



## Winter usage, wear and carrying capacity of sporting fields in the Sydney Basin

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# Winter usage, wear and carrying capacity of sporting fields in the Sydney Basin Version 2.2

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## Front cover picture

Sporting field that has handled 49 to 55 hours per week during the winter sport season and has not be turf patched in 3 years. Photo taken in August when the field is at its worst. Photo by Dr Mick Battam.

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## Executive summary

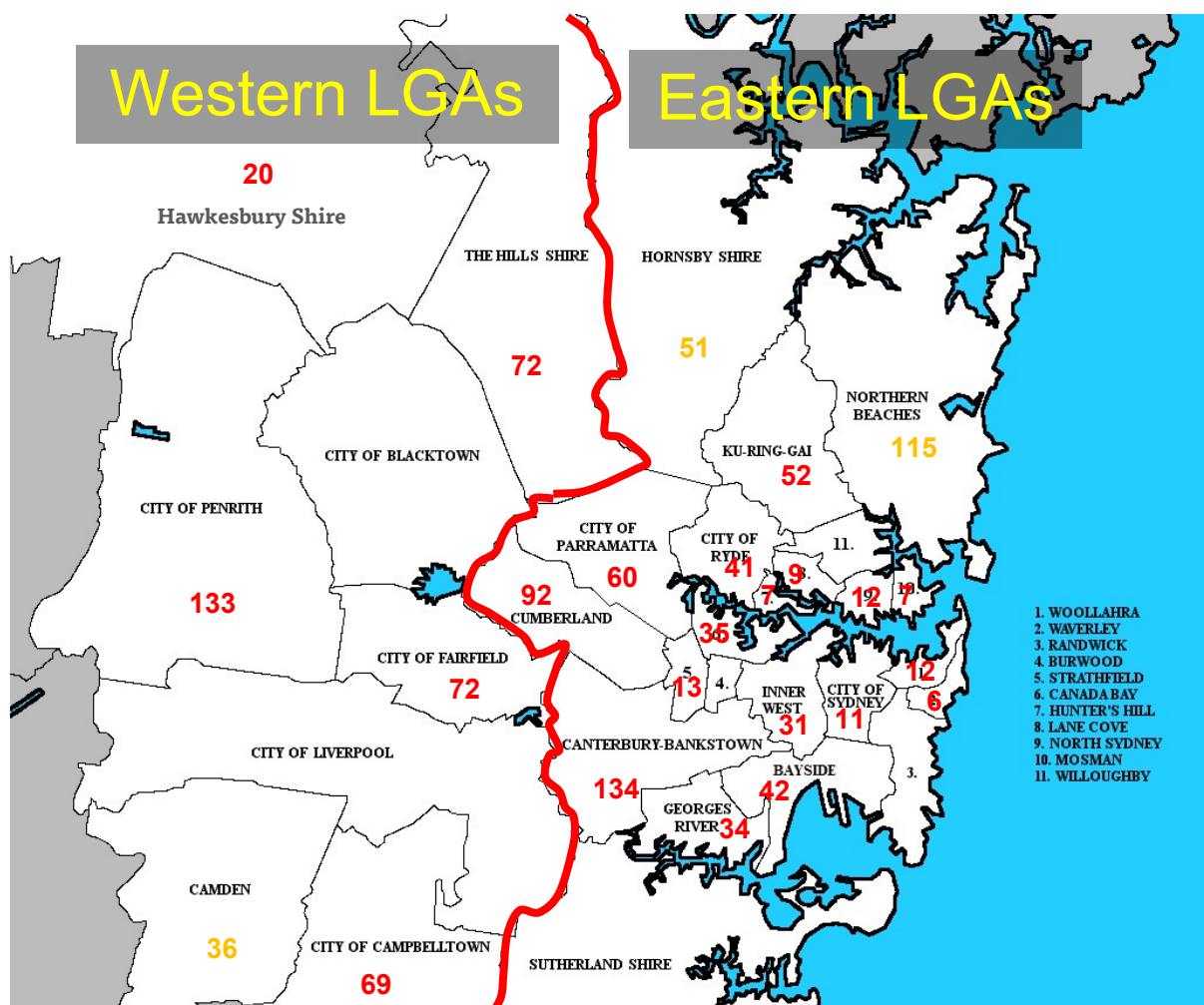
There is considerable confusion on sports field usage levels, with some groups ascertaining that many fields are receiving more than 60 hours per week of use. This report written by Dr Mick Battam was commissioned by the Turf Industry (Turf NSW, Turf Australia and Sport Turf Association NSW) to provide clear data on winter sport usage levels within the Sydney Basin.

### Framing the study findings

When reading this report, the following fundamentals should be kept in mind:

1. sport field usage hours are limited by timeslots around life commitments (sleep, work and school), winter daylight hours and weather. Some councils also place limits on usage
2. clubs often “Blanket book” fields so they are reserved for longer times than actual use

The study evaluated data for 1157 sporting fields located in 24 councils, with the councils in the Sydney Basin divided into two distinct zones (Figure E.1).



**Figure E.1:** Number of playing fields in each LGA where booking data was either provided by council (red) and/or available in sporting field strategies (orange). Wikipedia base map.

## How many hours per week are sporting fields used during winter?

Based on analysis of the booking hours and player numbers provided, median winter sport usage levels are estimated to be about:

- **Eastern LGAs:** 22 hours per week of formal sport and 2 hours per week of school use. Due to blanket bookings, Council booking data was about 5 hours per week higher; and
- **Western LGAs:** 12 hours per week of formal sport, with minimal data on school use.

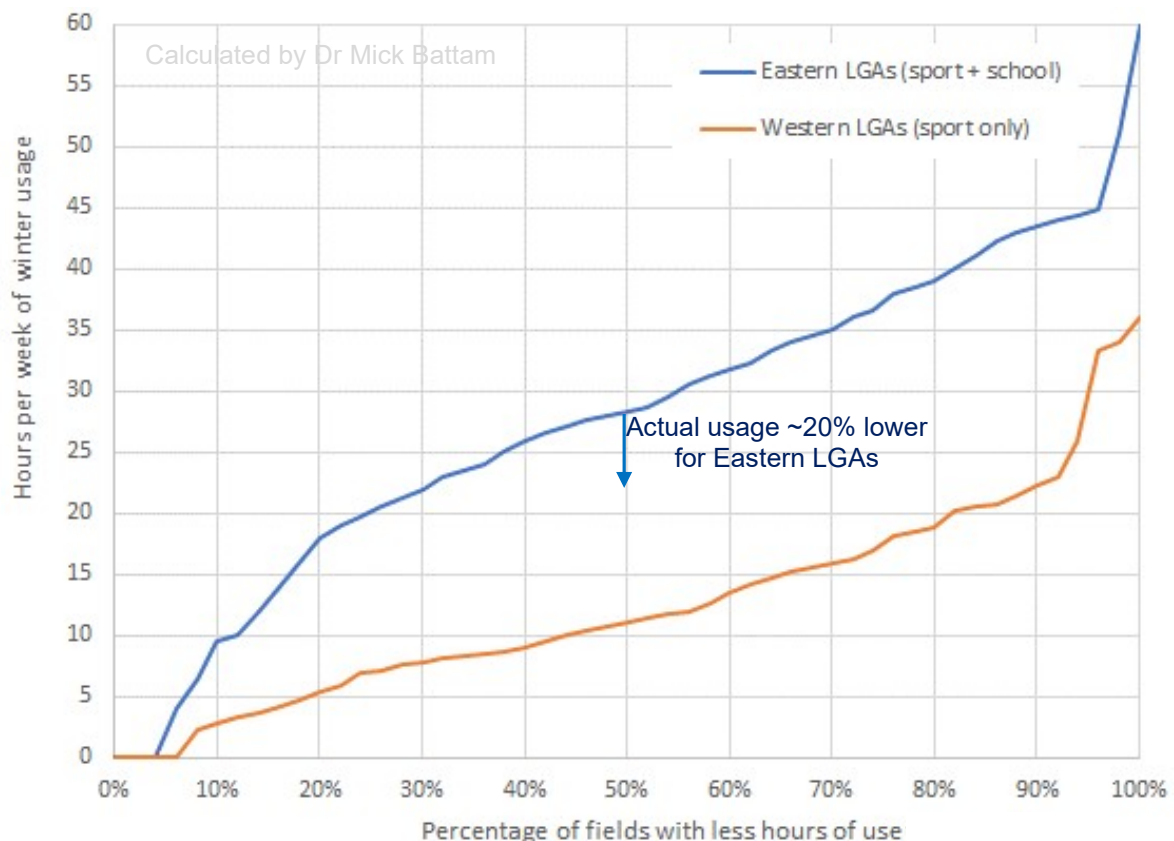
Vast amounts of blanket booking were observed in the western LGAs, with booked hours on average about 2.3 times more than actual usage. As such, booked hours should NOT be used in assembling sport field management strategies as it would lead to major errors and the misallocation of funds. Rather than relying on booked data, it is recommended that councils measure actual hours of usage on their playing fields.

