base of the fibres. Infill can be comprised of a range of artificial or natural materials.

Natural turf and grass

Natural turf is a grass plant field surface that requires soil, sun, water and nutrients for growth. Grass refers to the plant species, while turf means the whole surface including grass, root mat and soil.

Non-elite sports fields

Fields that host events no higher than regional level, and are commonly used for local competition only. They are often multiuse venues, catering for several different sports across the year. They are subject to much higher use, often in the order of 250 matches plus 150 training events a year, and have no restriction to public access.

REF

An REF is a Review of Environmental Factors report prepared as part of a Division 5.1 assessment prior to development or approval for development.

Soil and soil health

Soil is a living, life-giving natural resource with bacteria, fungi and microbes that is the foundation of ecosystems. Soil health is the continued capacity to function as part of the ecosystem to sustain plants, animals and humans through physical stability, cycling nutrients, regulating water and oxygen, maintaining soil life and filtering pollutants.

Sporting facility, sports fields and fields of play

Areas designed for specific formal sport training, play and competition and includes line marking, goals and sideline areas needed for the conduct of outdoor sports.

Synthetic turf

Turf surface made using 100% man-made fibres stitched into a carpet that is laid on an engineered constructed base often including a hard base layer and shock pad.

2G - Sand-based or sand dressed surfaces with short, dense pile usually less than 24mm.

3G - 35 to 65mm long-pile synthetic grass with sand and crumb infill keeping fibres upright and fulfiling performance requirements. Infill can be a range of artificial or natural materials.

4G - Synthetic grass without infill crumb whilst still meeting all the performance requirements. These surfaces are in the early stage of development. Note, technologies beyond 3G have not yet been recognised by sport governing bodies.

Turf capacity

Sports field capacity is the theoretical higher limit of use hours a field can tolerate or is likely to sustain before wear and impact begin to deteriorate the surface and impact play.

User demand

The assessment of the actual hours of use likely to form the demand for a facility. The actual hours of demand may vary from the modelled capacity and should be considered when comparing the cost benefits of different options.

Sports resources

Peak sporting bodies offer their own guidance and further information on sport specific requirements. Please see list below for current guidance.

AFL: https://www.afl.com.au/clubhelp/club-management/planning/community-facilities-development

Athletics: https://www.athletics.com.au/facilities-equipment/

Cricket: https://smartconnection.net.au/wp-content/uploads/2023/10/Community_Cricket_Facilities_Guidelines.pdf

Football (Soccer): https://footballfacilities.com.au/facility-guides/

Golf: https://www.golf.org.au/courseresources/

Hockey: https://www.hockeynsw.com.au/info-hub/facilities/

Lawn Bowls: https://www.bowls.com.au/wp-content/uploads/2018/09/Bowling_Green_Construction_Guidelines.pdf

NRL: https://www.playrugbyleague.com/media/1941/nrl-preferred-facility-guidelines.pdf

Office of Sport: https://www.sport.nsw.gov.au/community-sport-infrastructure-resource-library/design/outdoor-design

Rugby Union: https://australia.rugby/about/codes-and-policies/all-codes-and-policies

Tennis: https://www.tennis.com.au/vic/theclubhouse/facilities/facility-development

Specifications for synthetic turf sports field surfaces

Each sport has particular turf surface requirements when developing a sports field. All sports can be played on natural turf fields. How the turf is prepared and cared for will need to be adapted for some sports. For example, cricket pitches and lawn bowls are rolled to create a flat, firm surface.

Synthetic turf requirements also vary for different codes however some sports share similar requirements and can share the same field if designed correctly. It is important to get expert advice on these issues to deliver build-for-purpose.

*Table 1 adjacent provides general advice only regarding turf requirements. Final specifications for any synthetic turf project must be confirmed with the appropriate sports associations prior to construction.

Sports Code	Synthetic Turf*
AFL	Longer pile (40-60mm)
Athletics	Super long pile (80-85mm)
Cricket oval	Longer pile (40-60mm)
Cricket pitch & nets	Low Dense Pile (13-15mm)
Futsal/ Five-a-Side	Short, dense pile (13-24mm)
Gaelic Football	Longer pile (40-60mm)
Hockey	Wet Dressed: Short pile (8-12mm) Sand Dressed: Medium pile (20-35mm)
Lawn Bowls	Low Dense Pile (13-15mm)
Rugby League	Longer pile (40-62 mm)
Rugby Union	Longer pile (40-62mm)
Soccer	Varying lengths - Longer pile (40-60mm)

Table 1: Synthetic turf surfaces for different sports codes*

References

1. NSW Planning Portal, https://www.planning.nsw.gov.au/research-and-demography/population-projections
2. Ausplay 2023, https://www.clearinghouseforsport.gov.au/research/ausplay/results
3. NSW Chief Scientist & Engineer, 'Independent review into the design, use and impacts of synthetic turf in public open spaces', 2022, p 38-39
4. NSW Ministry of Health. (2022). 'Health impact of synthetic turf (artificial grass)', 2022,
5. NSW Chief Scientist & Engineer, 'Independent review into the design, use and impacts of synthetic turf in public open spaces', 2022, p 38
6. id, p 44
7. id, p 23
8. id, p 51-52
9. id, p 51-52
10. id, p 21
11. id, p 23
12. Sustainability Victoria, https://www.sustainability.vic.gov.au/projects/australias-first-synthetic-turf-recycling-hub
13. NSW Chief Scientist & Engineer, 'Independent review into the design, use and impacts of synthetic turf in public open spaces', 2022, p 40-41
14. id, p 51
15. id, p 23
16. id, p 24
17. id, p 24-26
18. id, p 61
19. id, p 21
20. id, p 61
21. id, p 61

Project Advisory Group

In developing these guidelines, we received valuable contributions, advice and reviews from a Project Advisory Group of 31 members from 30 NSW councils. We also acknowledge and thank industry experts, sporting groups and other contributors.

Bayside Council
Bega Valley Shire Council
Camden Council
City of Canada Bay
City of Canterbury Bankstown
Cumberland City Council
Fairfield City Council
Georges River Council
Gunnedah Shire Council
Hornsby Shire Council
Hunters Hill Council
Inner West Council
Ku-ring-gai Council
Lake Macquarie City Council
Liverpool City Council
Murray River Council
City of Newcastle
Northern Beaches Council
Penrith City Council
Port Macquarie Hastings Council
Randwick City Council
City of Ryde
Snowy Valleys Council
City of Sydney
Tamworth Regional Council
Tenterfield Shire Council
The Hills Shire Council
Waverley Council
Wollondilly Shire Council
Wollongong City Council

Centennial Parklands, Sporting Precinct, Moore Park, NSW.
(NSW Government)