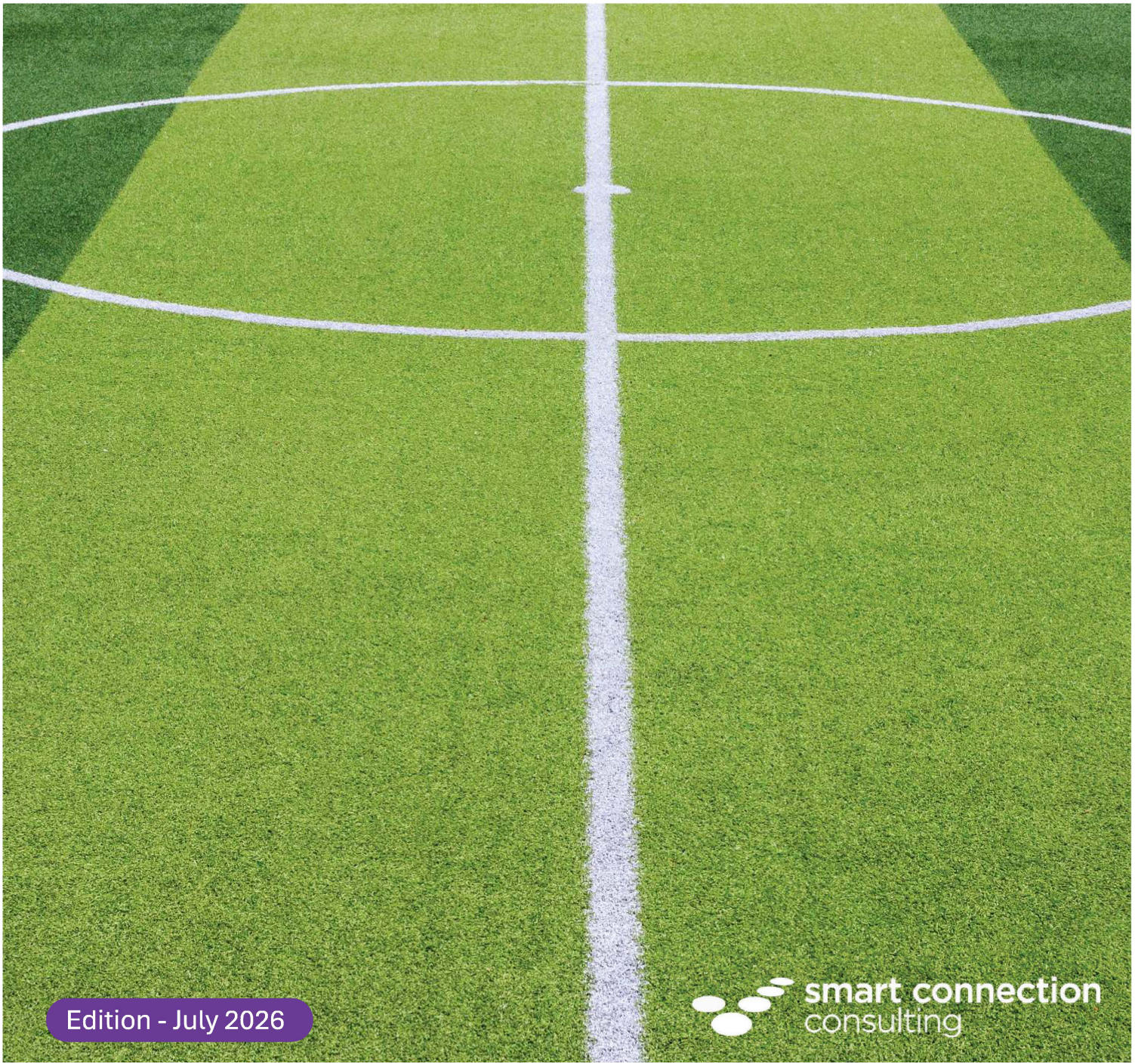
SPORTS&PLAY
INDUSTRY ASSOCIATION LIMITED

SYNTHETIC SURFACES

FREQUENTLY ASKED QUESTIONS

Perceptions, challenges and reality



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smart connection consulting

Synthetic Surfaces FAQ

Purpose and Context

There are community groups or alliances that have expressed concerns about the use of non-natural surfaces for sport and may not appreciate the full technical research around some of their concerns. This section addresses their concerns and typical questions and explores the reality and how any mitigations can be embraced to reduce risk to the environment or people using the surface.