## How many sporting fields are used more than 60 hours per week?

Several councils have between 1 and 3 fields that are “booked” for more than 60 hours per week. In almost all cases, these sites have been blanket booked, with actual usage usually much lower. Over the entire Sydney Basin during the winter sport season:

- 5 out of the 1157 fields (0.4% of fields) involved in this study are likely receiving more than 60 hours per week of formal sport and/or school usage; and
- 99% of fields receive less than 46 hours per week of formal sport and/or school usage.

These findings are entirely consistent with the limitations that work, school and sleep place on when formal sport can be played, which is typically confined to 4 pm to 9:30 pm on weeknights and 8 am to 5 pm on weekends (45.5 hours total).



**Figure E.2:** Estimates of winter sport usage levels, with the values for the eastern LGAs needing to be reduced by about 20% due to blanket bookings. These corrections are already encapsulated in the Western LGA graph.

## How many players per week can a sporting field handle?

Booking logistics limit the number of players that can use a field, with these arising because most clubs want to use fields for less than 46 hours per week. To host games over the weekend (8 am to 5 pm) and on Friday nights (5 to 10 pm), a full-sized soccer field has all timeslots filled by:

- ~ 400 players if the club consisted solely of senior players; or
- ~ 650 players if the club has about 66% of players less than 13 years of age.

In practice sporting clubs are unlikely to be able to fully utilise every game timeslot, with the capacity of most sites limited to about 600 players each week for a full-sized field.

## What is the carrying capacity of sporting fields?

Carrying capacity refers to the amount of wear (as distinct from usage hours) that a sporting field can handle whilst maintaining an acceptable playing surface. In Sydney:

- **natural turf:** well-constructed and maintained will provide acceptable turf cover, require minimal patching and recover year after year (>25 years life expectancy). The capacity of:
  - **most fields:** can be more than 600 players per week for the winter sport season. The characteristics of 12 fields handling 350 to 600+ players per week are provided;
  - **district fields (hosting representative teams):** is limited to about 400 players per week (based on current turf cultivars) as there is a greater expectation for the surface aesthetics (grass colour);
- **synthetic fields:** no information could be found on the cumulative number of games these surfaces will handle before needing to be replaced. However, the lifespan of a field that has been appropriately maintained is about:
  - **8 to 10 years:** for fields receiving 40 hours per week of use (FNSW guide). A field constructed in 2012, was patched in 2017, with council receiving a grant and replacing the surface and shock pad for ~\$1.2 million in 2021 (9-year lifespan); and
  - **5 years:** for fields receiving 60+ hours per week of use. This was stated by a synthetic turf consultant, with no published lifespan information available for these usage levels.

Many natural turf fields struggle as they have been poorly constructed and/or maintained. Lack of funds is often a major impediment to natural turf, with one of the most intensely used fields in Sydney not even having a pop-up irrigation system (~\$150,000) even though this council has spent more than \$10 million dollars installing synthetic fields.

## Weather limitations on sport usage

Weather can place limits on sport usage, with:

- **natural turf:** fields with soil issues and/or poor surface water management can remain wet for long periods after rain. More than 25 mm falls on average about 11 days per year in Sydney and 7 days per year in Penrith;
- **synthetic fields:**
  - surface temperature of 88°C (burn risk to players) have been recorded when ambient temperature was 28°C (nine news, 11/2/2022); and
  - FNSW synthetic guide suggests not playing when temperatures exceed 30°C. This occurs ~24 days per year in Sydney & ~71 days per year in Penrith.

Well-constructed natural turf fields drain rapidly after rain (Figure E.3), with hundreds of examples in the Sydney Basin of fields that can be played on within an hour after significant rain.



**Figure E.3:** Despite 300 mm of rain having fallen over a 5-day period, less than 24 hours after it stopped raining this cricket roller could be driven onto the field even though its drainage system is inadequate.

## What are the implications for sport planning?

The results of this study clearly demonstrate that booked hours should **not** be used in sports strategies for assessing the extent to which fields are over or under capacity because:

- booked hours substantially overestimate actual hours of sport use, with enormous differences for fields in the western LGAs; and
- fields with similar amounts of booked hours showing a 5-fold variation in wear levels.

Unfortunately, sports and/or facility strategies are generally based entirely on booked hours. As a result, the carrying capacity of many fields has been grossly misrepresented, leading to the sub-optimal allocation of millions of dollars in sports field funding, particularly if the intent is to increase the available carrying capacity.

## Improving fields and increasing carrying capacity

A comparison of the wear levels (as distinct from usage hours) on 152 sporting fields from the eastern LGA area found these exceeded the current carrying capacity of 67% of fields. However, most of these fields were receiving low to moderate levels of wear and were struggling as they had been poorly constructed and/or maintained. If all 152 fields were constructed/maintained according to best practice, then the collective carrying capacity of these sites could be increased by 59% which would:

- result in a major improvement in the condition of the 67% of fields where the current carrying capacity is exceeded, with more modest improvements on the other fields; and
- enable more sport to be played on about 74% of fields (those that have significant timeslots that are still available for booking), with the collective carrying capacity of the fields increased by 45%. However, it is often not possible to realise all these increases, due to club demand and other site limitations (location, amenities, parking, lights, etc).

By addressing the factors limiting natural turf performance over a five-year period, a council in southern Sydney reduced their annual spend on turf patching from \$280,000 to \$5,000. This council also reduced the number of fields in poor condition at the end of the winter sport season from 54 to 9. The characteristics of 12 fields that handle 40 to 60+ hours per week of use is provided (Section 8).



**Figure E.4:** This sporting field receives higher usage than 85% of fields in the Eastern LGA area and historically it struggled. Since being reconstructed correctly, the field has not needed patching for 6 years (insert), with nearby clubs requesting their fields be constructed using a similar approach.

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## 1 Background

Playing fields not only host formal sport, but those sites that are not fenced off to prevent access also provide a place for informal recreation. As such they often serve as a community focal point for socialisation and play a key role in improving physical and mental health for neighbourhood residents.

Those fields that are natural turf:

- assist in cooling urban environments (Figure 1.1);
- provide an area where rain can infiltrate (paths, roads, rooves and synthetic fields generally contribute to stormwater runoff), with some fields playing a role in flood mitigation;
- provide greenhouse gas sequestration (each square metre captures about 0.5 kg CO<sub>2</sub> annually);
- living turf does not sustain surface fire spread making natural turf a bush fire retardant (GHD, 2020), with some sporting fields used as a bush fire refuge. The study reported concerns about the toxicity of the smoke generated by burning synthetics
- provide economic benefits as people value living near turf open spaces.

Given the vital role that sporting fields play in society, it is surprising to find that very limited information exists on typical usage hours, wear levels and carrying capacity limits. This report collates this information for sporting fields within the Sydney Basin.

The report was commissioned by Turf NSW and has been written by Dr Mick Battam (soil scientist, with AgEnviro Solutions Pty Ltd). The document was peer reviewed by Peter McMaugh AM (Turfgrass Scientific Services Pty Ltd) and Dr Paul Lamble (Peak Water Consulting Pty Ltd).



**Figure 1.1:** In addition to removing carbon dioxide from the atmosphere, natural turf can play a key role in combating urban heat islands as these temperatures taken on a 38°C day demonstrate.



