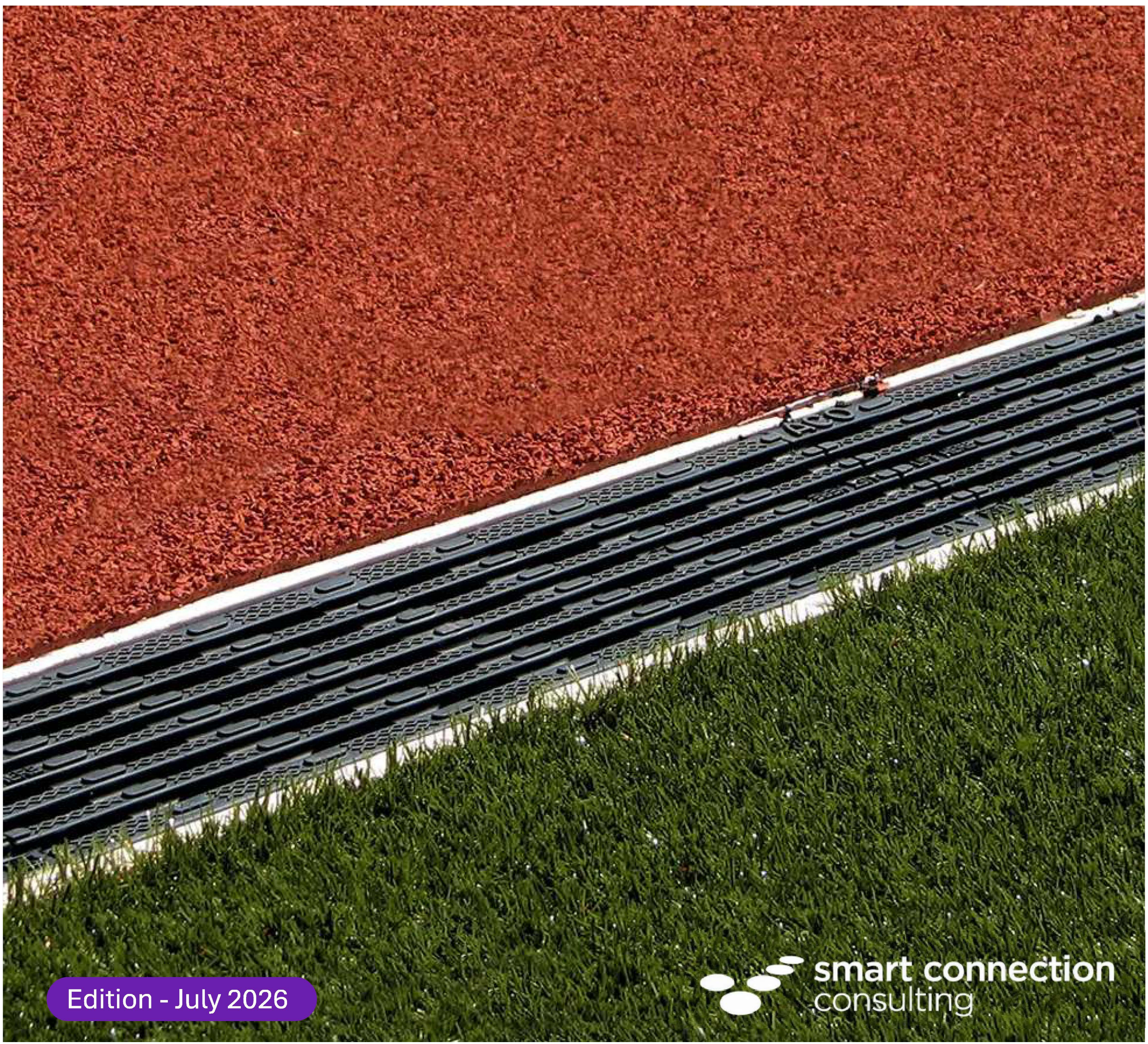
DRAINAGE FOR SYNTHETIC SPORTS FIELDS

Assuring water quality and surface playability



Drainage for Synthetic Sports Fields

Purpose and Context

Many local governments and sports consider investing in the use of synthetic sports surface technology across a city to satisfy the growing demand for sports as the population increases. Storms and flooding are a natural part of living in many parts of Australia and mitigation of their impacts should be considered at the planning and design stages of new facilities.