Perceptions, Challenges and Reality

1. **Is water polluted from the synthetic surface with leaching and heavy metals?**

This should not be the case. Synthetic fields with recycled car tyres, crumbed/SBR, are often identified as causing leaching into the local water system and environment, but this is unlikely on quality synthetic fields.

There has been significant research globally on the impact of recycled SBR on local ecosystems. These research projects, including those representing the California Environmental Protection Agency, the Norwegian Institute of Public Health, the French National Institute of Environment and Risk, and Auckland Council, all have similar conclusions.

The conclusions are best summarised by the Swiss Study by the Ministry of Environment, Traffic, Energy and Communications. The study was on the Environmental Compatibility of Synthetic Sports Surfaces, which explored the secretion of synthetic surfaces from disintegration by UV radiation, mechanical destruction by abrasion, diffusion of ingredients and washing off by rainwater.

The testing was in a controlled environment with rain washing through the synthetic and natural turf systems over a two-year period, then collected and measured for the secreted substances. The report summarises there is no risk for the environment from Poly Aromatic Hydrocarbons, PAH's, or heavy metals including Mercury, Lead, Cadmium, Chromium, Zinc and Tin, which were all lower than the required European safety levels.

Contemporary synthetic grass only uses organic infills, which have no PAH's or heavy metals.

The new European Standard, EN 15330-5 Surfaces for sports areas – Synthetic turf and textile sports surfaces – Part 5: Specification for infill materials, addresses the possible toxicology of infills by:

- Polycyclic aromatic hydrocarbons (PAH), content.
- Migration of chemical elements through accidental human digestion.
- Leaching of chemical elements through immersion in water.

These standards should be adopted in all Australian specifications moving forward, as Smart Connection Consulting has been for a number of years.

2. **Are heavy metals from the grass colouring dangerous to the environment?**

Historically, Lead Chromate was used for pigment colouring in yarn, and after research was conducted in 2008, the use of Lead Chromate as a pigment for the grass was stopped in 2009 for all sports turf on a voluntary basis by all the major manufacturers.

The European standards require infills to satisfy the thresholds of CEN/TS 16384:2021 Annex A; EN 12457-4, tables 6 and 7, mainly:

- Mercury ≤ 0.001 mg/l
- Lead ≤ 0.025 mg/l
- Cadmium ≤ 0.005 mg/l
- Chromium ≤ 0.008 mg/l
- Zinc ≤ 3.0 mg/l
- Tin ≤ 0.04 mg/l

It is recommended to mitigate any perception of environmental impact that synthetic systems that are procured should therefore meet these, or the alternative standard.

In addition, we recommend adopting the Category 3, Table 1 of EN71.3:2019 – A2 IN 2024, Safety of Toys – Part 3: Migration of Certain Elements. In the US, the equivalent is ASTM F3188-16. Both the European and US alternative standards measure the possible heavy metal migration of material that may be hazardous if ingested. We recommend that all turf procured in Australia adopts this standard.

3. **Isn't the carbon footprint impact greater with synthetic grass?**

Concern has been voiced that the reduction of natural grass by the synthetic sports surface reduces carbon sequestration, with the loss of natural grass. This is true, and the greenhouse gases calculated as part of research by Carbonneutral.com.au states that:

- Natural grass generates -2T CO^2
- SBR infill for synthetic turf -89T CO^2
- EPDM infill -118T CO^2
- TPE infill -180T CO^2

That said, with the next generation of planning, the EU has dedicated that all products need to now be able to demonstrate their carbon and environmental footprint.

In Australia, it is recommended that the key approaches to lowering the environmental footprint include:

- Consideration of the whole-of-park environmental footprint, and not just the field-of-play surface.
- Expansion of the tree canopy for the whole park.
- Retain as much of the natural grass and fauna on site, e.g. spectator mounds, or reshaping of parkland.
- Ensure circular economy products are chosen.
- Embrace green engineering for the construction of the sports surface, pathways, etc.

