

TURFGRASS CONSULTING & RESEARCH

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RESEARCH PROJECT

“Compare possible hours of use for different sports field construction types and maintenance inputs”

Sports Turf Association Victoria

Milestone Report 3

March 2018

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PROJECT BRIEF

The Problem

Over the past decade the number of sports field constructions and renovations has increased with the general aim of being able to cope with the increasing demand for playing surfaces and the increasing number of users. The challenge has been not only to construct better quality sports fields but also to be able to provide the necessary level of maintenance so as to optimise the capital investment. The problem has often been that the level of maintenance is not in line with the capital investment or expectations and unfortunately these costly projects do not deliver the required outcome.

Project Objective

The objective of this project is to compare sports field construction types and the associated maintenance practices with the quality of the playing surfaces and the potential hours of use.

Project Outcome

The outcome of the project is to develop a protocol that identifies the cost/benefit of different construction types and the required level of maintenance (including equipment type, activity type, seasonal timing and frequency, infrastructure and budget) to optimise the hours of use.

The project outcome will be focused on improving the turf condition, wear tolerance, wear recovery and surface playability as it relates to specific maintenance practices relevant to the desired standard of field and construction type.

METHODOLOGY

The project is being undertaken on Local Government sports fields that are in play and maintained by the Council or their service provider. The playing surfaces are being regularly assessed over the trial period (minimum 18 months) using a range of scientific instruments in order to provide a detailed objective assessment.

Table 1: Description of sports fields

| Sports field No.1 | |
|-------------------|--|
| Location | Bayside |
| Soil type | Sand profile with subsoil drainage |
| Turf type | Santa Ana overseeded with ryegrass |
| Cricket | Turf pitch |
| Sports played | Senior football, Junior football, Auskick, Womans football, Cricket Victorian Amateur Football Association (VAFA) Premier C |
| Sports field No.2 | |
| Location | Mornington Peninsula |
| Soil type | Fine sandy loam no subsoil drainage |
| Turf type | Kikuyu |
| Cricket | Synthetic pitch |
| Sports played | Junior football, Auskick, Junior cricket |
| Sports field No.3 | |
| Location | Mornington Peninsula |
| Soil type | Fine sandy loam no subsoil drainage |
| Turf type | Kikuyu |
| Cricket | Nil |
| Sports played | Senior soccer – State League 1 SE, Bayside, Bayside Woman’s Premier League |
| Sports field No.4 | |
| Location | Mornington Peninsula |
| Soil type | Sand profile with subsoil drainage |
| Turf type | Santa Ana |
| Cricket | Turf pitch – Premier Grade Cricket (2 XI) |
| Sports played | Senior football, Junior football, Auskick, Cricket Peninsula Football Netball League - Peninsula Seniors |

Trial layout

Each site has 5 sample locations; goal square, both wings, centre half forward/back and the centre of the field (figure 1). Each sample location is 10m x 10m in which each measurement has been undertaken.

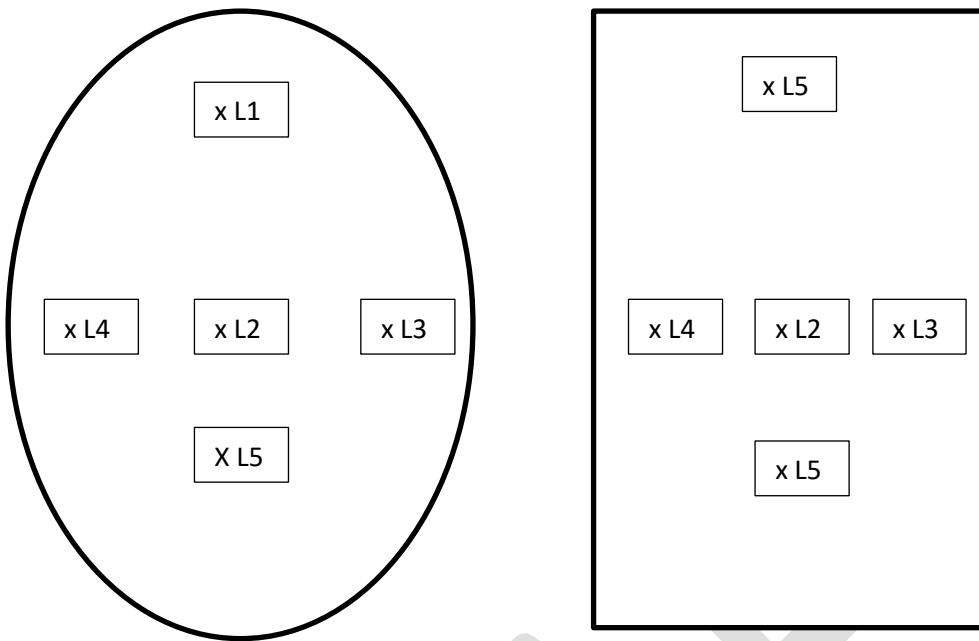


Figure 1: Sample locations

Test methods

The test methods used to assess each field are described in Milestone Report 1 (August 2017).

Maintenance data

Detailed maintenance data will be collected over the length of the trial period and will include;

- Mowing frequency
- Mower type and Height of cut
- Aeration - type and frequency
- Fertiliser - type and frequency
- Irrigation - frequency (volume of water)
- Renovation (scarifying, topdressing, hollow tine coring and compaction relief)
- Turf replacement
- Overseeding and spring transition of overseeded grass
- Weed control
- Insect control
- Disease control
- General repair of damaged turf

Weather data

Weather data and in particular rainfall will be collected for the duration of the project.

RESULTS

Assessments have been undertaken in late March 2017, early June 2017, early August 2017, late November 2017 and March 2018 with the results for March 2018 summarised below;

Rainfall

Rainfall data was collected for the closest Bureau of Meteorology sites and the results are detailed in table 2 and figure 2. The weather from March through to November 2017 was relatively dry and the rainfall was below the long-term average for all sites. December 2017 was wet and the rainfall was well above the long-term average. January to March 2018 has been very dry and the rainfall was well below the long term average. February 2018 in particular recorded almost no effective rainfall with all fields relying on irrigation.

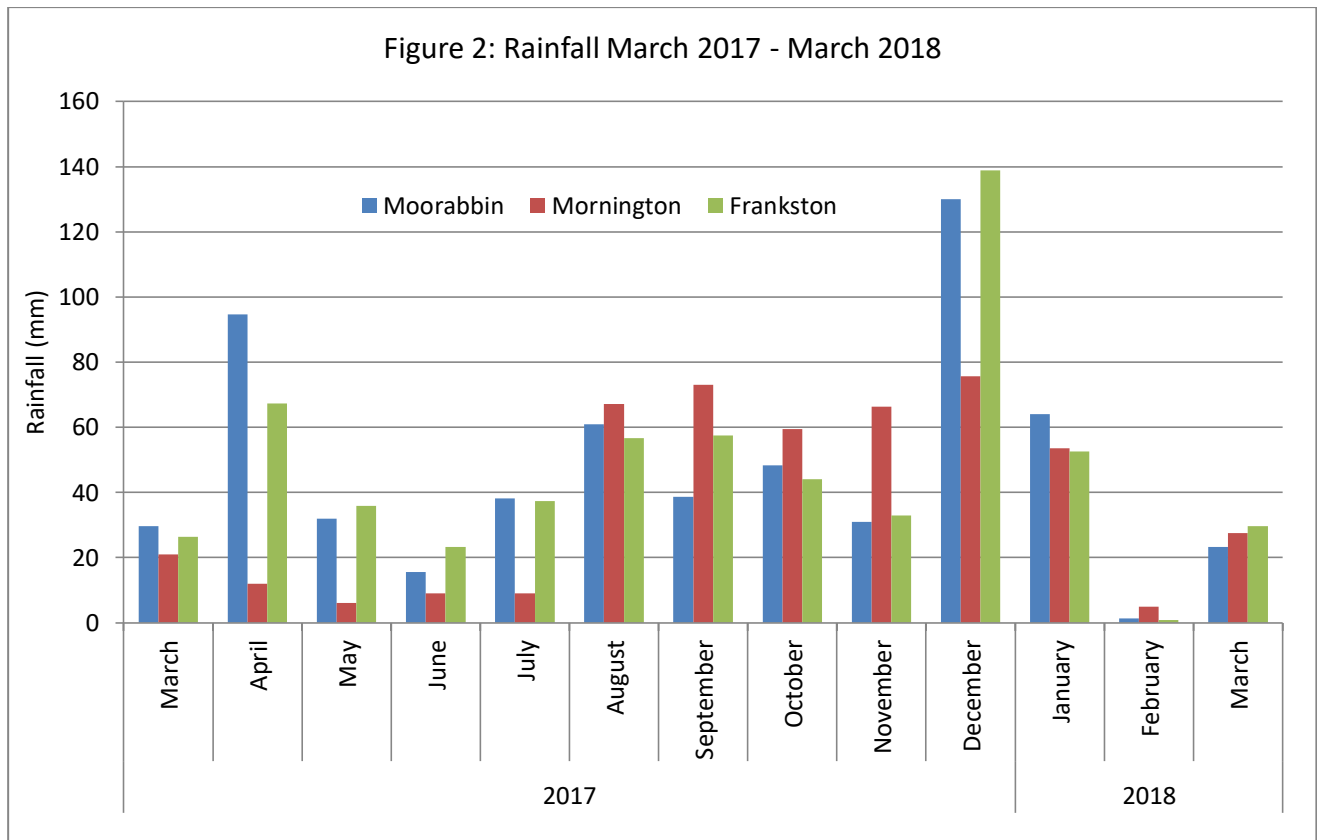


Table 2: Monthly rainfall data

| | 2017 | | | | | | | | | | 2018 | | |
|-------------------|-------|-------|------|------|------|--------|------|------|------|-------|------|------|-------|
| | March | April | May | June | July | August | Sept | Oct | Nov | Dec | Jan | Feb | March |
| Moorabbin | 29.6 | 94.6 | 32 | 15.6 | 38.2 | 61 | 38.6 | 48.4 | 31 | 130 | 64 | 1.4 | 23.2 |
| Long term average | 44 | 63 | 69 | 56 | 62 | 65.1 | 64.6 | 68.8 | 62.4 | 60.5 | 44.4 | 45 | 43.7 |
| Mornington | 21 | 12 | 6 | 9 | 9 | 67.1 | 73 | 59.5 | 66.3 | 75.6 | 53.6 | 5 | 27.6 |
| Long term average | 49 | 62 | 70 | 71 | 69 | 71 | 71.5 | 69 | 59.8 | 53.6 | 38.4 | 38.1 | 44.9 |
| Frankston | 26.4 | 67.3 | 35.9 | 23.3 | 37.3 | 56.7 | 57.5 | 44 | 33 | 138.8 | 52.5 | 0.8 | 29.6 |
| Long term average | 47 | 65 | 68 | 73 | 71 | 65.6 | 68.9 | 68.7 | 60.5 | 64.2 | 47.3 | 48.3 | 47 |

Field No.1

Turf composition and Turf density:

Table 3: Field No. 1 Turfgrass composition

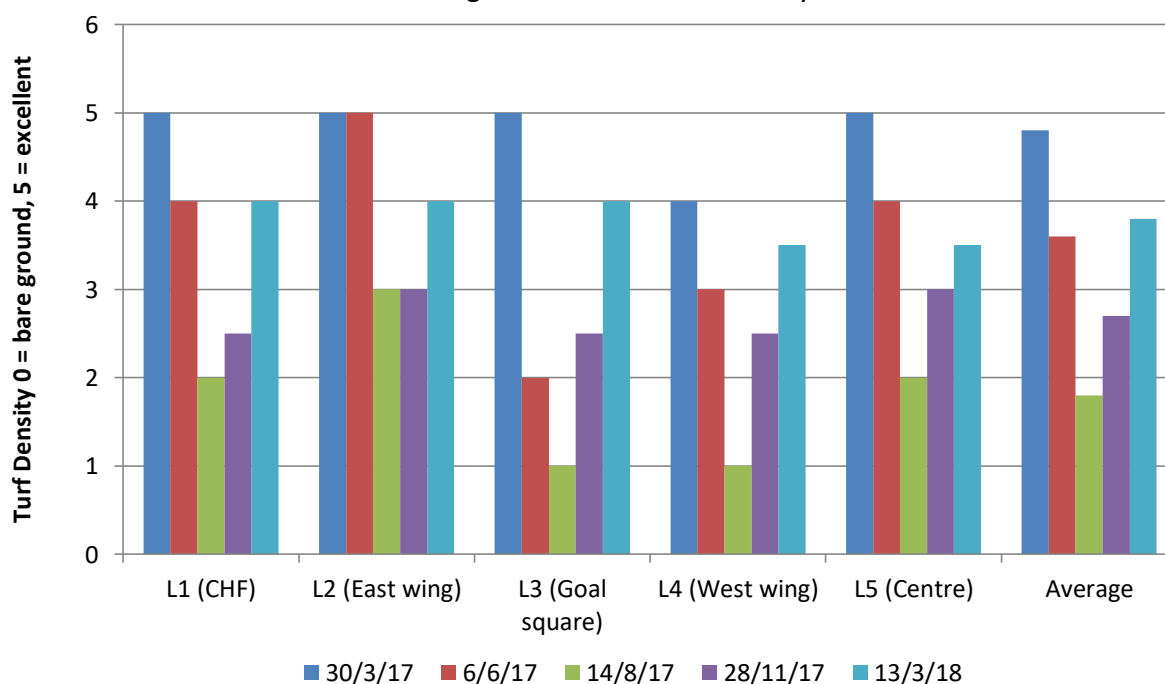
| | 30/3/17 | | | 6/6/17 | | | 14/8/17 | | | 28/11/17 | | 13/3/18 |
|------------------|---------|--------|---------------|---------|-------|---------------|---------|-------|---------------|----------|---------------|---------|
| | % Couch | % Rye* | % bare ground | % Couch | % Rye | % bare ground | % Couch | % Rye | % bare ground | % Couch | % bare ground | % Couch |
| L1 (CHF) | 78 | 22 | 0 | 91 | 2 | 7 | 90 | 5 | 5 | 86 | 14 | 100 |
| L2 (East wing) | 57 | 43 | 0 | 44 | 56 | 0 | 67 | 33 | 0 | 92 | 8 | 100 |
| L3 (Goal square) | 100 | 0 | 0 | 81 | 0 | 19 | 70 | 0 | 30 | 82 | 18 | 100 |
| L4 (West wing) | 85 | 15 | 0 | 86 | 9 | 5 | 80 | 6 | 14 | 84 | 16 | 100 |
| L5 (Centre) | 83 | 17 | 0 | 60 | 40 | 0 | 59 | 34 | 7 | 84 | 16 | 100 |
| Average | 80.6 | 19.4 | 0 | 72.4 | 21.4 | 6.2 | 73.2 | 15.6 | 11.2 | 85.6 | 14.4 | 100 |

*Ryegrass

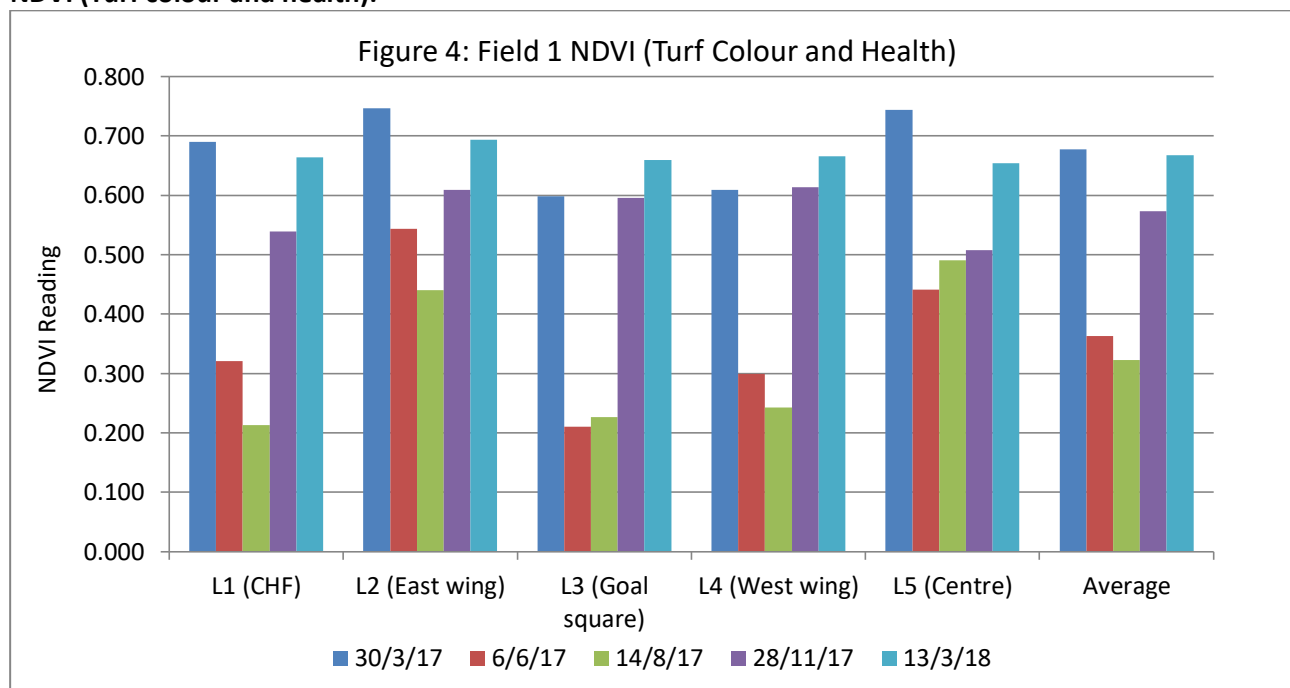
Comments:

- Couch was the predominant grass type with a 100% grass cover.
- There was no bare ground though there were some areas that lacked density as a consequence of the previous winter's damage and slow recovery.
- The poorest turf cover is still in the goal squares and the pavilion side of the field where there is a lot of training.
- The weed population was relatively low. However, there were new germinations of Summergrass (*Digitaria sanguinalis*) noted in the thin areas in December 2017 and they have developed into mature plants.
- Turf density has improved since the December 2017 assessment although less than expected and reflects in part the recovery of the couch, uneven water distribution and potentially low fertility in the higher wear areas.

Figure 3: Field 1 Turf Density



NDVI (Turf colour and health):



Comments: The turf colour/health has continued to improve as the couch responded to the warmer weather.

Thatch depth and root depth:

Table 4: Thatch and Root Depth

| | Thatch depth (cm) | | Root depth (cm) | |
|------------------|-------------------|------------|-----------------|-------------|
| | 30/3/17 | 30/3/17 | 30/3/17 | 13/3/18 |
| L1 (CHF) | 6 | 4 | 25 | 12 |
| L2 (East wing) | 5 | 3 | 25 | 12 |
| L3 (Goal square) | 3 | 4 | 25 | 20 |
| L4 (West wing) | 5 | 4 | 25 | 14 |
| L5 (Centre) | 5.5 | 4 | 25 | 10 |
| Average | 4.9 | 3.8 | 25 | 13.6 |

Comments: The thatch depth has reduced marginally and the root depth has decreased considerably. The reduction in the root system is related to the dry soil conditions and the associated increase in soil strength.

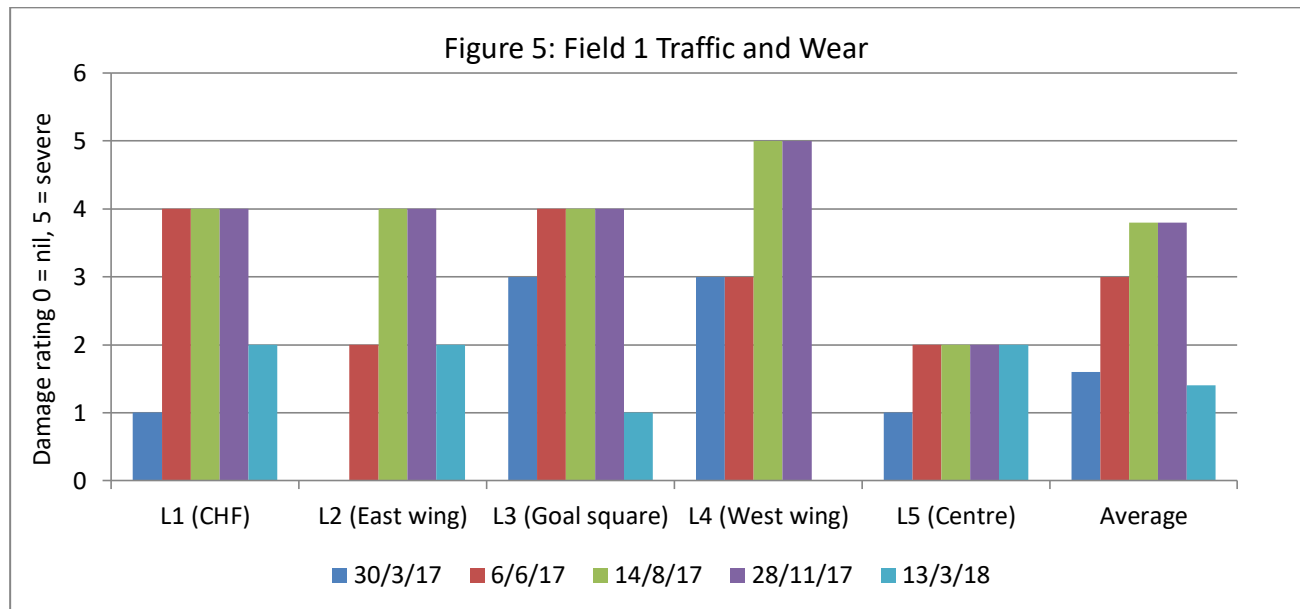
Infiltration rate:

Table 5: Infiltration rate

| Infiltration rate (mm/hr) | 30/3/17 | 14/8/17 | 28/11/17 | 13/3/18 |
|---------------------------|-----------|-----------|------------|------------|
| L1 (CHF) | 25 | 100 | 80 | 333 |
| L2 (East wing) | 5 | NT | 170 | 84 |
| L3 (Goal square) | 5 | 5 | 70 | 240 |
| L4 (West wing) | 25 | NT | 180 | 360 |
| L5 (Centre) | 120 | NT | 300 | 394 |
| Average | 36 | NA | 160 | 282 |

Comments: The infiltration rate varied across the field but was considered to be moderate to high and had increased compared to the previous assessments.