## 2 Methodology

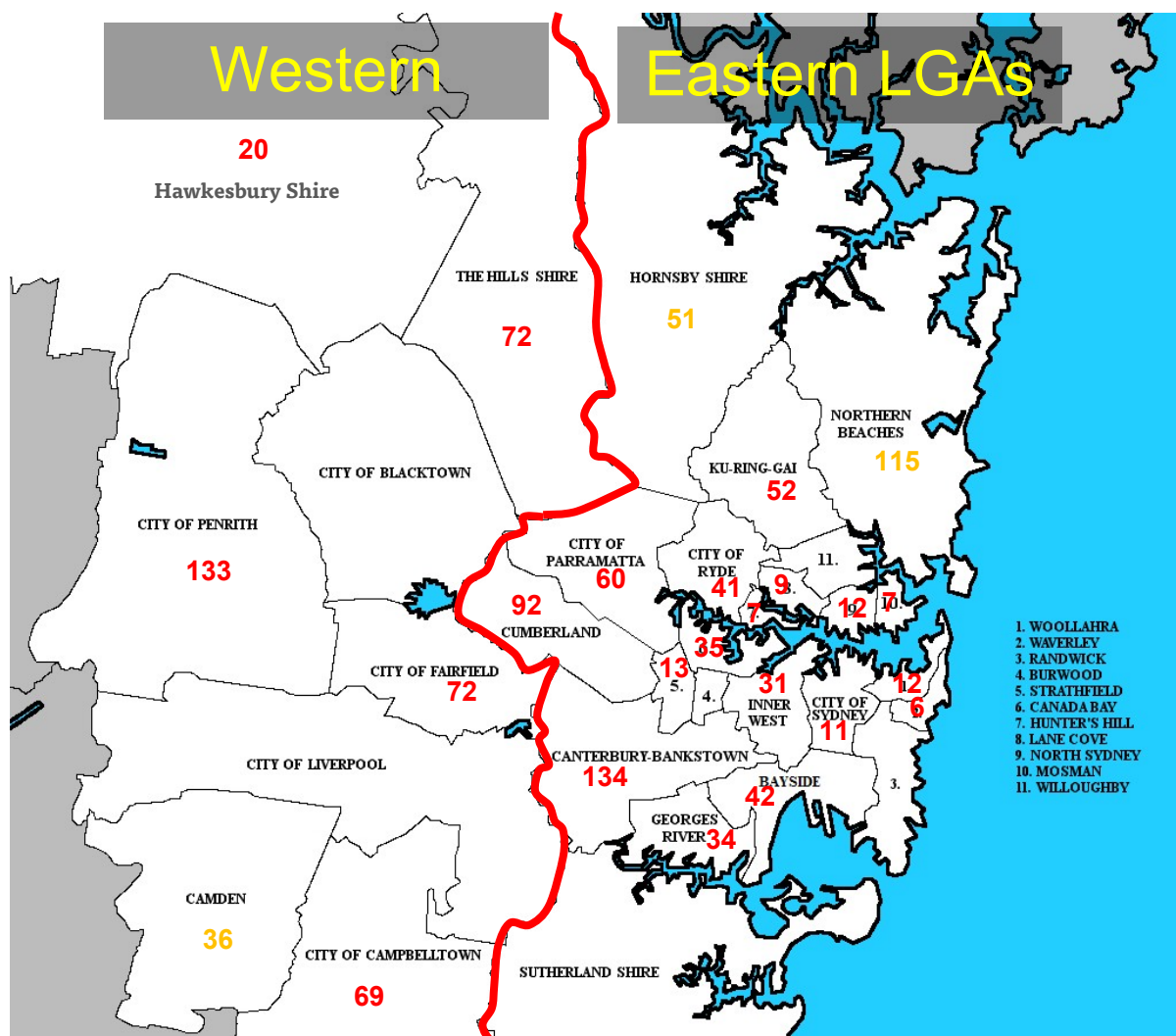
The study documents sport usage hours for about 1157 playing fields within the Sydney Basin, with the number of fields included from each LGA described in Figure 2.1. The term “full-sized field” in this study is referring to football fields (regardless of code) that host adult competition games. As such, there is no reference to any official standard playing field size. In most cases, councils have already defined the size of each of their sporting fields as being either a:

- full-sized field;
- three-quarter field; or
- mini or junior field.

In this study, undersized fields are counted as a fraction of full-sized field based on their size.

### 2.1 Number of fields involved this study

Winter sporting field usage data was assembled based on booking information provided by councils and/or sporting clubs within the Sydney Basin. To ensure the data was not biased by COVID lockdowns, booking data was obtained from winter booking information for the May-June 2021 period (prior to lockdown) and/or 2019 winter sport season. Some additional usage data was obtained from council publications, competition draws and/or information provided by individual sporting clubs.



**Figure 2.1:** Number of playing fields in each LGA where booking data was either provided by council (red) and/or available in sporting field strategies (orange). Wikipedia base map.

## 2.2 Format of the data

The format and quality of the usage data varied considerably between the councils. Some councils provided detailed booking information that allowed clear distinction between user groups (sport training, official games, school and fitness trainers). In contrast, other councils only provided the total booked hours per week, with little or no information available on the split between users.

There were differences between the way councils dealt with fitness trainers. Whilst some had recorded their hours of use, other councils:

- allowed the field to be booked at the same time, presumably assuming the fitness classes would be performed around the perimeter of the site; and/or
- did not even require a booking by these groups.

As such, usage by fitness classes is not included in this study. However, it is noted that fitness classes are typically performed in running shoes, which generally has a much lower impact, especially if wear is not concentrated in one location.

## 2.3 Booking limits enforced by some councils

Of the 24 councils involved in this study, 5 were placing limits on usage hours by either:

- placing an upper limit on the weekly usage hours for some or all fields; or
- preventing training on specific nights of the week such as Monday and/or Friday.

Usage hours (as distinct from the number of players using these fields) would potentially increase if these limitations were removed. Those fields with usage hour limitations represented less than 10% of fields in the study, with the maximum potential impact of these sites typically less than 5.5 hours per week. In many cases the limits are likely having minimal impact on site wear levels, with training able to occur within the timeslots available on other nights.

## 2.4 Dealing with blanket bookings

Booking data provided by councils usually includes so called 'blanket bookings', which are used to reserve the field even at times when it is not being used. As such, booked hours can include significantly longer periods than actual usage time.

To obtain a more accurate estimate of actual usage hours, those fields that were suspected of being blanket booked (e.g. booked at 11 pm on Sunday nights) were either:

- adjusted to more accurately reflect usage hours based on:
  - information from competition draws, discussions with club members and/or their affiliated sporting association;
  - discussions with council staff;
  - lighting limitations at the site (its dark in winter after 5 pm, with several councils indicating that lights are not used on their fields on weekends); or
- omitted from the study (if no additional usage information could be obtained).

Despite taking these corrective measures, significant amounts of blanket booking likely remain in the data, with many fields known to be free on a Sunday afternoon despite having a formal booking during this time. Techniques for quantifying these hours are discussed in Section 3.

To ensure councils have accurate usage data for making major investment decisions, it is recommended that monitoring be conducted of actual sport usage hours instead of making decisions on data that contains blanket bookings.

### 3 How many hours per week are sporting fields used?

Winter sport usage levels in the Sydney Basin were collated into the two zones described in Figure 2.1:

- **Eastern LGAs:** Sutherland, Bayside, Georges River, Canterbury Bankstown, Randwick, Waverly, Woollahra, Sydney, Inner West, Burwood, Strathfield, Canada Bay, Cumberland, Parramatta, Ryde, Hunters Hill, Lane Cove, North Sydney, Mosman, Willoughby, Northern Beaches, Ku-Ring-Gai and Hornsby; and
- **Western LGAs:** Campbelltown, Camden, Liverpool, Fairfield, Penrith, Blacktown, Hills and Hawkesbury.

It was obvious from the booking data where to delineate between these two zones, with there being a marked increase in the amount of blanket booking in the western LGAs.

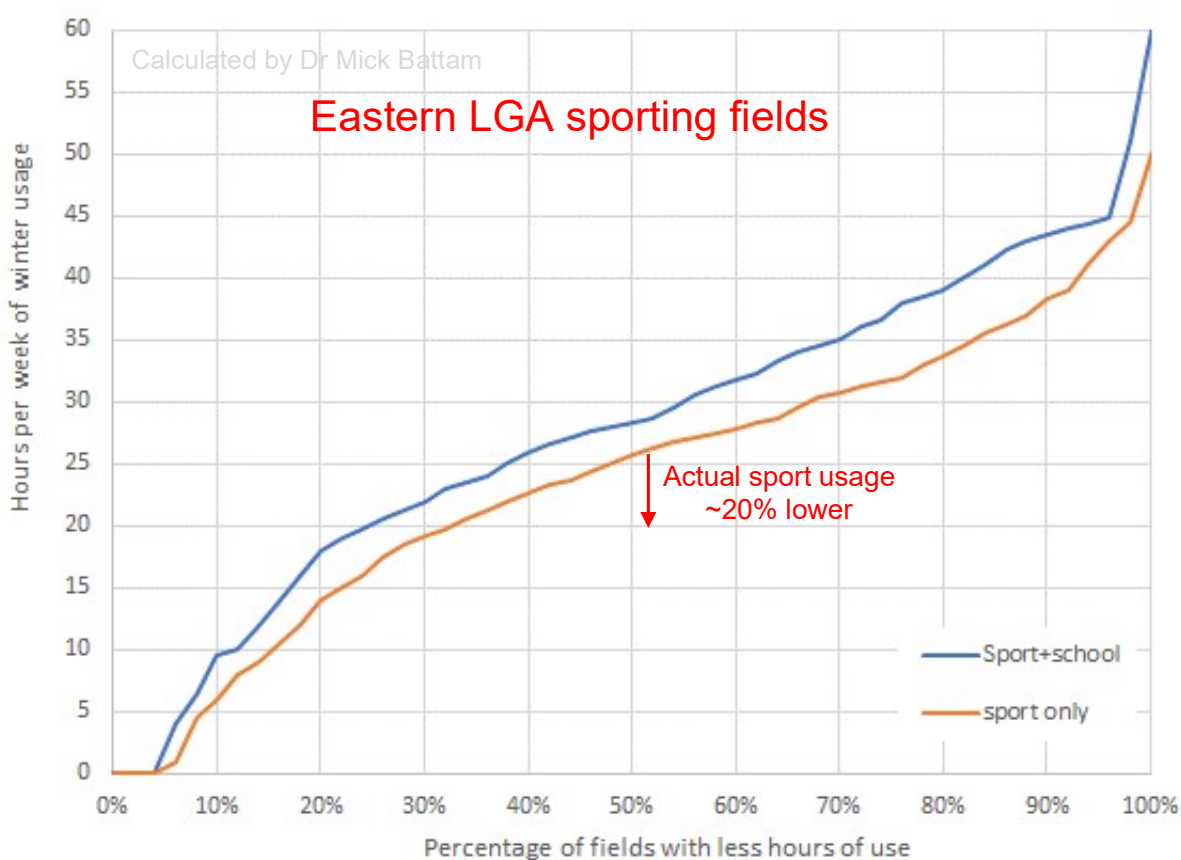
#### 3.1 Eastern LGAs

##### Estimating usage hours from booking data

The following analysis is based on data from 766 playing fields provided by 19 councils in the eastern LGA area. During the winter sport season analysis of the booked data found (Figure 3.1):

- a median of 27 hours of per week of formal sport and 2 hours per week of use by schools. However, actual sport usage is likely around 20% lower (see Figure 3.2); and
- 99% of fields receive less than 46 hours per week of formal sport.