- Water harvest the rainwater from the surface to water the whole parkland.
- Utilise as much recycled content in the performance surface and civil engineering solution.
- Utilise organic infill for the sports fields.
- Embrace heat-reduced technology for sports surfaces.

Adopting these strategies can increase and improve the environmental outcomes of a parkland, especially with reduction of the environmental footprint impact.
Manufacturing locally in energy-efficient factories will have a significant impact.

4. **Do synthetic turf fields create a significant urban heat island impact?**

The urbanisation of Australia has radically transformed environments from native vegetation through farmland to present-day urban footprints of towns and cities with urban sprawl. Away from the coastal areas, where the natural land receives a moderating influence of cooling sea breeze, population heartlands in urban areas are now showing Urban Heat Island effects.
Urban surfaces such as roads and roofs absorb, hold, and re-radiate heat, raising the temperature in urban areas. This effect is often worsened by development activity when green spaces are replaced with more hard surfaces that absorb heat.
This Urban Heat Island, UHI, shows that the area is significantly warmer than its surrounding rural areas due to a number of direct and indirect causes, including:

- Absorption of short-wave radiation in concrete, asphalt and buildings, and then slow release during the night.
- Change in surface materials which do not have evapotranspiration properties, e.g. concrete versus grass vegetation.
- Dark-coloured surfaces that retain heat during the day and release it at night, e.g. asphalt.
- Increase of carbon dioxide through increases in traffic pollutants and people, with reduced trees capturing carbon dioxide in cities.
- Use of building materials, pavements and roofs has significantly different thermal bulk properties and surface radiative properties, e.g. shade and evaporation. Also, high buildings normally reduce wind penetration, which also acts as a coolant and assists in the disbursement of pollutants.

The NSW Chief Scientist and Engineer stated in her report, 2023, that the impact from synthetic sports fields is likely to be very low and localised. That said, we should still be looking at how this small impact can be elevated through good design planning.
This can include the adoption of initiatives such as:

- Expansion of tree canopy around the field of play to provide shade and greater tree evaporation to cool the area.
- Water harvesting to use on the rest of the parkland.
- Use of organic infill as opposed to black rubber infill.
- opportunities.
- *Procurement of a dual-yarn technology system, monofilament and tape, to reduce the heat impact.*
- *Increase of landscape performance to offset any reduction of natural grass.*
- *Create shaded areas around the field of play.*
- *Placement of the fields and UHI strategy can create a positive impact here.*

5. **Do synthetic surfaces create heat stress on a player?**

A key component of many community concerns is the heat of non-grass surfaces, which on warm or sunny days increases greater than on most wet fields. The heat on concrete or asphalt sports courts is significantly warmer, where the UV radiation is high.

Synthetic grass also has a propensity to get warmer if using a black infill. All these surfaces lack the water component of natural grass, when it is watered and not dried out.

The industry has invested significantly over the past decade in the manufacturing of heat-reduced acrylic surfaces, heat-reflected grasses and lighter-coloured rubber surfaces that do not absorb the heat as much.

In Australia, the industry has been introducing innovations for a number of years, including:

- Cool grass technology, 5% reduction of heat.
- Acrylic coating heat technology, 30% reduction in heat, for hard surfaces.
- Use of dual-yarn grass technology, FIFA heat index reduced by a 0.5 score.
- Organic infill, as opposed to rubber/plastic, 30% reduction in heat.
- Shade sail over smaller areas, e.g. bowls areas, courts, etc., have been found to reduce heat by 30% on high UV days.
- Vertical draining on grass systems allows the base to stay moist longer, and by reverse osmosis, the infill and carpet stay a little cooler.
- Tree canopy near to the surface provides shade and the leaves' evaporative cooling effect helps.
- Water harvesting into wetlands close to the surface helps, especially if the sports surface is down-wind of the wetlands.
- Water on hockey fields.

It is important to consider heat stress as a holistic approach for weather stress. In the same manner that owners of natural grass fields have to close many grass fields in wet weather to protect both the field of play and the players, it may be similar to consider a similar approach for synthetic surfaces.