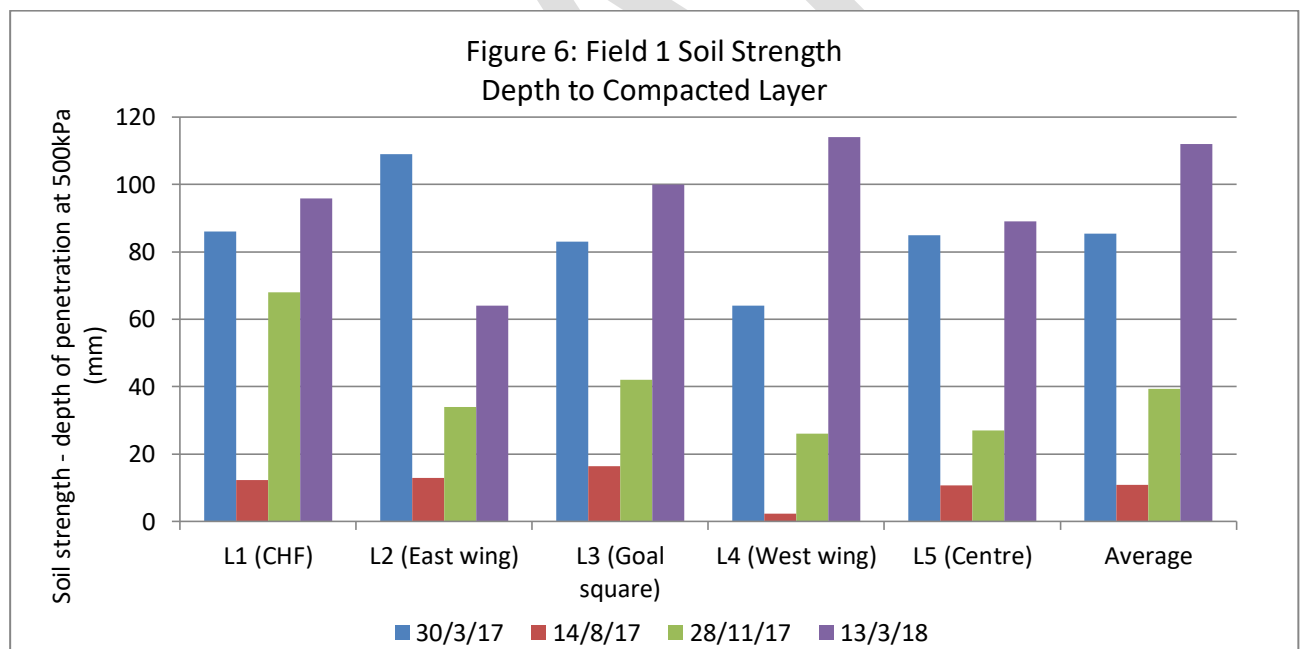
Traffic and wear:



Comments:

- Moderate to no wear across the field though the higher traffic areas had the lowest turf density.
- Concentrated wear in goal squares and the west side of the field adjacent to the pavilion.
- The surface levels were within acceptable limits with no holes greater than 10 – 15mm depth.

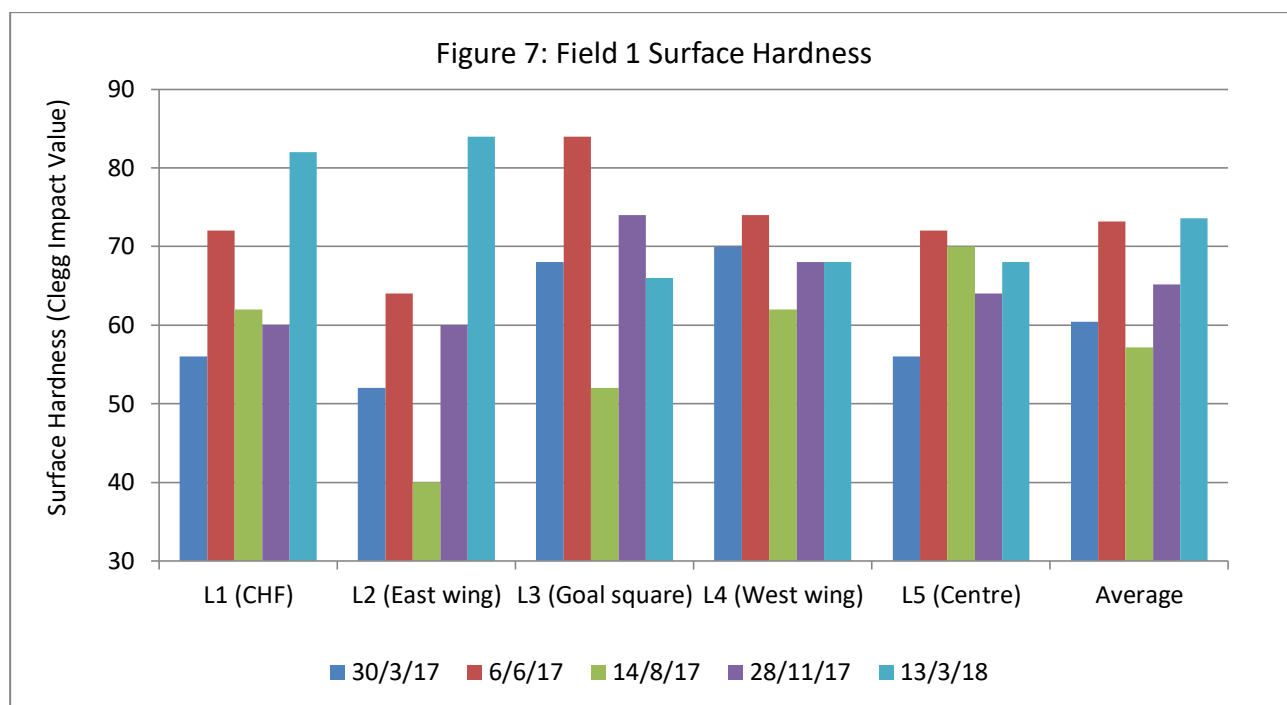
Soil strength (compaction):



Comments:

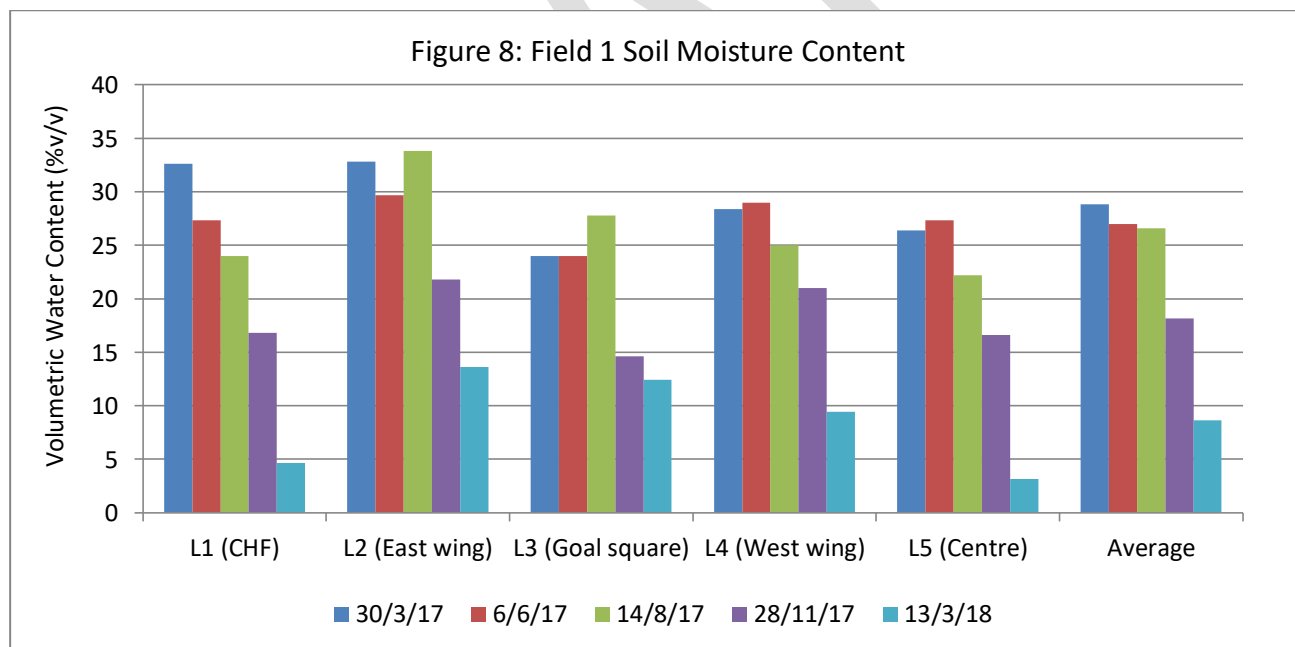
- At the March 2017 assessment the compacted layer was at about 80 – 100mm.
- At the August 2017 assessment the compacted layer was very shallow at less than 20mm.
- There has been a considerable reduction in soil strength and reflects the recent soil decompaction.

Surface hardness:



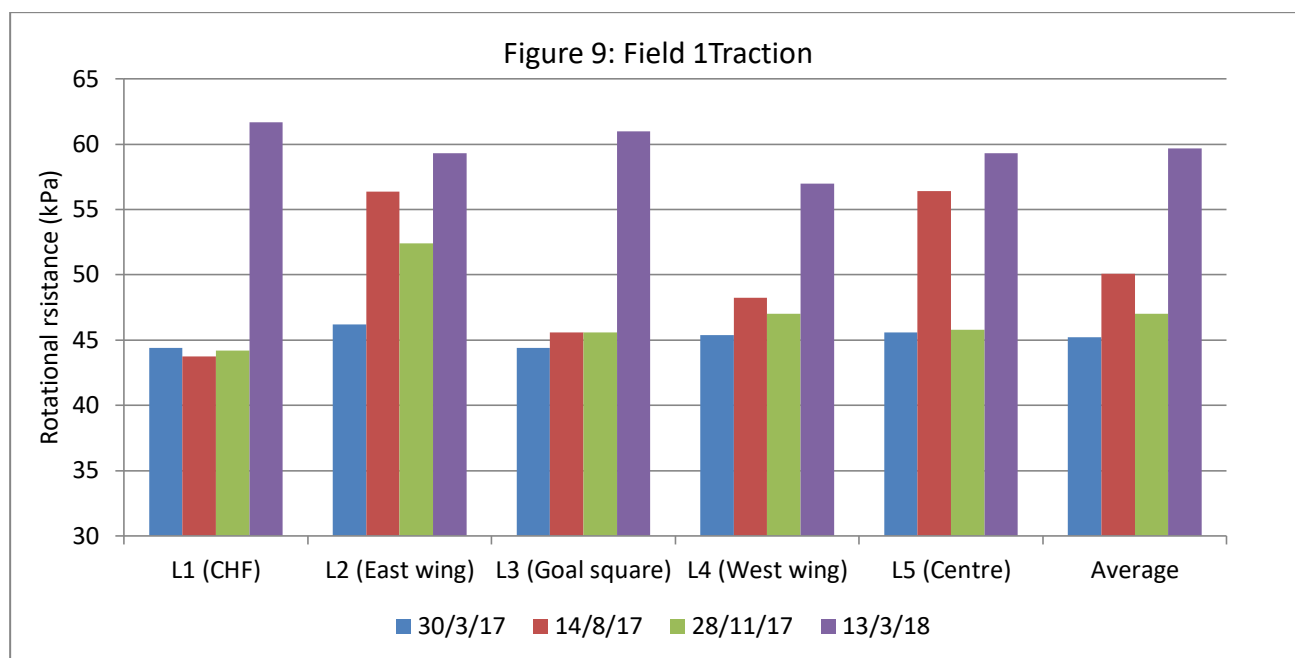
Comment: The surface hardness varied somewhat but tended to be within the acceptable range.