These results are not surprising given the limitations that life commitments (e.g. work, school and sleep) place on when formal sport can be played.



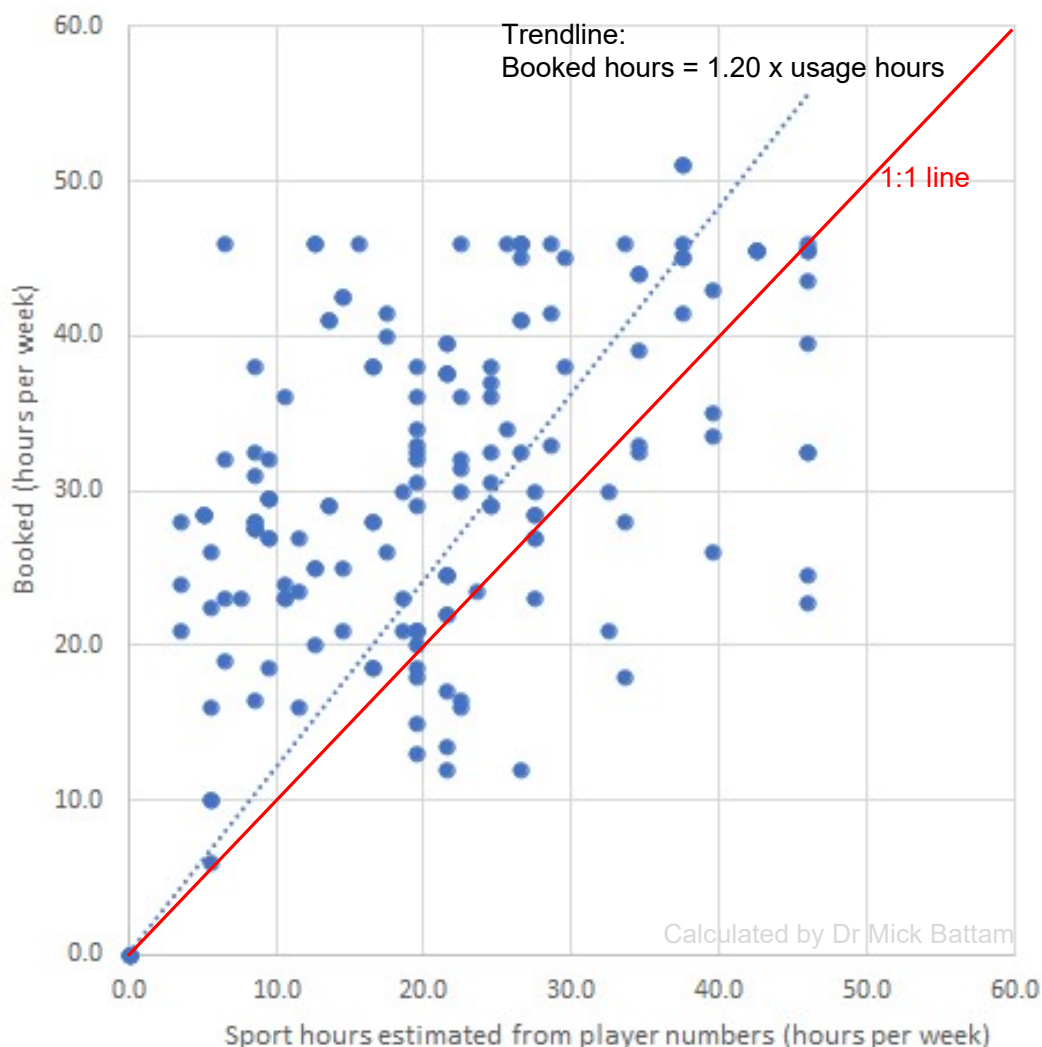
**Figure 3.1:** Winter sport booking hours for 766 playing fields located in 19 LGAs all of which are within the eastern LGA area. Due to blanket booking, the actual sport usage hours are about 20% lower than these values (see Figure 3.2).

### Estimating usage hours from player numbers

Clubs often book sporting fields for longer timeslots than they require (blanket booking). As a result, booking data will overestimate actual sport usage hours. To better estimate actual usage hours, these were estimated based on player numbers for 169 sporting fields located in the eastern LGA areas. This analysis was performed based on the following assumptions:

- 50% of players were less than 13 years of age;
- training and formal gameplay sessions were rounded up to the nearest half hour time slot;
- 80 to 100% of the playing field space is used in any time slot;
- teams train once per week. Whilst some teams will train more often, it is not uncommon for teams involving older players to not conduct any training; and
- players older than 13 years of age are assumed to have two teams training on the field at once.

Comparing these calculated sport usage levels with booking information suggests the booked data overestimates formal sport usage by about 20% (Figure 3.2). This is not surprising, with many fields known to be free on a Sunday afternoon despite having a formal booking during this time. As such, the median usage for the sporting fields in the eastern LGAs is likely closer to 22 hours per week during the winter sport season.



**Figure 3.2:** Comparison showing that sport usage levels estimated from booked hours were on average 20% higher than those estimated from player numbers for fields in the eastern LGAs.

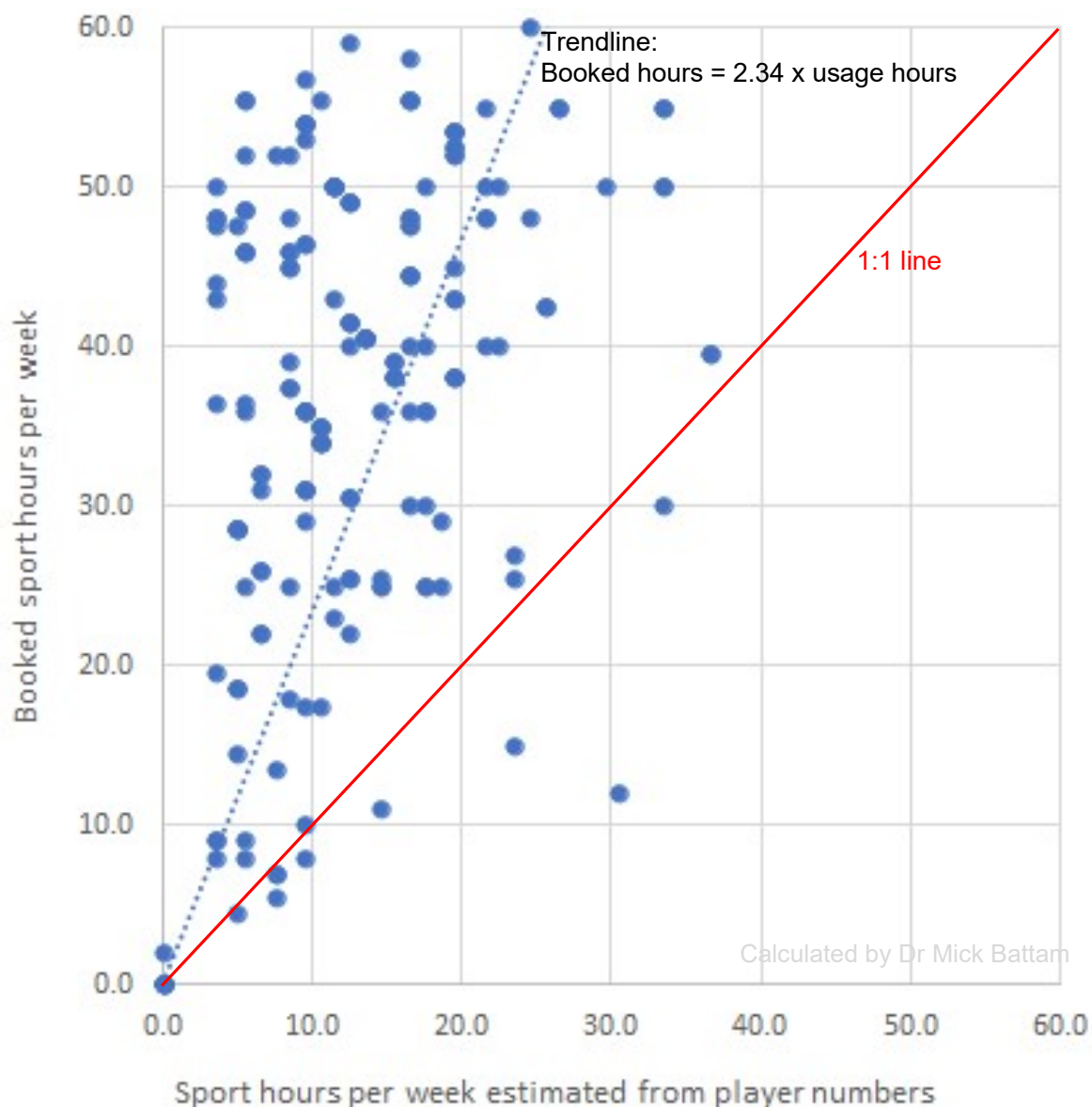
## 3.2 Usage on fields in the Western LGA area