A synthetic sports field is often chosen because it offers higher carrying capacity and faster return to play than natural turf in wet periods, but that operational benefit only materialises when the field's hydraulic pathway is complete. Water must move through the carpet and infill, through the backing and any shockpad, into a horizontal drainage solution (Drainage cell) into collectors drains around the outside of the field) or a vertical solution down through graded stones or levelling layers, into a subsurface drainage pipe or collector drains, and then safely to an outlet or attenuation system without causing instability, uplift, contamination, or local nuisance flooding.

Why Drainage is Important to Synthetic Sports Fields

Drainage governs four outcomes that matter: playability, safety, asset life, and downstream impact. A field that does not dewater quickly loses usable hours, even if the carpet itself looks intact.

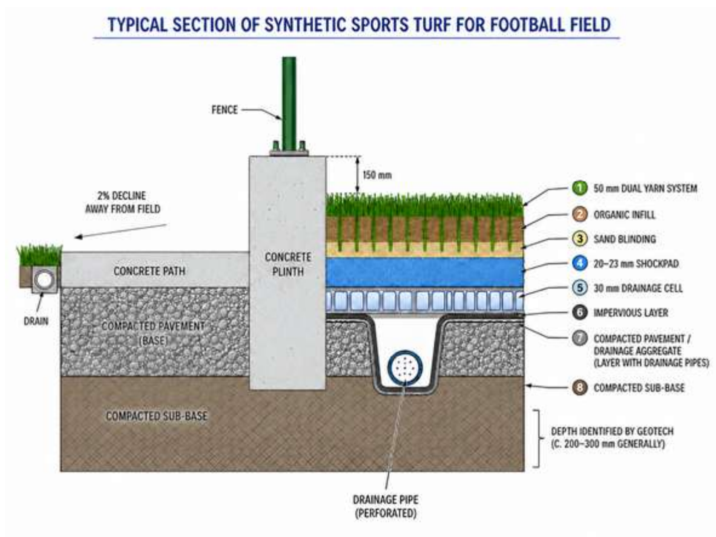
With the transition to organic infill, some of which is lighter than water if there is ponding due to ineffective drainage the infill can be move across the field surface due to grade or wind, causing significant maintenance issues or replacement costs. Therefored the water needs to pass through the carpet and shockpad quickly.

A field that stays saturated or develops perched water can soften the support profile below the surface, cause uneven response underfoot, and accelerate local deformation at seams, edges and high-wear areas.

Hydraulically, a synthetic field behaves less like a single surface and more like a layered porous pavement with strict performance requirements. Water first enters as rainfall or if not designed adequately as an overland inflow, then seeks the path of least resistance through pores and voids. If the connected void structure is open and maintained, drainage is rapid (e.g Drainage cell) or can be slower on a vertical drainage surface where the water will fill the voids between the rocks before the water is collected for the storm water pipes. If it is interrupted by fines, organic matter, collapsed layers, blocked outlets or weak subgrade, the field can surcharge even though the carpet remains nominally permeable.

Maintenance is not an optional afterthought. Melbourne Water states that WSUD assets require regular scheduled maintenance to ensure they "perform as intended", and that common mistakes include staff being unaware of the asset, failing to budget for maintenance, or omitting an operation and maintenance plan. Those warnings translate directly to synthetic fields: a field may dewater well at practical completion but lose performance over time if pits are not opened, collector drains are not flushed, sediment is allowed to enter edge trenches, and surrounding hardstand does not receive regular sweeping or debris control.

An indicative horizontal drainage strategy section through a typical synthetic field drainage assembly is shown below. It is schematic rather than site-specific, but it illustrates the hierarchy that should be preserved: surface intake, lateral transmission, filtration/separation, structural support, collection, discharge, access and overflow.



Flooding Types

For synthetic sports fields in Australia, at least four flooding mechanisms should be distinguished during planning and design. The first three are the formal categories highlighted by Melbourne Water:

- **Stormwater flooding,** Melbourne Water describes stormwater flooding as occurring when heavy rain exceeds drainage-system capacity and notes that it is common in built-up areas and can happen quickly;
- **Waterway flooding** stems from rivers and creeks overflowing after heavy or prolonged rain;

- **Coastal flooding** occurs when tides and storms push seawater inland.
- **Groundwater or perched-water flooding**, which is especially relevant where fine soils, shallow groundwater, filled land or old swamp margins are present. If infiltration to ground is proposed on such sites, field testing and conservative assumptions are essential.