Soil moisture content:



Comments: The soil moisture content varied across the field and was relatively low. Some areas were very dry and reflected the poor water distribution from the irrigation system.

Traction:



Comments:

- The traction has increased considerably and reflects the improvement in the turf cover and turf density. The traction was relatively consistent across the field and within acceptable limits.
- The data continues to strongly endorse the use of couch for high wear situations.

Field No.2

Turf composition and Turf density:

Table 6: Field No. 2 Turfgrass composition

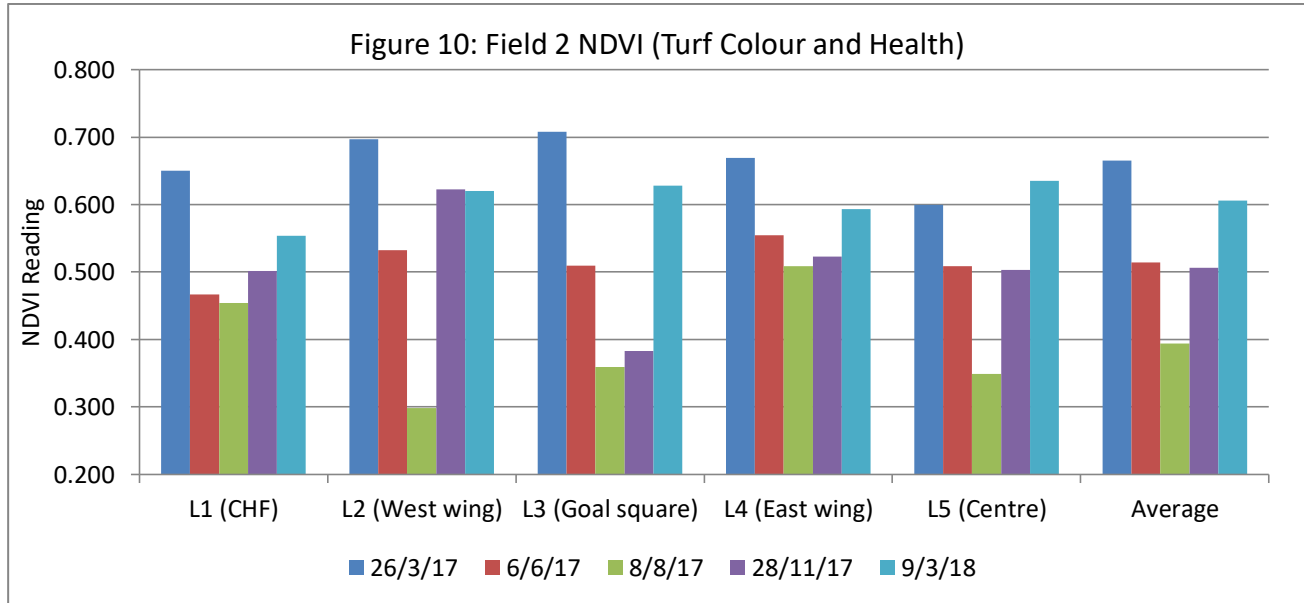
| Location | 26/3/17 | | 6/6/17 | | 8/8/17 | |
|------------------|----------|---------------|--------------------|---------------|---------------|--------------------|
| | % Kikuyu | % bare ground | % Kikuyu | % bare ground | % Kikuyu | % bare ground |
| L1 (CHF) | 98 | 2 | 98 | 2 | 60 | 40 |
| L2 (East wing) | 100 | 0 | 100 | 0 | 90 | 10 |
| L3 (Goal square) | 90 | 10 | 90 | 10 | 90 | 10 |
| L4 (West wing) | 100 | 0 | 100 | 0 | 75 | 25 |
| L5 (Centre) | 80 | 20 | 90 | 10 | 75 | 25 |
| Average | 93.6 | 6.4 | 95.6 | 4.4 | 78 | 22 |
| Location | 24/11/17 | | | 9/3/18 | | |
| | % Kikuyu | % bare ground | % <i>Poa annua</i> | % Kikuyu | % bare ground | % <i>Poa annua</i> |
| L1 (CHF) | 83 | 13 | 4 | 93 | 7 | 0 |
| L2 (East wing) | 100 | 0 | 0 | 100 | 0 | 0 |
| L3 (Goal square) | 83 | 17 | 0 | 98 | 2 | 0 |
| L4 (West wing) | 96 | 4 | 0 | 100 | 0 | 0 |
| L5 (Centre) | 78 | 22 | 0 | 100 | 0 | 0 |
| Average | 90.5 | 8.5 | 1 | 98 | 2 | 0 |

Comments:

- The field had a very good base of Kikuyu initially.
- The field experienced high wear on wet soils through the winter months. During the winter the stolons and rhizomes persisted very well and helped to hold the surface together.

- With the spring and summer weather conditions the Kikuyu has recovered extremely well and overall is providing a very good turf cover. It was noticed at site 1 that the winter wear was evident in the spring and continues to influence the turf condition and density at the end of summer. Areas like this require additional fertiliser to stimulate growth and recovery.
- In the spring there were some small weeds present consisting of Summergrass (*D. sanguinalis*) and Wireweed (*Polygonum* spp.). At the March 2018 assessment there was well developed wireweed in the thinner areas of the turf.

NDVI:



Comments: The turf colour and health has improved as the Kikuyu responds to the warmer weather, however, it is less than optimum due to the dryness across the field. The Kikuyu in the localised dry areas is under stress which was reflected in the turf health.

Table 7: Thatch and Root Depth

| | Thatch depth (cm) | | Root depth (cm) | |
|------------------|-------------------|------------|-----------------|-----------|
| | 26/3/17 | 9/3/18 | 26/3/17 | 9/3/18 |
| L1 (CHF) | 2 | 5 | 10 | 15 |
| L2 (East wing) | 3 | 5 | 10 | 15 |
| L3 (Goal square) | 2 | 4 | 15 | 10 |
| L4 (West wing) | 3 | 4 | 14 | 10 |
| L5 (Centre) | 2 | 4 | 10 | 15 |
| Average | 2.4 | 4.4 | 11.8 | 13 |

Comments: The thatch depth has increased and reflects the improved growth and density of the Kikuyu. The root depth has increased marginally and is also related to the improved growth in the Kikuyu.

Infiltration rate:

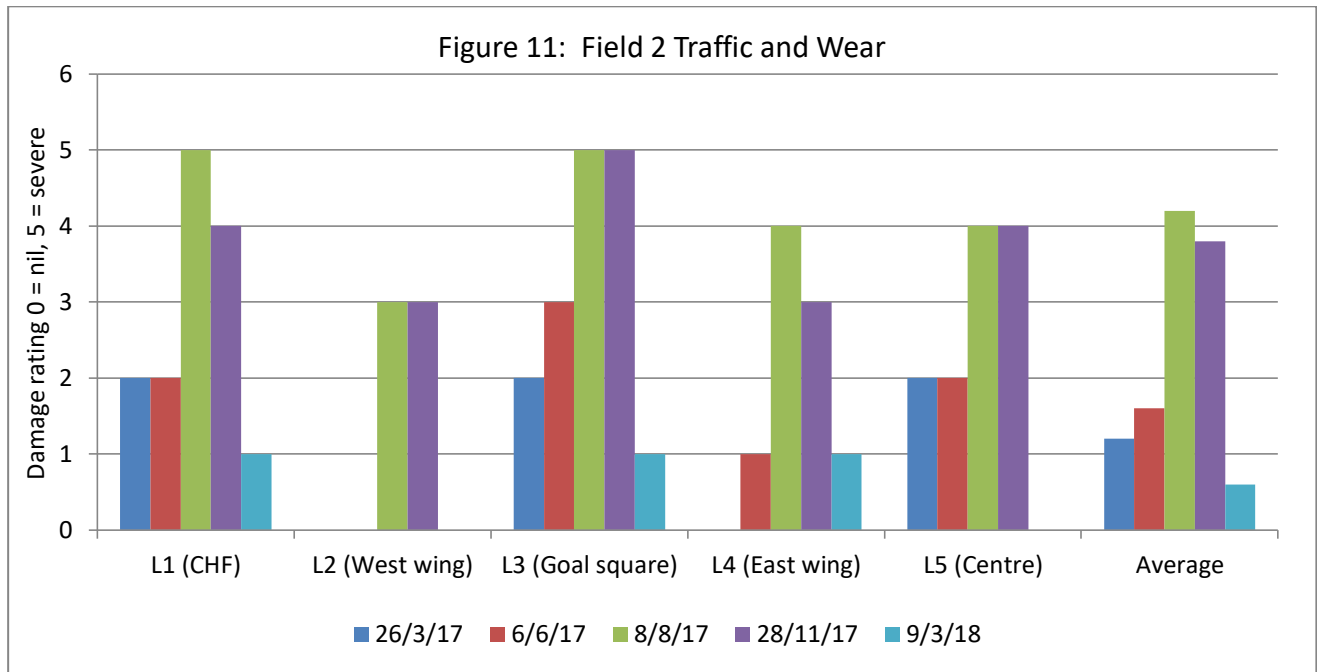
Table 8: Infiltration rate

| Infiltration rate (mm/hr) | 26/3/17 | 8/8/17 | 24/11/17 | 9/3/18 |
|---------------------------|-----------|--------------|------------|-----------|
| L1 (CHF) | 40 | <5 | 8 | 3 |
| L2 (East wing) | 30 | <5 | 9 | 13 |
| L3 (Goal square) | 40 | <5 | 8 | 21 |
| L4 (West wing) | 35 | <5 | 6 | 6 |
| L5 (Centre) | 15 | <5 | 15 | 11 |
| Average | 32 | <5 | 9.2 | 11 |

Comments:

- The initial infiltration rate was consistent across the field. The centre was more compacted and had the lowest infiltration rate.
- At the August 2017 assessment, the infiltration rate was not measureable but had improved marginally with the November 2017 assessment. It was noted that there had been some soil aeration take place which has contributed to the marginal increase in the infiltration rate.
- At the end of summer, the infiltration was still about the same as the spring measurements.