### Estimating usage hours from booking data

Substantial amounts of blanket booking were observed on fields in the western LGA areas, with this evident from:

- sporting fields that are booked for more than 60 hours per week, but host less than 150 players per week;
- sporting fields that perform well despite having been constructed poorly so they are only capable of handling low levels of use; and
- discussions with council officers, some of whom nominated their most intensely used sporting fields which in some cases were only being used for about 25 hours per week based on discussions with the clubs.

As such, council booking data for fields in the western LGA areas were regarded as being too unreliable for estimated sport usage levels (Figure 3.3). The extent of blanket booking is likely due to the higher number of fields per capita, as there is less of a need to share facilities with other users.



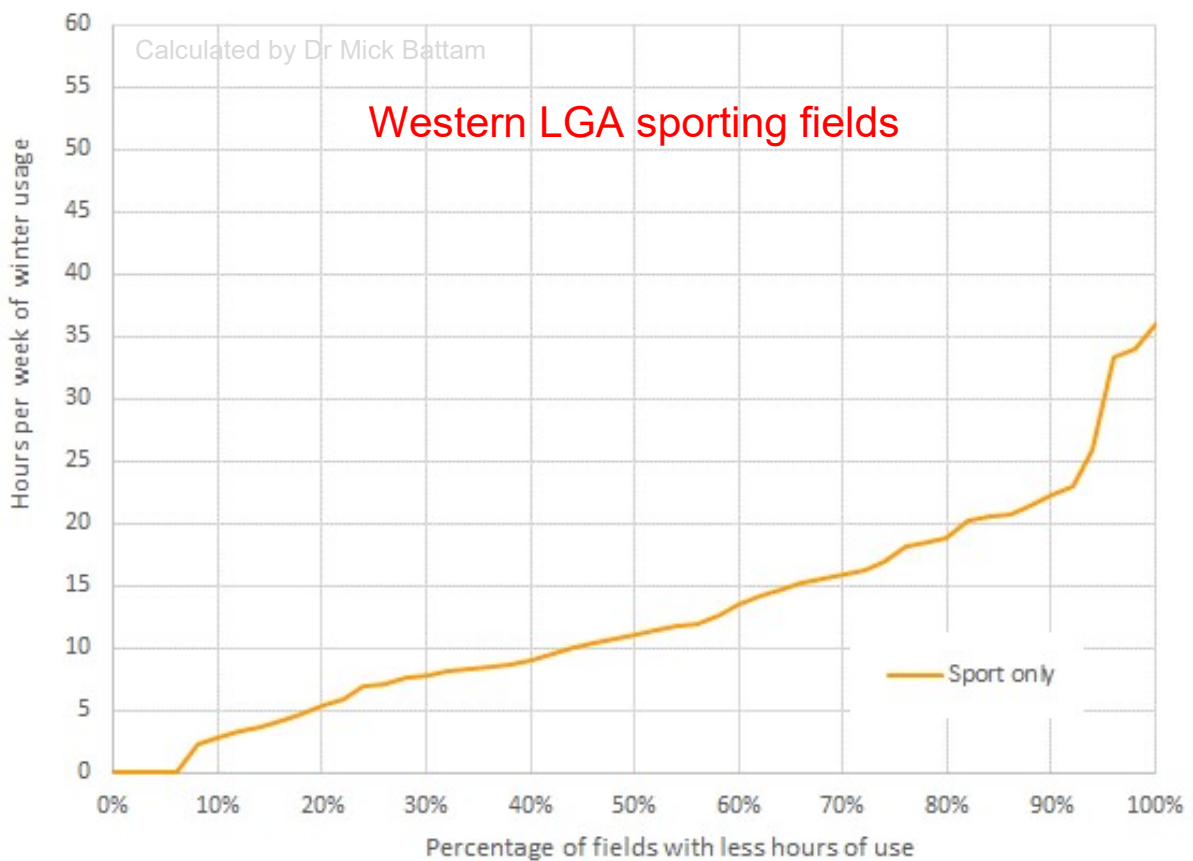
**Figure 3.3:** Comparison showing that sport usage levels estimated from booked hours were on average 2.34 times higher than those estimated from player numbers for fields in the western LGAs.

### Estimating usage hours from player numbers

Booked hours greatly exceed usage hours in the western LGAs. As such, these should not be used to estimate sport usage levels and would lead to misleading results if used in sports planning. Instead, winter usage levels have been estimated based on sport participation rate data for 228 playing fields in Campbelltown, Fairfield, Penrith and Hawkesbury LGAs. This data suggests that (Figure 3.4):

- these fields have a median usage level of about 12 hours of per week of formal sport; and
- 99% of fields receive less than 37 hours per week of formal sport.

Ideally, these findings would be updated once additional sports participation rates are determined for some of the other western LGAs.



**Figure 3.4:** Winter sport usage hours estimated from sport participation levels (booking data was far too inaccurate) for 228 playing fields located in 4 of the western LGAs.

## 4 Factors limiting sport usage

### 4.1 Constraints on booking hours

Life commitments (e.g work, school and sleep) result in formal sport typically being limited to the following timeslots:

- Monday to Thursday from around 4:00 pm to 9:30 pm (5.5 hours per night);
- Friday night from around 5:00 to 10:00 (5 hours); and
- Weekends from around 8 am to 5 pm (18 hours over the weekend), with several clubs commenting that it is too dark in winter to play after 5 pm.

As such, it not surprising that 99% of fields in the Sydney Basin receive less than 46 hours per week of formal sport usage.

Some fields also host school sport, athletics carnivals and PDHPE classes. Much of this usage typically causes lower impact then formal sport as the students often wear running shoes instead of football boots. A very small number of fields host midweek lunchtime sports and/or are used daily for lunchtime/recess play by schools.

### 4.2 Constraints on player numbers

The use of fields by clubs for a maximum of about 46 hour per week (as players are at school, work or sleeping), places limits on the number of players that can use a field. These limits depend on the age of the players, size of the field and the code of sport.

As an example, a soccer club that has about two thirds of its players less than 13 years in age would struggle to host games for more than 650 players per full sized field. This is demonstrated by the following fully booked game schedule that includes players and substitutes (or reserves):

- Friday night (2 senior games), 60 players
- Saturday:
  - 8 to 11:30 am (U5 to U12 games), 290 players
  - 11:30 am to about 5 pm (U13 through to senior games), 90 players
- Sunday:
  - 8 to 10:00 am (junior football), 90 players
  - 10:00 am to about 5pm (4 senior games), 120 players

This limit is a game scheduling constraint, but some clubs may also experience limits associated with scheduling training, especially in councils that place limits on midweek usage of fields.

In practice, player numbers do not always enable the above 650 capacity to be realised. For example, there may only be enough players for 6 MiniRoo games even though the field could accommodate 8 games at once. As such, it is not surprising that some clubs have commented that game scheduling is becoming a limitation when their club has more than 600 players per full size field.

A club with a greater percentage of senior players is even further constrained by game scheduling. For example, a club consisting solely of older players (U13+) could only host about 13 games, limiting the size of the club to about 400 players per full size field.

## 5 Wear versus usage hours

### 5.1 Defining wear

Foot traffic causes damage to turf by tearing leaves, stems, stolons, rhizomes and roots. In this report, a **wear unit** is defined as the equivalent damage caused to a field in standard condition by one game per week of adult soccer. The total amount of wear a field receives can be determined from factors such as (but not limited to):

- usage hours (as distinct from booked hours);
- age of players;
- number of players training on a field per hour;
- area of the field;
- type of sport activity: soccer generally has more concentrated wear than other football codes, with usage by primary students (if wearing running shoes) causing less damage;
- standard of sport being played, with higher wear typically associated with elite players.