Whether that is rubber athletic tracks, acrylic tennis/netball/basketball courts, or synthetic grass hockey/football codes, a heat policy by the sport is normally used to determine an appropriate level of heat and humidity for people to play in.
Sports Medicine Australia produces a Hot Weather guideline that has been adopted by many sports in the development of their own Heat Policies.

It is recommended that, to reduce heat stress on players at the planning and design stage, strategies such as the ones listed below are considered:

Design and Plan to Cool the Created Environment

- Ensure that the design integrates into the broader environment to create opportunities for additional cooling designs, including additional trees, water harvesting into wetlands, etc.
- Explore green engineering technology and blue and green infrastructure building methods into each project.
- Explore how the drainage strategy can replace water into the soil as opposed to stormwater, to keep the ground close to the field moist.
- Develop light-coloured paths, rooves and other hard standing areas to reduce the propensity to capture heat radiation from the normal black surfaces.
- Landscaping to reduce solar radiation.
- Encourage innovation from the contracts to drive opportunities.

Cool with Green Space and Water

- Invest in water harvesting and keep as much water on site for alternative uses.
- Increase the tree canopy in the area around the parkland to provide both shade and other green benefits to the environment.
- On hockey surfaces, use water cannons to help with speed of play and heat reduction.
- Include water bubblers around the field to reduce heat impacts on players.
- Use water-sensitive urban design, WSUD.
- It is recommended that the infill surface temperature during exposure to infrared energy is measured against the EN 15330-5 standard and procure systems with a Class 1, below 50°C, or Class 2, 50–65°C rating.

6. **Are intentionally added microplastics from synthetic fields dangerous to the environment?**

Microplastics is a term commonly used to describe extremely small pieces, less than 5mm in all directions, of synthetic or plastic material in the environment resulting from the disposal and breakdown of products and waste materials.
The concern around microplastics centres on their potential to cause harm to living organisms in the aquatic and other land-based environments.
There are two forms of microplastics:

- Intentionally added microplastics.
- Secondary microplastics.

The intentionally added microplastics are the SBR/crumb rubber that was historically used as infill for 3G grass, or rubber on the top of athletics tracks or playground soft-fall areas. The secondary microplastics are seen with ageing of the fields, as the end of the grass yarn breaks off.

The European Commission received a report, DG Environment, in February 2018, which explores this in detail and provides the most extensive study to date. It specifically explores synthetic sports surfaces as part of a broader sector of microplastics.
Synthetic fields are “a relatively small source”, as shown in the table below.
The migration of microplastics off the field of play into waterways of the adjacent soil is the concern of the community. This can be addressed simply by a number of design considerations, namely:

- Do not use and intentionally add microplastics — use organic infill for 3G fields.
- Design a subsurface drainage system so that no microplastics can enter the waterways through the drainage.
- Create an upstand barrier around the field to contain the secondary microplastics.
- Procure a grass system that is exceptionally durable and has a UV stabiliser to reduce the level of breakage with age. These fields should be dual-yarn, tape and monofilament, and be tested to Lisport 2012 of 200,000 reps.

7. **Doesn’t flooding destroy synthetic surfaces?**

Some sports fields and courts are built on a floodplain, which means we will never be able to prevent flooding. Storms and flooding are a natural part of living in that area.
Organisations should consider as to whether these flood types would most likely impact, or even preclude, synthetic surfaces being installed. Flooding challenges may curtail the ability to install and manage a synthetic sports surface, and what civil engineering mitigation should be considered by themselves and community clubs and organisations as part of their site feasibility and prior to any investment.

The Sports & Play Industry Association (SAPIA) brings together the organisations that create the places where people of all ages and abilities can play, move and participate. Through professional standards, industry leadership and innovation, we are building and maintaining better places for a more active world.

To provide these SAPIA Insight Notes, we have partnered with Smart Connection Consulting to provide the latest technical knowledge on the issues that the community are keen to understand better. These notes are based around the NSW & SA Governments Frameworks for Decision Making for Synthetic Sports Fields.

To understand how SAPIA can assist you in making a difference to your projects and the community understanding of this technical subject please contact the SAPIA office at office@sapia.org.au or on our website www.sapia.org.au.