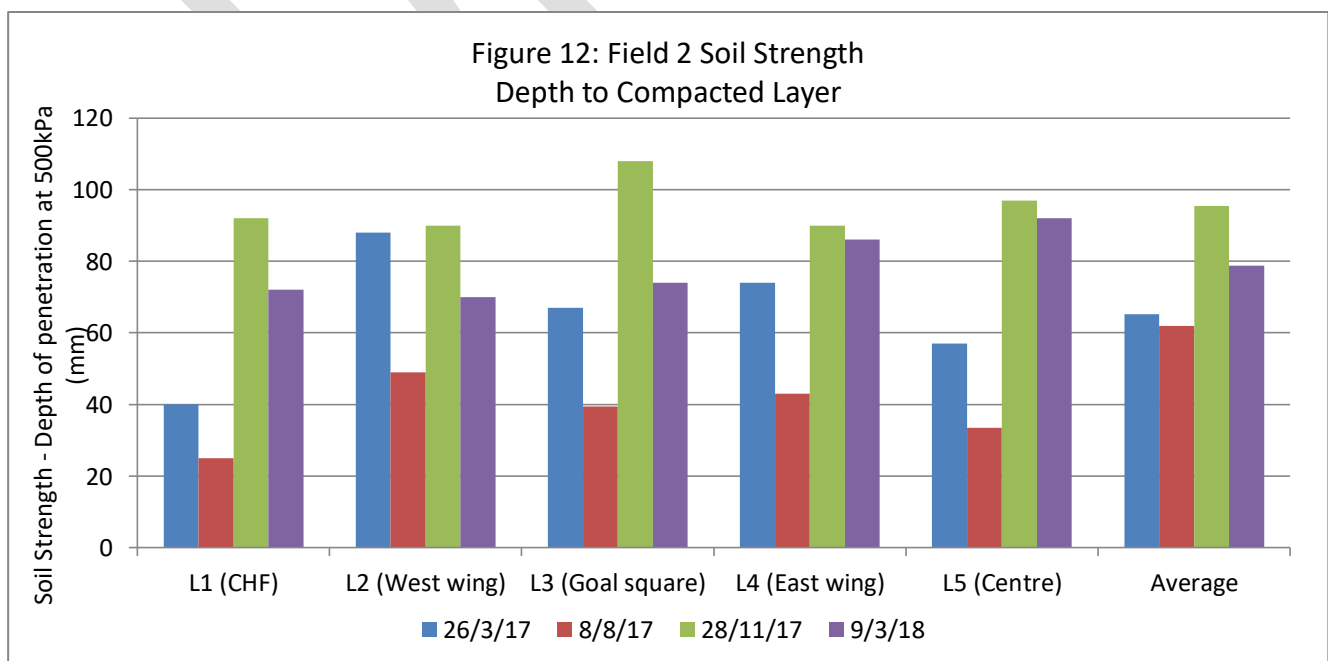
Traffic and wear:



Comments:

- There was strong recovery in the Kikuyu and most of the damaged areas had recovered completely. The goal square in particular had shown remarkable turf recovery.
- The surface levels were within acceptable limits with no holes greater than 20mm depth.

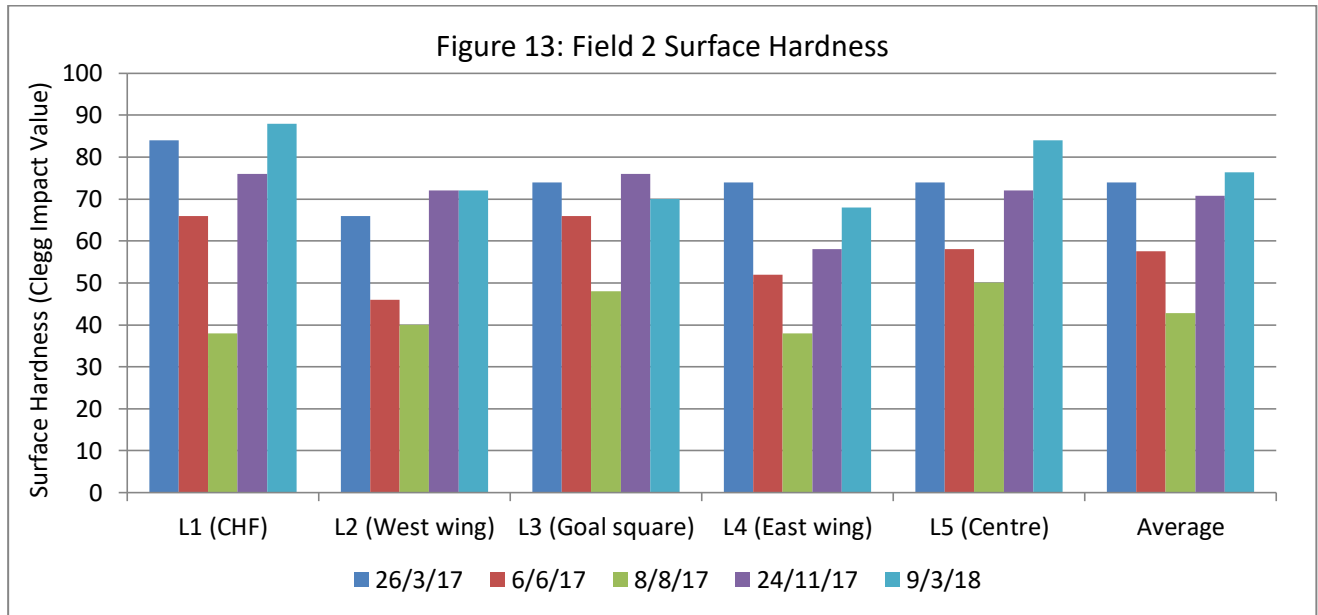
Soil strength (compaction):



Comments:

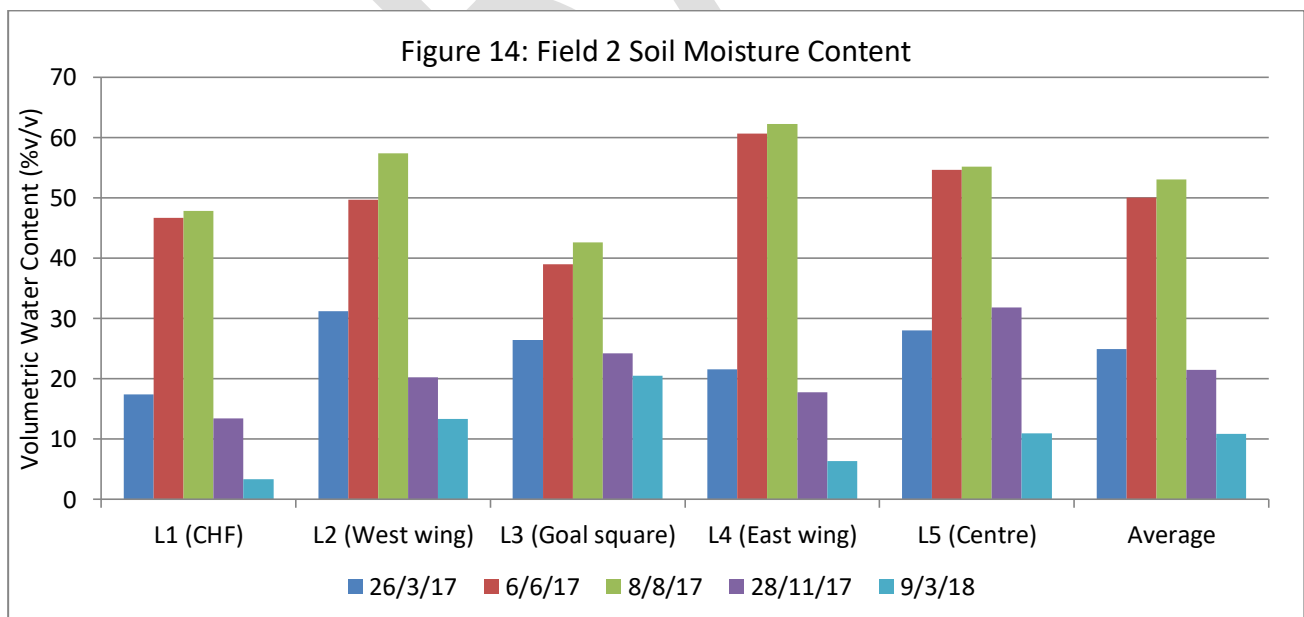
- At the initial assessment the compacted layer was at about 40 – 85mm.
- At the November 2017 assessment there was an obvious reduction in the soil strength with the zone of compaction at about 95mm.
- Compared to the spring assessment there was some increase in soil strength and compaction. This increase in soil strength is mainly due to the dry soils.

Surface hardness:



Comment: The surface hardness was moderate and within the acceptable range. The firmer areas are related to soil moisture with the drier areas being harder.

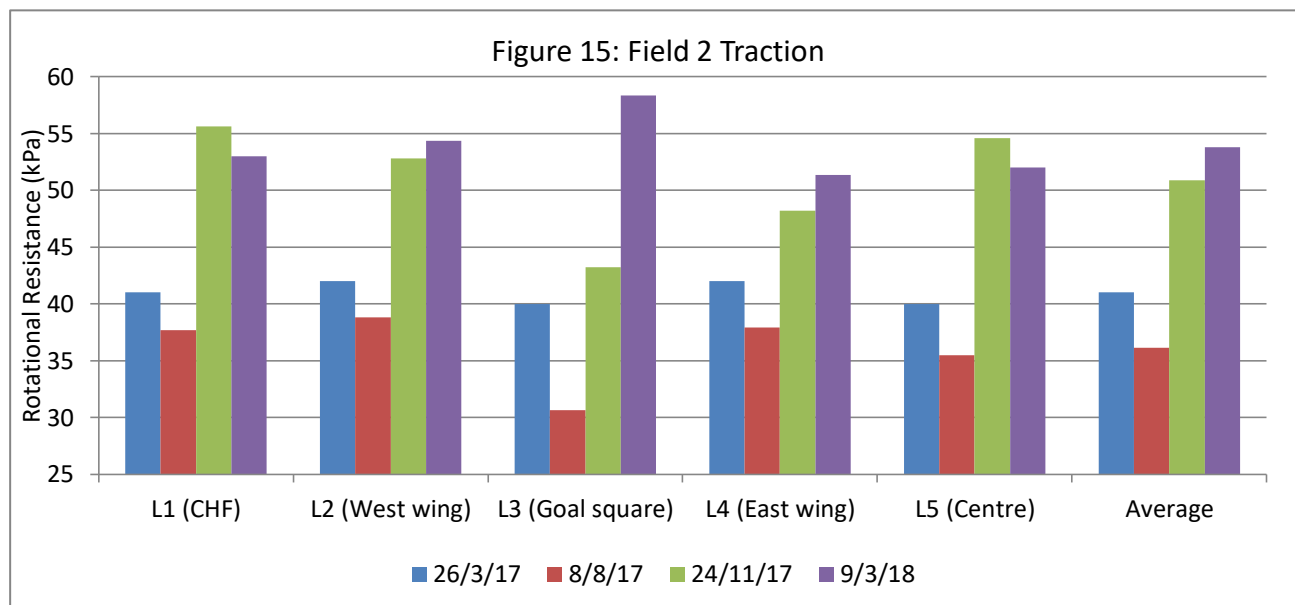
Soil moisture content:



Comments:

- The soil moisture content varied considerably across the field and reflects the lack of uniformity in the irrigation system.
- The moisture content was at saturation in June and August 2017 and on this recent assessment the soils were very dry.

Traction:



Comments:

- The initial traction readings were within the acceptable limits but at the lower end of the range.
- The traction reduced considerably in late winter due to the saturated soils.
- At the November 2017 assessment the traction had increased considerably in response to the growth of the Kikuyu and drier soils.
- At the March 2018 assessment the traction generally increased and again reflected the improved Kikuyu cover and density.