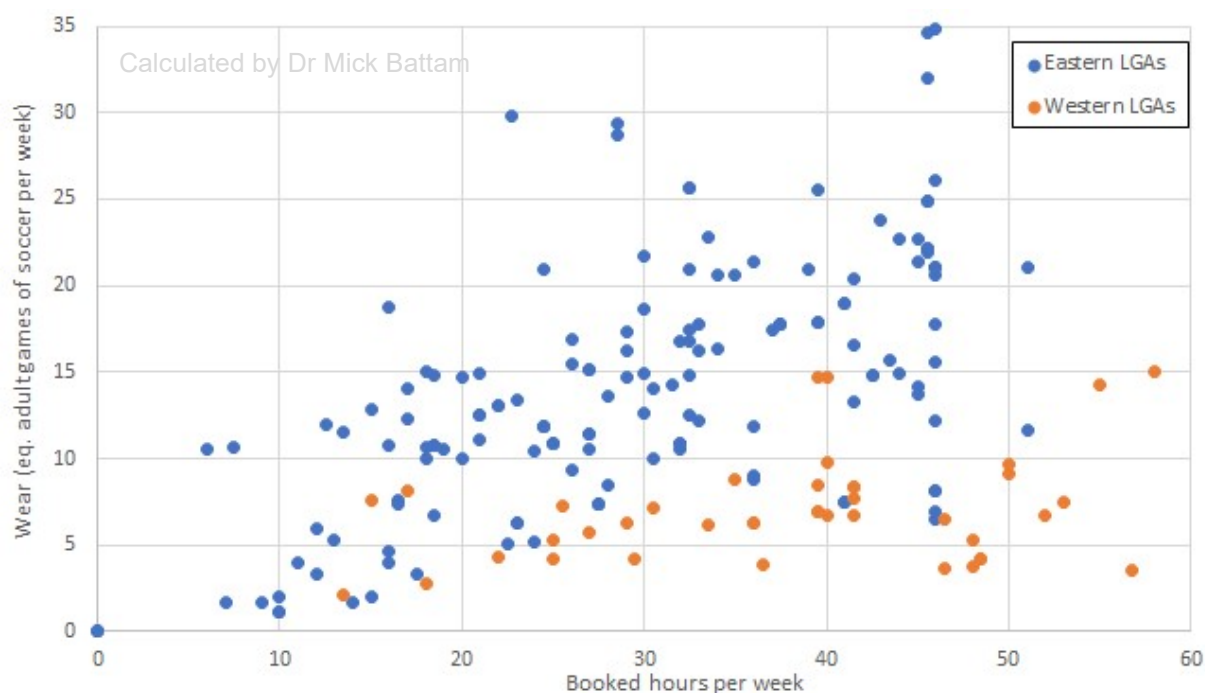
A game of adult soccer was chosen as the wear unit for this study because soccer is currently the dominant winter sport code being played in Sydney.

### 5.2 Can wear be predicted from usage hours?

Comparisons on 152 playing fields from the eastern LGA area found massive variation in wear levels for a given number of booked hours (Figure 5.1). For example, fields booked for:

- 5 to 10 hours per week have wear levels that vary from 2 to 11 wear units (5-fold difference);
- 20 to 25 hours per week have wear levels that vary from 5 to 30 wear units (6-fold difference);
- 45 to 50 hours per week have wear levels that vary from 7 to 35 wear units (5-fold difference)

Data from 41 playing fields in the western LGA area found similar wear levels on those booked for 10 to 20 hours per week to those fields booked for 40 to 50 hours per week. This is consistent with the large amounts of blanket booking on western LGA fields (Section 3.2).



**Figure 5.1:** Comparison of wear levels and booked hours for 193 playing fields. The poor correlation between these parameters is clearly demonstrated by the at least 5-fold variation in wear levels for a given number of booked hours.



### 5.3 Should booked hours be used in sports strategies?

Booked hours should **not** be used in sports strategies for assessing the extent to which fields are over or under capacity because:

- booked hours do not provide a reliable means for estimating wear levels, with a 5-fold variation in wear levels observed for a given number of booked hours (Figure 5.1); and
- booked hours substantially overestimate actual hours of sport use (Section 3), with enormous differences for fields in the western LGAs.
- the capacity of the field, i.e. the ability of a field to sustain usage depends on its carrying capacity relative to the wear levels it receives (Section 6).

It is noted that that common industry practice is to base sports and/or facility strategies on booked hours. As a result, the usage hours are overstated and the carrying capacity of many fields has been grossly misrepresented. This then leads to the sub-optimal allocation of millions of dollars of sports field funding, particularly if the intent is to increase the available carrying capacity. As such, there are many examples where millions of dollars of sports field funding have been misallocated, with one example provided in Figure 5.2.



**Figure 5.2:** The field below was incorrectly identified in the council sport planning strategy as “heavily overused”. Not only is this untrue (acceptable turf cover despite the field having NO automatic irrigation system and a turf cultivar that cannot handle high wear), but it resulted in the misallocation of funds and suboptimal community outcomes.

<sup>1</sup> capacity is limited by game scheduling limits (section 4), but other factors such as parking, amenity and site location may also place limits on capacity

## 6 Predicting the condition of sporting fields

### 6.1 Defining carrying capacity

Carrying capacity refers to the amount of wear (as distinct from usage hours) that a sporting field can handle whilst maintaining an acceptable playing surface. Carrying capacity depends on site specific characteristics that include (but are not limited to):

- soil characteristics which have a major influence over:
  - turf growth rates: which can be reduced by more than 90% if the soil is poor;
  - turf anchorage: with the turf more easily damaged and/or slower to recover if the buried tissues such as rhizomes can be torn by players;
  - surface moisture levels: a surface that is wet (but not necessarily saturated) is more susceptible to compaction and shear damage (less turf anchorage);
- microclimate: with turf typically growing slower in well shaded areas (shading is most crucial in the warmer months of the growing season rather than the winter months);
- drainage characteristics: playing on a wet field can more than double the damage;
- turf cultivar: soft cultivars can be more than 4 times more prone to damage; and
- management practices: stressed turf is far more prone to damage and much slower to recover.

These parameters can vary greatly between sites. As such, it is not valid to use a single value to define the carrying capacity of natural turf fields. For example, some fields are in such poor condition that they struggle to handle any wear, whilst some intensely used fields maintain good cover throughout the entire year (Figure 6.1).



**Figure 6.1:** Two sporting fields about 7 km apart that have very different carrying capacities. The more intensely used field was built according to best practice principles and easily handles much higher levels of wear whilst requiring no patching, with the poorly built field struggling to handle low levels of wear. Photos taken at the end of football season when fields are at their worst.

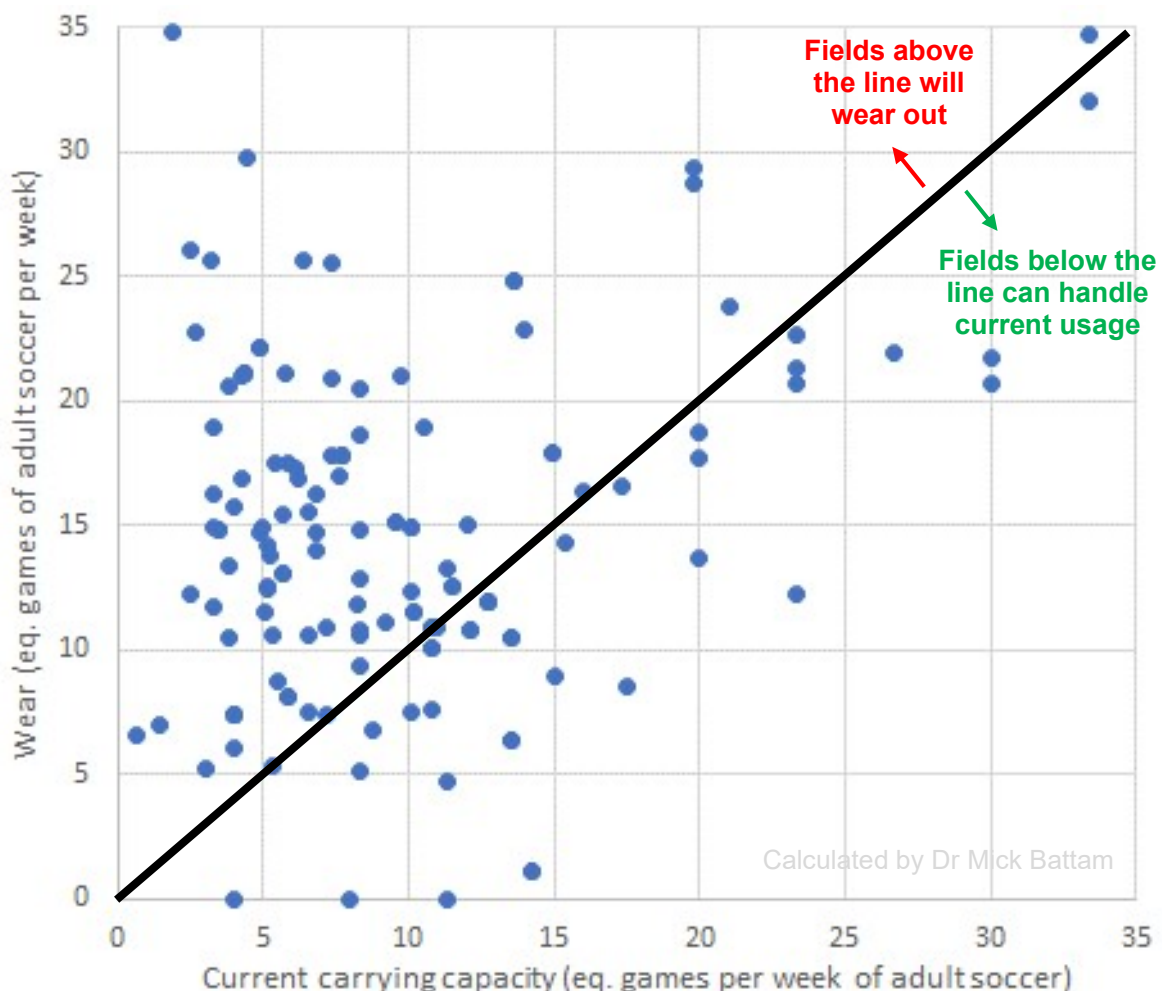
## 6.2 Comparing wear with carrying capacity