These distinctions matter because they create different design mitigations controls. A field that performs well in an intense local storm may still fail when the downstream creek is flooded and the outlet is drowned, or when coastal tailwater prevents drainage.

Photos: Poor Drainage Strategy has allowed the cork infill to float and move across the field due to the drainage cell not being deep enough and the collector drains at the edge of the field being inadequate for this type of rain event

Terminology and Design Metrics

The most important hydrologic terms should be used precisely. In Australian Rain Runoff (ARR), AEP (Annual Exceedance Probability) means the probability that an event will be equalled or exceeded in any year; ARI (Average Recurrence Interval) is the average time period between occurrences.

Traditional approaches for a synthetic sports turf field was an ARI of 1 in 10 years, but with the organic infill we are now recommending a 1 in 50 year minimum. The contemporary approach is a 2% AEP

On sports projects, that matters because a planner may be asking for tolerable annual disruption, a drainage engineer may be sizing a pit network, and an operator may be thinking in terms of "how many times per season" the field can be expected to surcharge. Those are related, but not identical, questions.

Because standards text is licensed, project teams should verify the detailed compliance properties against the relevant current editions of AS 3706 test methods and the project specification rather than relying on generic marketing terminology alone.

Mitigation Strategies

Understanding the cause of the probable flooding event will guide the design mitigation strategy needed for each field. This could include:

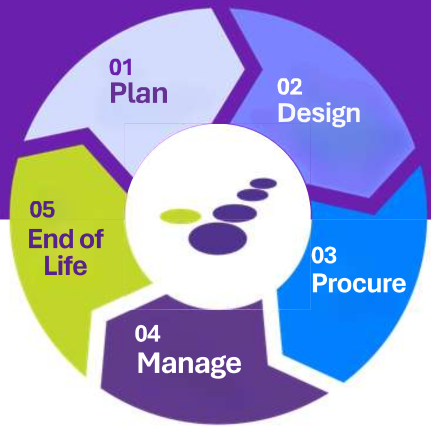
- Overland flow – which is detrimental to synthetic surfaces so should be redirected below or around the field of play.
- Stormwater flooding – where we need to reduce ponding to ensure that the water filters through the surface quickly and is taken away so that there is not "backfilling" through the carpet into the infill etc.

These strategies include ensuring hydrologic clarity at planning stage. Melbourne Water's early-planning guidance requires discussion of catchment size and land use, site characteristics, drainage characteristics, strategies and targets, preferred asset types, construction and maintenance considerations, and ongoing maintenance responsibilities.

The second strategy is dual drainage thinking: one system for the field itself, and one for everything around it. The field system usually includes surface grading, sub-surface drainage layers, use of drainage cells, collector drains, inspection pits and protected outlets.

The surrounding system deals with upslope overland flow, hardstand runoff, batters, edge kerbs, pathways and discharge controls. Melbourne Water's drainage-system guidance shows why this distinction matters: drainage is hierarchical, moving from local drains to larger regional systems, and even a well-constructed local asset can fail when downstream capacity is exceeded or tailwater rises.

Some synthetic surface drainage systems fail from gradual blockage of the holes in the carpet blinding rather than from a dramatic one-off break.



Recommendations

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.

Plan

- Identify the AEP for the drainage strategy and suggest a 2% AEP.
- Understand the hydrology of the whole parkland.
- Appreciate if the stormwater trunk upstream can cope with the discharge rates from a horizontal drainage solution, fast, or a slower discharge from a vertical drainage strategy.
- Understand the physical characteristics of the soil to cope with a vertical or horizontal drainage solution.
- Appreciate the likelihood of flooding type and how to mitigate impact on the field of play.

Design

- Civil works, pipe size and position across the field to collect the water in the most efficient manner.
- All drainage must be subsurface to ensure no microplastics can enter the closed drainage system.
- Infill drainage holes are to be designed to increase porosity.
- The porosity-level requirement should be at least 500ml/hour, not the standard FIFA requirement of 180ml/hour.

Procure

- The specification should not be a design and construct contract as the additional drainage standards must be specified in detail and not left to each tenderer.
- Reference checks should be taken to ensure there are no historic drainage challenges with the tenderer's previous work.
- Quality of pipework needs to be aligned to Australian Standards.
- Ensure drainage cells are to the HD standard.

Manage

- Ensure drainage channels and pits are monitored and maintained regularly.

End of Life

- Flush all drainage and use CCTV to ensure there are no complications or damage to any drainage pipes or pits.

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.