Field No.3

Turf composition and Turf density:

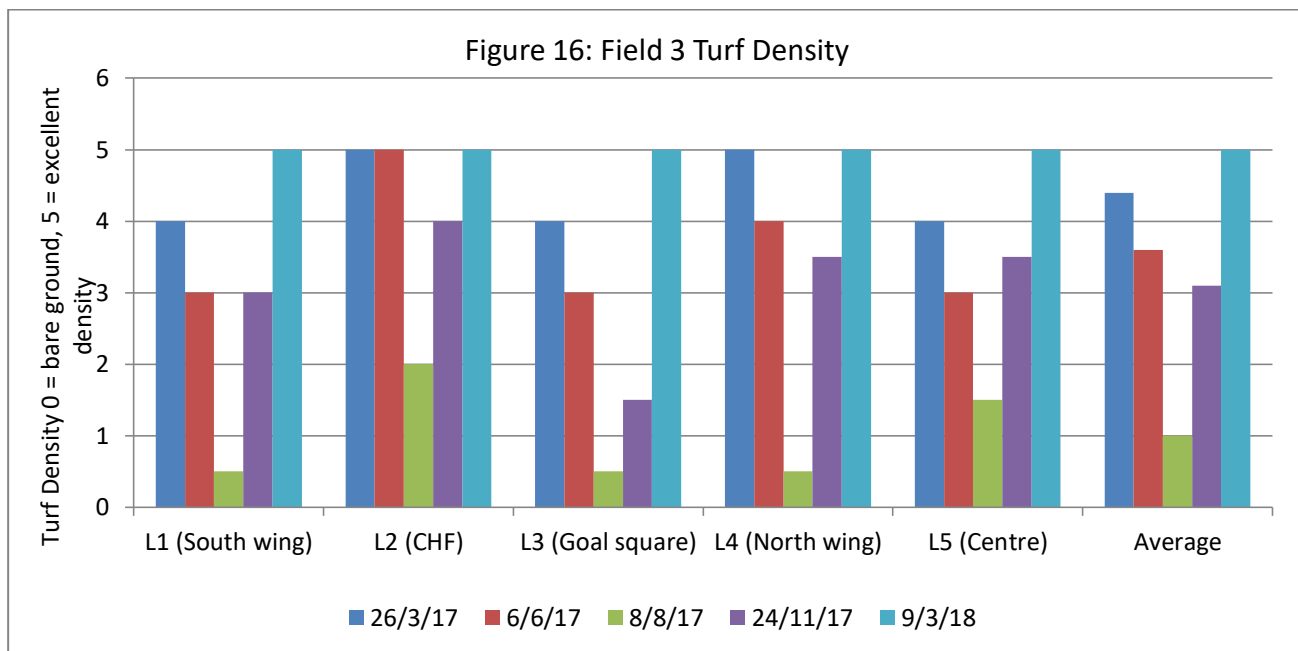
Table 9: Field No. 3 Turfgrass composition

| | 26/3/17 | | 6/6/17 | | 8/8/17 | | 24/11/2017 | | | 9/3/18 |
|------------------|----------|---------------|----------|---------------|----------|---------------|------------|---------------|--------------------|----------|
| | % Kikuyu | % bare ground | % Kikuyu | % bare ground | % Kikuyu | % bare ground | % Kikuyu | % bare ground | % <i>Poa annua</i> | % Kikuyu |
| L1 (CHF) | 98 | 2 | 98 | 2 | 60 | 40 | 83 | 13 | 4 | 100 |
| L2 (East wing) | 100 | 0 | 100 | 0 | 90 | 10 | 100 | 0 | 0 | 100 |
| L3 (Goal square) | 90 | 10 | 90 | 10 | 90 | 10 | 83 | 17 | 0 | 100 |
| L4 (West wing) | 100 | 0 | 100 | 0 | 75 | 25 | 96 | 4 | 0 | 100 |
| L5 (Centre) | 80 | 20 | 90 | 10 | 75 | 25 | 78 | 22 | 0 | 100 |
| Average | 93.6 | 6.4 | 95.6 | 4.4 | 78 | 22 | 90.5 | 8.5 | 1 | 100 |

*Note: After the field was assessed the goal squares were turfed with Kikuyu

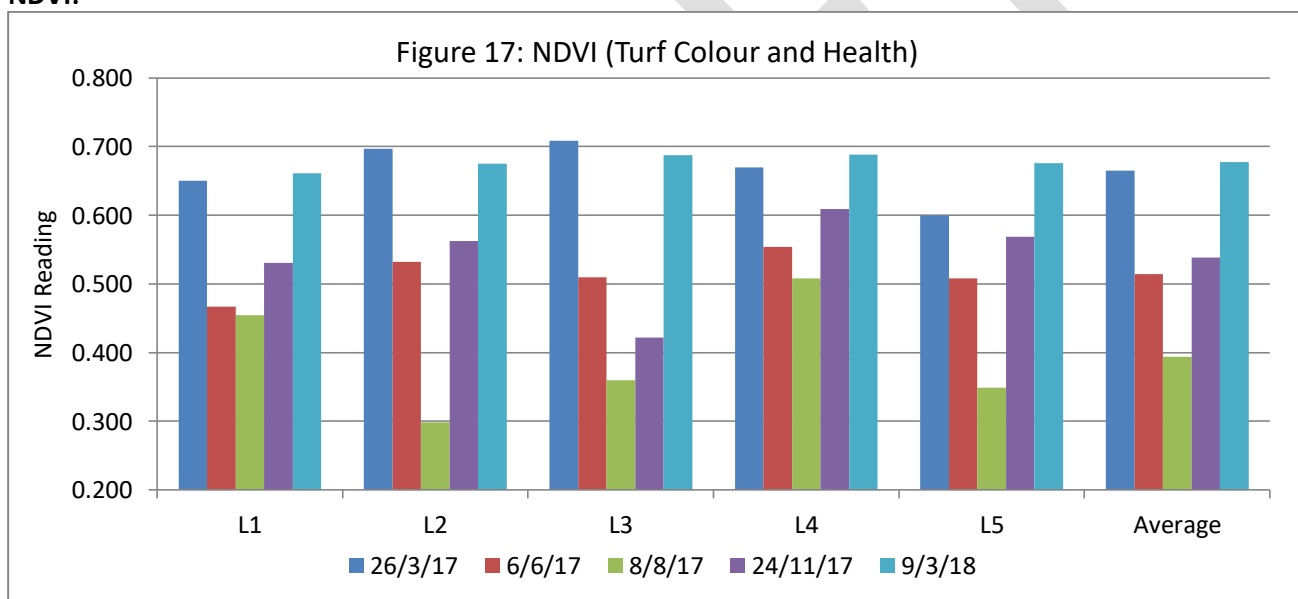
Comments:

- The field had an excellent base of Kikuyu.
- The field experiences minimal wear over summer.
- The goals, the centre and other areas were repaired with Kikuyu turf.
- Over the spring/summer the Kikuyu has increased considerably in turf density.



Comments: The turf density was excellent and was in response to the improved growth of the Kikuyu.

NDVI:



Comments: The turf colour and health was very good and reflected the strong growth of the Kikuyu.

Thatch and Root Depth:

Table 10: Thatch and Root Depth

| | Thatch depth (cm) | | Root depth (cm) | |
|------------------|-------------------|----------|-----------------|-------------|
| | 26/3/17 | 9/3/18 | 26/3/17 | 9/3/18 |
| L1 (CHF) | 2 | 3 | 12 | 16 |
| L2 (East wing) | 2 | 3 | 15 | 12 |
| L3 (Goal square) | 2 | 3 | 13 | 15 |
| L4 (West wing) | 2 | 3 | 20 | 12 |
| L5 (Centre) | 2 | 3 | 15 | 12 |
| Average | 2 | 3 | 15 | 13.4 |

Comments: The thatch depth has increased marginally and the root depth has decreased marginally.

Infiltration rate:

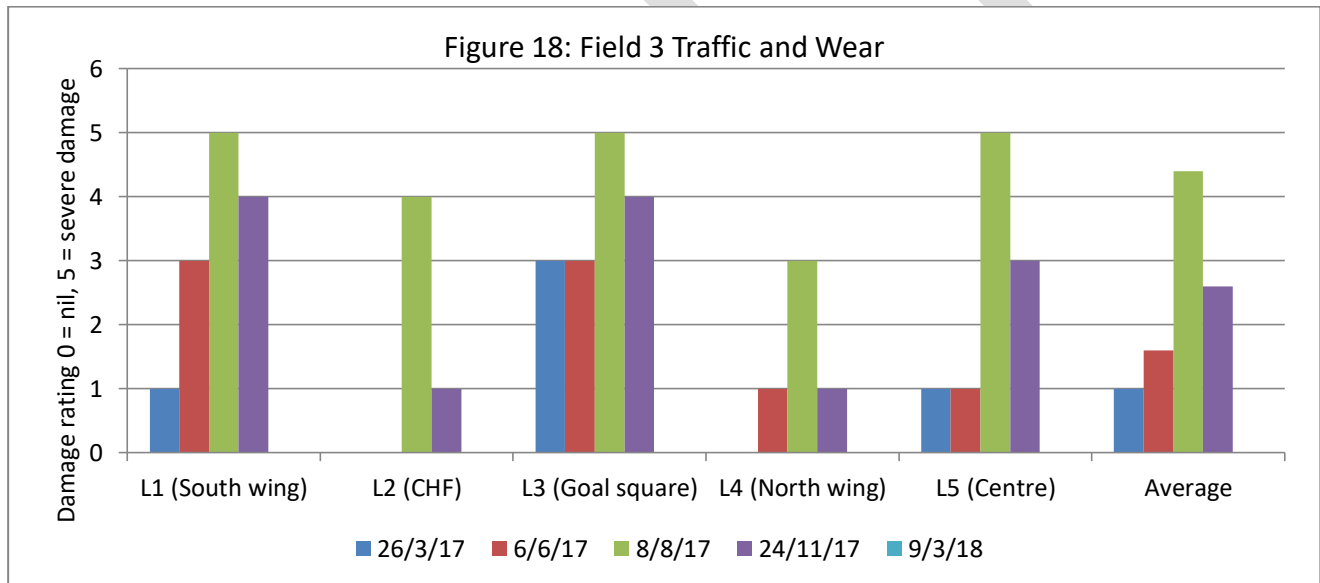
Table 11: Infiltration rate

| Infiltration rate (mm/hr) | 26/3/17 | 8/8/17 | 24/11/17 | 9/3/18 |
|---------------------------|---------|--------|----------|--------|
| L1 (CHF) | 40 | <5 | 10 | 25 |
| L2 (East wing) | 35 | <5 | 12 | 25 |
| L3 (Goal square) | 5 | <5 | 14 | 18 |
| L4 (West wing) | 25 | <5 | 10 | 20 |
| L5 (Centre) | 25 | <5 | 11 | 17 |
| Average | 26 | <5 | 12 | 21 |

Comments:

- The initial infiltration rate was reasonably consistent across the field.
- At the August 2017 assessment the infiltration rate was not measureable at any of the locations due to the wet soils and surface compaction.
- At the November 2017 assessment, although low, there was some improvement in the infiltration rate and reflected a recent aeration.
- At the March 2018 assessment the infiltration rate was similar to the same period in 2017. This reflects the renovations that were undertaken in the late spring.