A comparison was performed on 152 sporting fields from the eastern LGA area. This found wear exceeded the current carrying capacity on 102 fields (Figure 6.2). The majority of these fields were receiving low or moderate levels of wear (Figure 6.2), but were struggling to maintain acceptable turf cover because they are poorly constructed and/or maintained.

If all 152 fields were constructed and maintained according to best practice, then the collective carrying capacity of these sites could be increased by 59%. This increased capacity would:

- result in a major improvement in the condition of the 67% of fields where the current carrying capacity is exceeded, with more moderate improvements on most other fields;
- enable more sport to be played on about 74% of fields (those that have significant timeslots that are still available for booking), with the collective carrying capacity of the fields increased by 45%. However, it is often not possible to realise all these increases, due to club demand and other site limitations (location, amenities, parking, lights, etc).

The performance of a sporting field can be predicted by comparing wear rates with the carrying capacity (Figure 6.3), but the exact condition will also be influenced by weather conditions, sporting club practices (if wear is spread evenly) and the maintenance program implemented by the council.



**Figure 6.2:** Comparison of the carrying capacity and wear levels of 152 playing fields in the Eastern LGA area. The 102 located above the blackline will struggle to maintain acceptable turf cover during the winter sport season. Note that two of the fields in this study have 33 wear units of capacity which is more than that received on almost all of the fields. Note: one site is receiving 35 wear units yet is only capable of handling 4 units of wear, with this field being very bare by the end of football season.

**Low wear**



**Vulnerable to damage**

- major soil issues
- wrong turf type
- lots of weeds
- waterlogging



**Resistant to damage**

i.e. constructed & maintained according to best practice

**Figure 6.3:** If wear levels exceed carrying capacity then a sporting field will deteriorate, with the photos providing a guideline year. Actual usage will vary with weather conditions both during and prior to the commencement of the winter sport season.

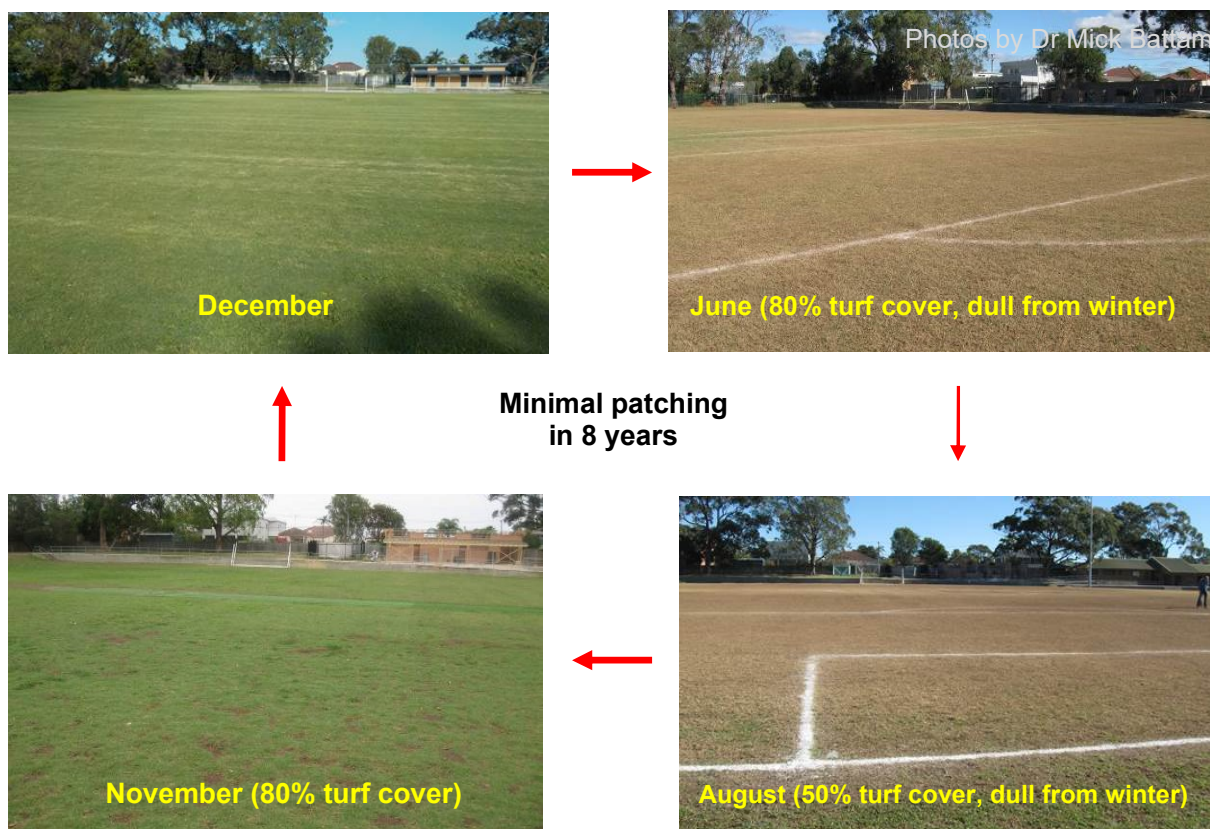
## 7 Carrying capacity limits of fields

### 7.1 Natural turf limits

If sporting fields are constructed correctly then they should never become completely bare as occurs on a turf farm when sod is harvested (Section 9), with one of the most intensely used field in Sydney (~800 players per field):

- maintaining at least 80% turf cover across most areas until about midway through the winter sport season;
- maintaining about 50% turf cover across most areas by the end of the winter sport season;
- recovering each spring so it achieves more than 80% turf cover by mid-November; and
- dense turf cover is achieved in December.

This field was reconstructed according to best practice in 2013. Following the reconstruction, the field was under-fertilised and had limited weed control for a three-year period, which meant the recovery each year took about 4 weeks longer to occur in these years. Since being reconstructed according to best practice, the field generally achieved a thick turf sward by the start of each football season. As such, it is not surprising to find that this field (one of the most intensely worn fields in NSW) has needed minimal patching in 8 years.



**Figure 7.1:** Performance of one of the most intensely used fields in Sydney (~800 players per field) which has had minimal patching since being reconstructed in 2013. It is maintained using a typical council budget but would perform better if more intensely managed. Prior to soil/turf amendment this field had barely a blade of grass left by the end of each football season.

## 7.2 Synthetic turf limits

Synthetic turf has a finite useful life in much the same way that carpet in a commercial building does. No information could be found on the cumulative number of games synthetic surfaces will handle before needing to be replaced. However, the lifespan of a synthetic field that has been appropriately maintained is likely to be about:

- **8 to 10 years:** for fields receiving 40 hours per week of use, with the shock pad expected to last about 20 years (Football NSW synthetic guideline); and
- **5 years:** for fields receiving 60+ hours per week of use. This was stated by a synthetic consultant, with no published lifespan information available for these usage levels.