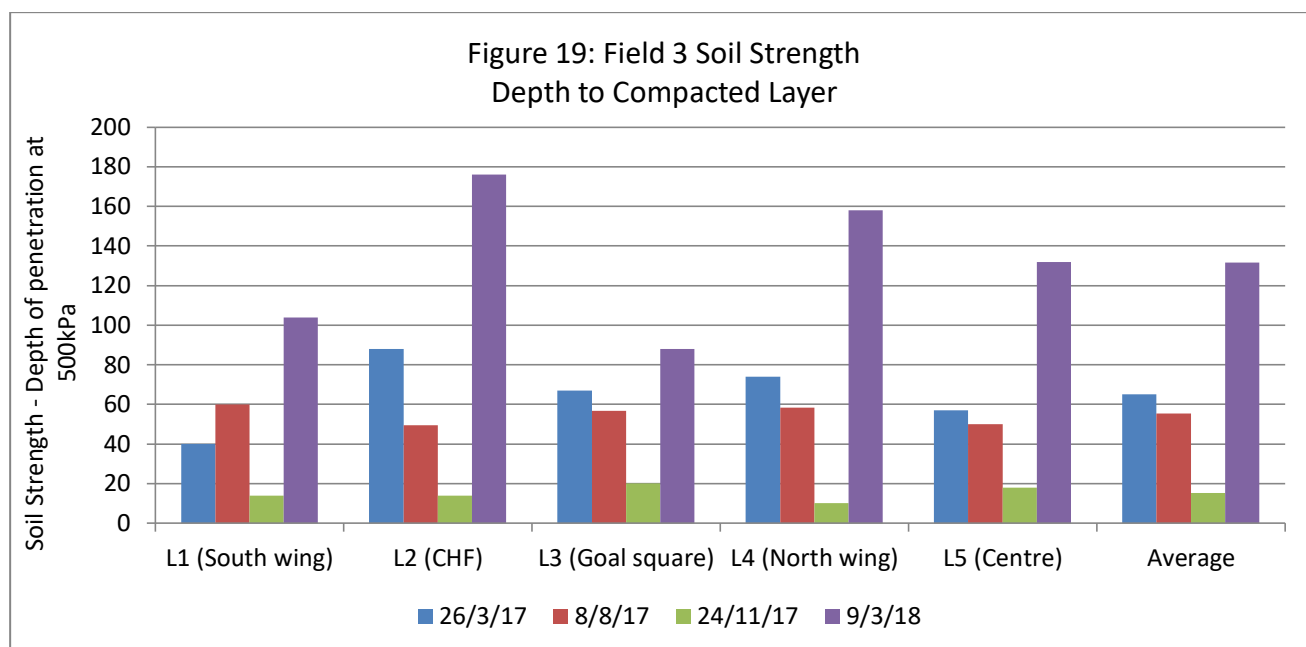
Traffic and wear:



Comments:

- There was no wear on the field (on the chart they are recorded as a zero value)
- The surface levels were within acceptable limits with no holes greater than 20 mm depth.

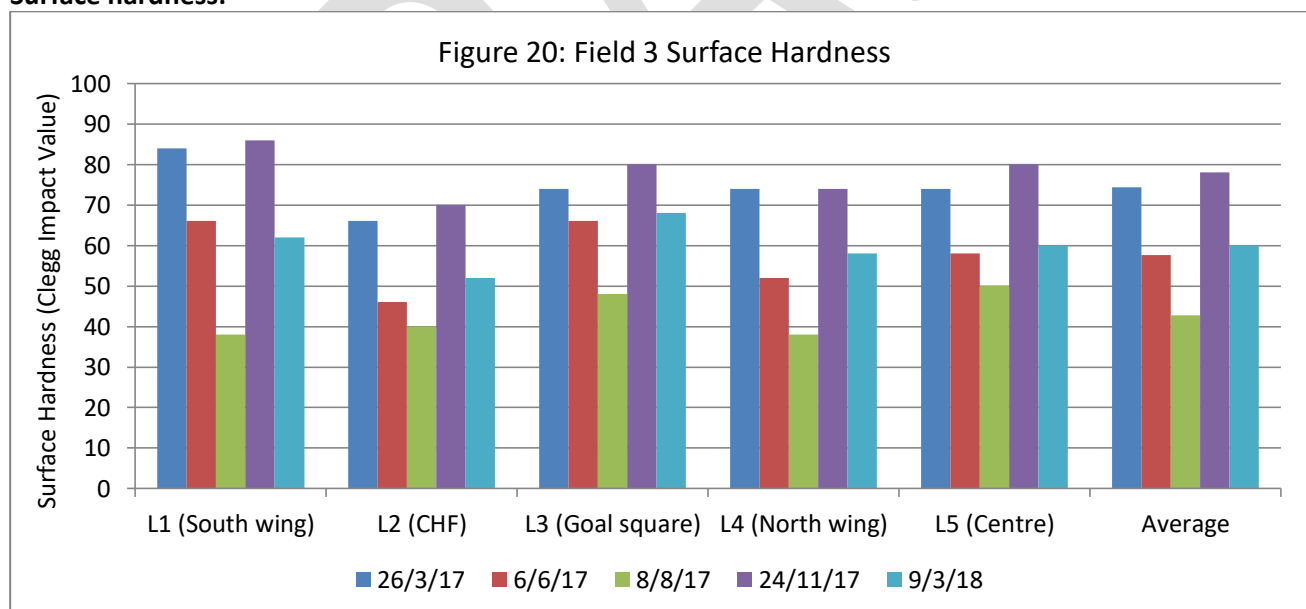
Soil strength (compaction):



Comments:

- At the November 2017 assessment the soils were quite dry and hard and the compacted layer was very shallow.
- At the March 2018 assessment the soils were considerably less compacted and had responded to a recent aeration.

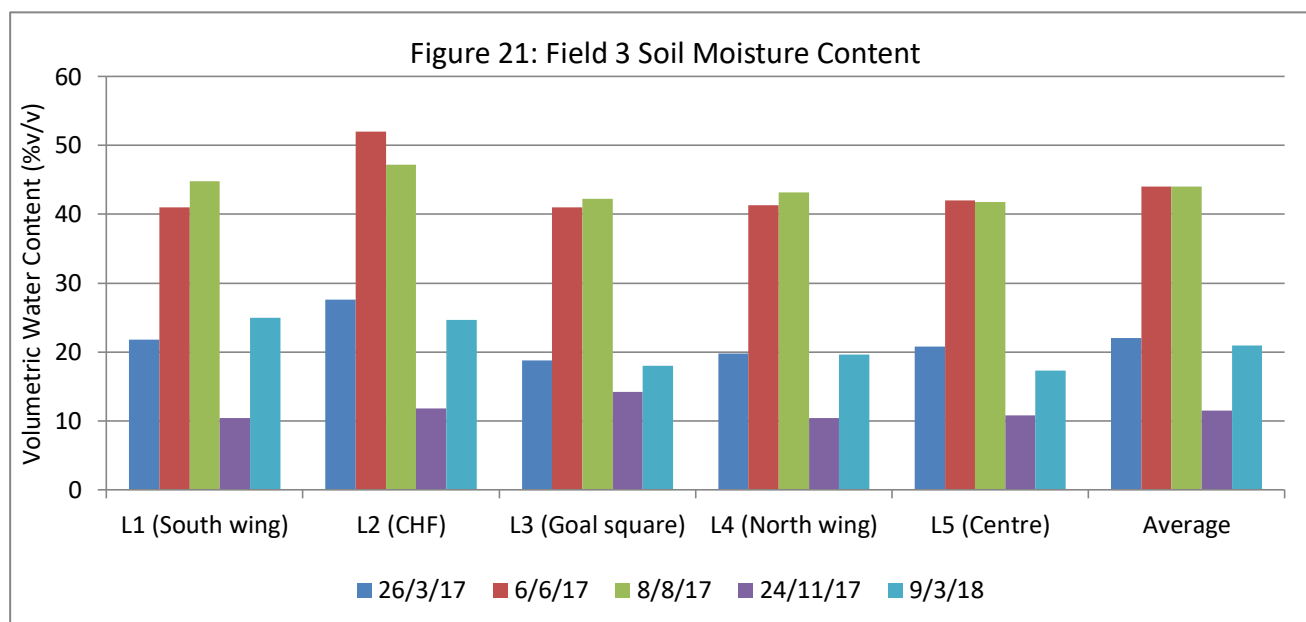
Surface hardness:



Comment:

- The November 2017 hardness readings were elevated and reflected the dry soils (similar to the March 2017 readings).
- At March 2018 the hardness readings were considerably less and reflected an increase in soil moisture and Kikuyu growth.

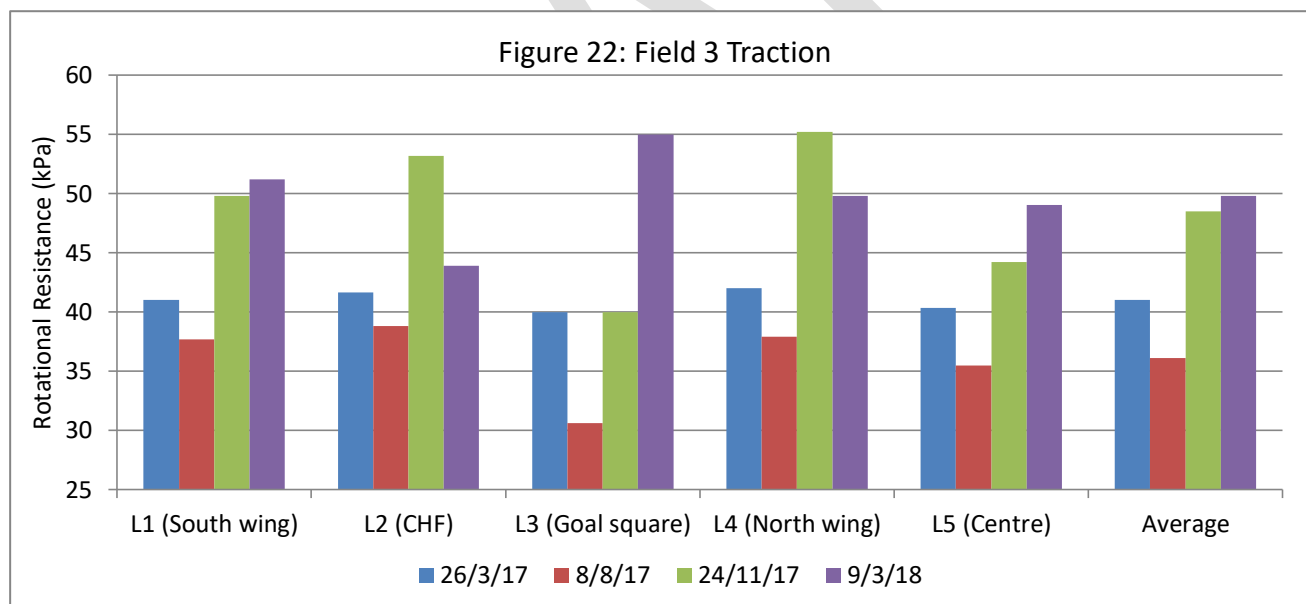
Soil moisture content:



Comments:

- The soils were very dry during the November 2017 assessment.
- At the March 2018 assessment the soils were closer to optimum moisture content and indicated an improvement in the irrigation regime.

Traction:



Comments:

- The initial traction readings were within the acceptable limits but at the lower end of the range.
- The traction reduced considerably in late winter due to the saturated soils.
- At the November 2017 assessment the traction increased and reflected the drier soils and improving turf cover and density.
- The March 2018 traction was variable and there was only a minor change compared to November 2017.