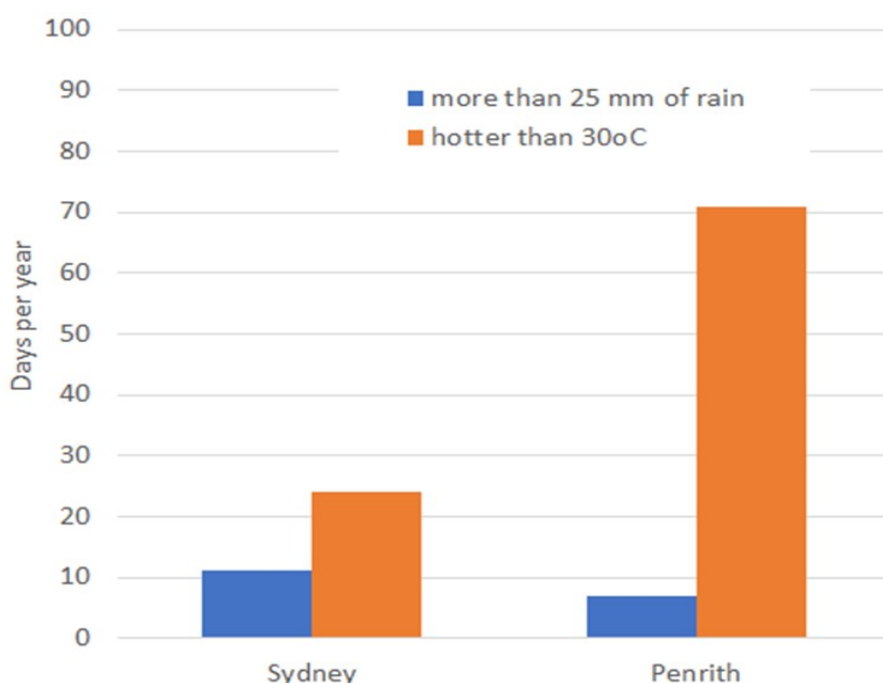
A synthetic field on the north shore was constructed in June 2012. The field was patched in 2017, with council receiving ~\$800,000 grant and issuing a tender for resurfacing including shock pad replacement in 2021 (9-year lifespan), with the works costing about \$1.2 million dollars. The reliance of grants to perform scheduled asset renewal works is unsustainable and represents a significant risk (e.g. financial, safety, field availability for play, etc.) to the community.

## 7.3 Weather limits

Weather can place limits on sport usage such as:

- **natural turf fields:** well-constructed fields generally drain rapidly, but those fields with poor surface water management and/or soil issues can remain wet for days after rain; and
- **synthetic fields:** the surface can be hotter than 70°C on hot days which not only represents a hot temperature for play, but also a burn risk to players. The Football NSW synthetic guideline suggests these fields should not be played on when temperatures exceed 30°C.

The average days per year when weather is likely to impact on play on these two surfaces is provided for Sydney and Penrith (Figure 7.2).



**Figure 7.2:** Average days per year when weather is more likely to impact on play. These impacts can be minimised on natural turf (improved soil, surface water management and/or drainage) and synthetic (shading of surface, playing at night or early morning). Whilst rain has minimal impact on well-constructed natural turf fields, those that are poorly constructed may remain wet for days afterward.

## 8 Characteristics of fields that handle high wear

By addressing the factors limiting turf performance, some councils have achieved major improvements in the performance of their sporting fields. For example:

- a council in southern Sydney reduced their annual spend on turf patching from \$280,000 to \$8,000 over a five-year period;
- a north shore council was spending about \$40,000 annually to patch three sites, but these fields now require minimal patching; and
- a council in southern Sydney previously struggled to maintain turf cover on 3 fields which now survive the winter sport season without requiring turf patching.

The factors limiting turf performance are site specific. Whilst some sites may have inadequate soil depth, others struggle because of an inappropriate turf cultivar, poor drainage and/or soil that sets hard or has low levels of fertility. However, once these limitations have been addressed, most fields can handle very high levels of wear. The characteristics of 12 fields that handle 40 to 60+ hours per week of use are summarised in Table 8.1.

**Table 8.1:** Characteristics of 12 sporting fields that handle high or extreme levels of wear yet maintain acceptable turf cover and require minimal or no turf patching. The performance of many of these fields could be further improved by implementing better maintenance practices.

Legend	Site											
	1	2	3	4	5	6	7	8	9	10	11	12
<p><b>Legend</b></p> <p>Yes</p> <p>Somewhat yes</p> <p>Somewhat no</p> <p>No</p>	<p>Extreme wear ← High Wear →</p>											
<b>Characteristics</b>												
Engineered sand profile (perched water table)	No	No	No	No	No	No	No	No	No	No	No	No
Soil profile - very sandy mix (50:50 to 80:20)	No	No	No	No	No	No	Somewhat yes	No	No	No	Somewhat yes	No
Soil profile – moderately sandy (but not sand)	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes
Soil moderately friable (not heavily compacted)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Somewhat no	Yes	Yes	Yes	Yes
More than 200 mm of topsoil in all areas	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Receives adequate fertiliser application	Somewhat yes	Somewhat yes	Somewhat yes	Somewhat yes	Somewhat yes	Yes	Somewhat yes	Somewhat yes	Somewhat yes	Somewhat yes	Somewhat yes	Somewhat yes
Soil has an acceptable nutrient holding capacity	Yes	Yes	Yes	Yes	Somewhat yes	Yes	Somewhat yes	Yes	Yes	Yes	Yes	Yes
Soil has an acceptable balance of nutrients	Yes	Yes	Yes	Yes	Yes	Yes	Somewhat yes	Yes	Yes	Yes	Yes	Yes
Rapid return to play after moderate rain	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Rapid return to play after extended rain	Yes	Yes	Somewhat yes	Somewhat yes	Yes	Somewhat yes	Yes	Yes	Somewhat yes	Yes	Yes	Yes
Has a slit drainage system	Yes	No	No	No	No	Yes	No	Yes	No	Yes	No	Yes
Has a pop-up irrigation system	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	No
Has a wear tolerant turf cultivar	Yes	Yes	Yes	Yes	Yes	Yes	Somewhat yes	Yes	Yes	Yes	Yes	Yes
Has low numbers of weeds	Yes	Yes	Somewhat yes	Yes	Yes	Yes	Yes	Somewhat yes	Somewhat yes	Yes	Somewhat yes	Yes
Club spreads wear moderately evenly	Yes	Yes	Yes	Somewhat yes	Yes	Somewhat yes	Somewhat yes	No	Yes	Yes	Yes	Somewhat yes
Oversown with ryegrass?	No	Yes	No	No	No	No	No	No	No	No	No	No
Field in good condition in August?	Somewhat yes	Somewhat yes	Somewhat yes	Yes	Yes	Yes	Somewhat yes	Somewhat yes	Yes	Yes	Yes	Yes

## 9 Recovery capabilities of natural turf

When turf farmers harvest couch or kikuyu from their farms, the entire grass surface is removed as well as 5 to 15 mm of soil (turf rolls sold with soil attached). Whilst the surface is bare after harvesting, the turf regrows from underground stems (rhizomes) i.e. no additional turf is sown.

If the turf recovering after cutting is managed correctly, turf grown in Windsor will take about 4 warm months to go from bare ground until full cover is achieved (Figure 9.1), with the turf able to be harvested again about one warm month after this. As the harvesting process causes much more damage than that inflicted by football players, it is not surprising to find well managed turf can handle and recover from more than 45 hours per week of use.



**Figure 9.1:** After harvesting rolls from turf farm, rhizomes (buried stems) enable the bare ground to go back to full turf cover in about 4 warm months. As football does not cause anywhere near this much damage it is not surprising that turf can rapidly recover from wear if managed correctly.



## 10 Conclusions

Sport usage data was obtained for 1157 playing fields (24 councils) within the Sydney Basin. After accounting for blanket booking, the study found 99% of fields receive less than 46 hours per week of formal use. These findings are entirely consistent with the limitations that work, school and sleep place on when formal sport can be played, which is typically confined to 4 pm to 9:30 pm on weeknights and 8 am to 5 pm on weekends (45.5 hours total).

The study identified that council booking data exaggerates the hours sporting fields are used due to blanket bookings. As such, this information should not be used in sports strategies for assessing the extent to which fields are over or under capacity. To better ensure sporting fields meet community requirements it is recommended that Councils:

- collect data on actual hours of sports field use, so they have a better understanding of what is occurring on the ground
- rely on suitably qualified natural turf specialists to assess the wear levels and carrying capacities of natural turf fields
- educate their staff on the capabilities of well-constructed and maintained natural turf fields which can handle more than 46 hours per week of use (Figure 10.1)
- educate their staff and assign appropriate budgets that allow natural turf fields to be constructed and maintained in optimal condition, so user groups are less likely to request expensive alternative surfaces that are less environmentally friendly

There are many examples of fields that historically performed poorly, but once amended and maintained correctly can handle high levels of use (Figure 10.1).



**Figure 10.1:** The clubs using this field requested it be converted to synthetic as it struggled each year (insert), but this was blocked by residents. The field was then reconstructed according to best practice and has made it through 3 seasons without turf patching. The presidents of the soccer and AFL clubs that use this site both commented on the excellent performance of this field in video testimonials, with case study videos available on the media link at [www.agenviro.com](http://www.agenviro.com).