Field No.4

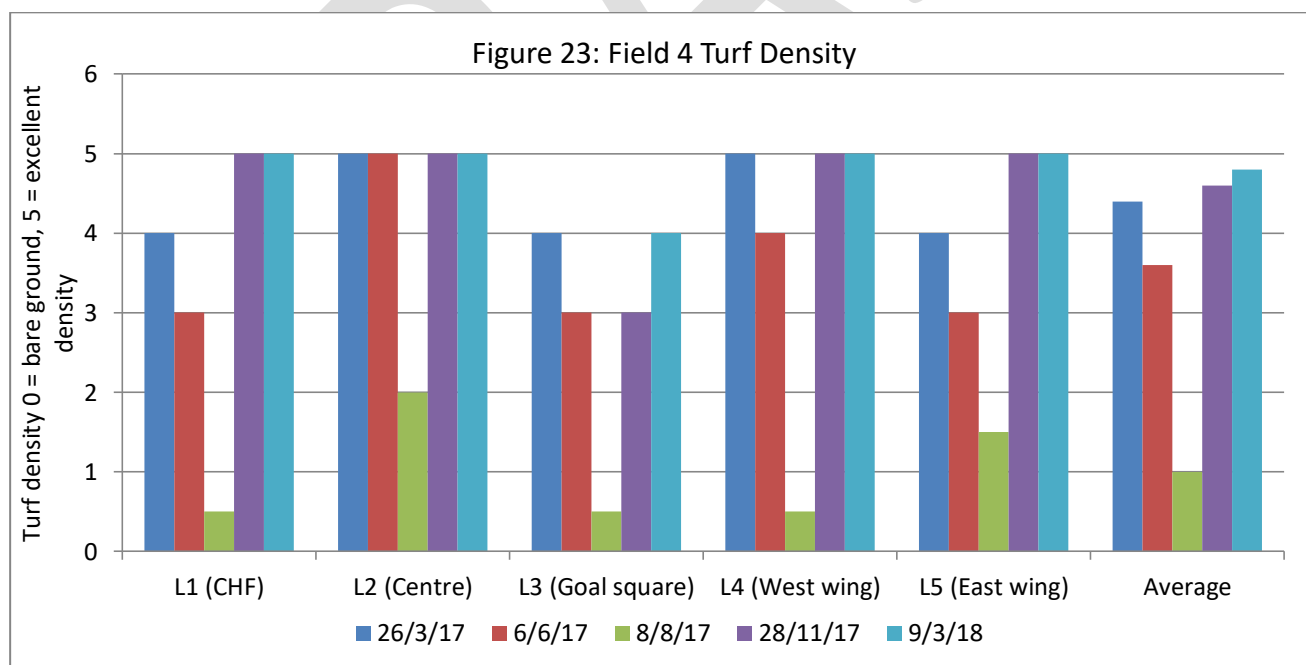
Turf composition and Turf density:

Table 12: Field No. 4 Turfgrass composition

| | 26/3/17 | | 6/6/17 | | | 14/8/17 | | | 28/11/17 | | | 12/3/18 |
|------------------|---------|--------------------|---------|--------------------|---------------|---------|--------------------|---------------|----------|--------------------|---------------|---------|
| | % Couch | % <i>Poa annua</i> | % Couch | % <i>Poa annua</i> | % bare ground | % Couch | % <i>Poa annua</i> | % bare ground | % Couch | % <i>Poa annua</i> | % bare ground | % Couch |
| L1 (CHF) | 100 | 0 | 93 | 7 | 0 | 89 | 11 | 0 | 100 | 0 | 0 | 100 |
| L2 (Centre) | 97.9 | 2.1 | 56 | 44 | 0 | 38 | 57 | 2.5 | 96 | 4 | 0 | 100 |
| L3 (Goal square) | 100 | 0 | 100 | 0 | 0 | 100 | 0 | 0 | 97 | 3 | 0 | 100 |
| L4 (West wing) | 87 | 13 | 91 | 9 | 0 | 34 | 66 | 0 | 94 | 6 | 0 | 100 |
| L5 (East wing) | 97.9 | 2.1 | 79 | 21 | 0 | 80 | 20 | 0 | 100 | 0 | 0 | 100 |
| Average | 96.6 | 3.4 | 83.8 | 16.2 | 0.0 | 68.2 | 30.8 | 0.5 | 97.4 | 2.6 | 0.0 | 100 |

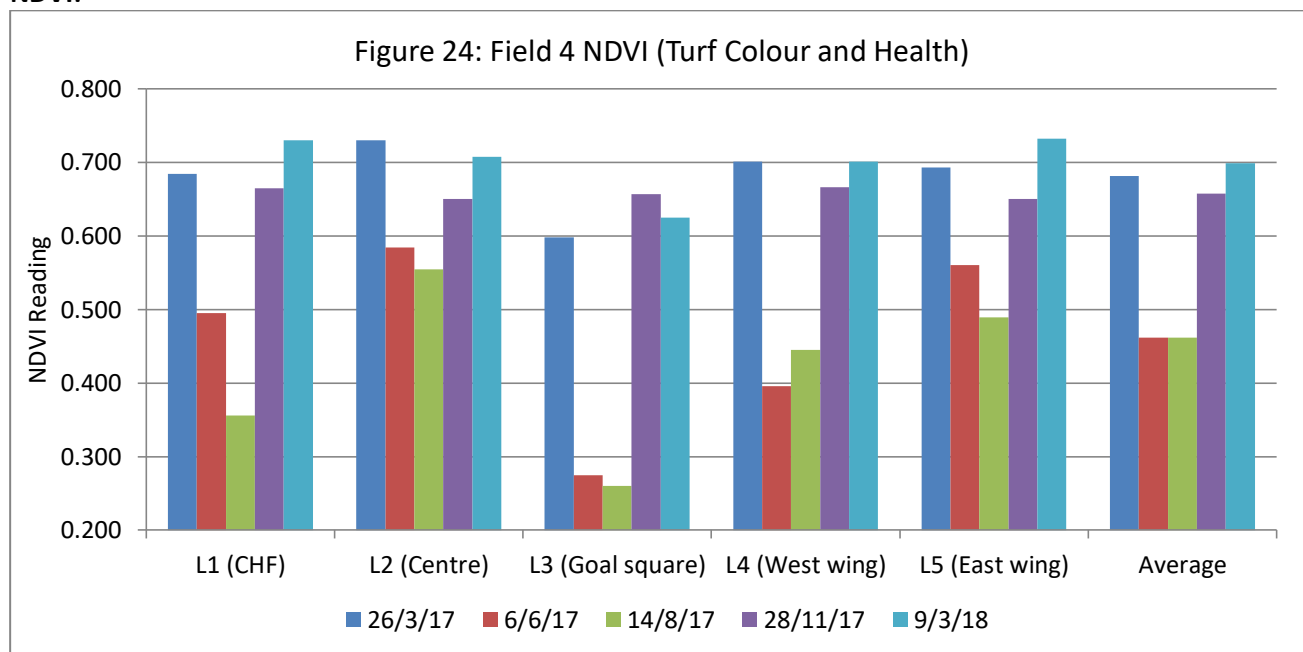
Comments:

- The field had an excellent cover of Santa Ana.
- At the November 2017 assessment the field was almost completely recovered with an excellent cover of couch. The turf density was excellent across most of the field with the goal square still recovering from the winter wear.
- At the March 2018 assessment the couch cover had further improved and there were no weeds noted.



Comments: The turf density was high at all locations except the south goal square. The south goal was still recovering from the wear during the previous winter.

NDVI:



Comments: The turf colour and turf health was high and reflected the strong turf growth. The only exception was the south goal square that had not yet reached peak growth and recovery.

Table 13: Thatch and Root Depth

| | Thatch depth (cm) | | Root depth (cm) | |
|------------------|-------------------|------------|-----------------|-------------|
| | 30/3/17 | 12/3/18 | 30/3/17 | 12/3/18 |
| L1 (CHF) | 6 | 8 | 25 | 20 |
| L2 (East wing) | 6 | 8 | 33 | 18 |
| L3 (Goal square) | 4 | 8 | 20 | 15 |
| L4 (West wing) | 7 | 8 | 20 | 20 |
| L5 (Centre) | 6 | 4 | 25 | 16 |
| Average | 5.8 | 7.2 | 24.6 | 17.8 |

Comments: The thatch depth has increased with a noticeable organic matter layer and the root depth has decreased considerably. The reduction in the root system is related to the dry soil conditions and the associated increase in soil strength.

Infiltration rate:

Table 14: Infiltration rate

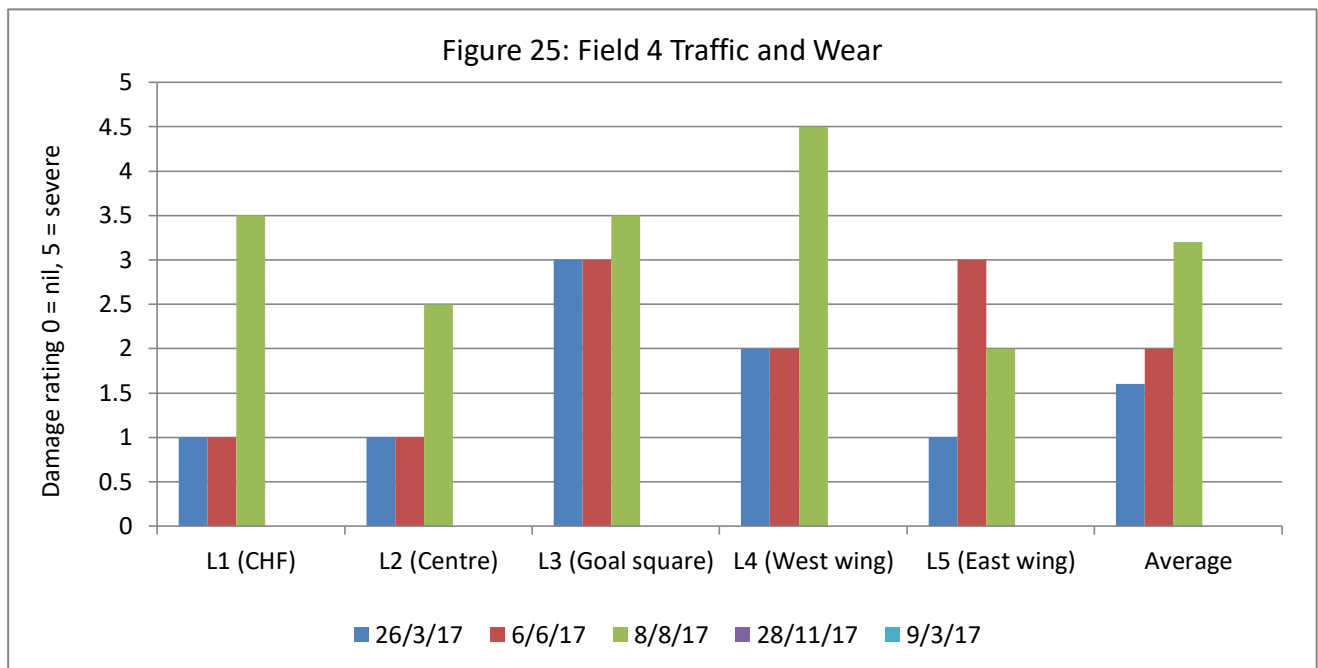
| Infiltration rate (mm/hr) | 26/3/17 | 14/8/17 | 28/11/17 | 12/3/18 |
|---------------------------|-----------|------------|-----------|------------|
| L1 (CHF) | 10 | 0 | 18 | 50 |
| L2 (Centre) | 30 | 5 | 23 | 12 |
| L3 (Goal square) | 5 | 12 | 13 | 270 |
| L4 (West wing) | 10 | 5 | 26 | 250 |
| L5 (East wing) | 5 | 0 | 26 | 360 |
| Average | 12 | 4.4 | 21 | 188 |

Comments:

- The initial infiltration rate varied considerably across the field.
- At the August 2017 assessment the infiltration rate was generally very low and reflected the surface sealing due to the high moisture content at the surface.
- At the November 2017 assessment the infiltration rate had increased and was consistent across the field.

- At the March 2018 assessment the infiltration rate was high and was as a result of the recent vertidrainage where there were holes still visible at the surface.

Traffic and wear:

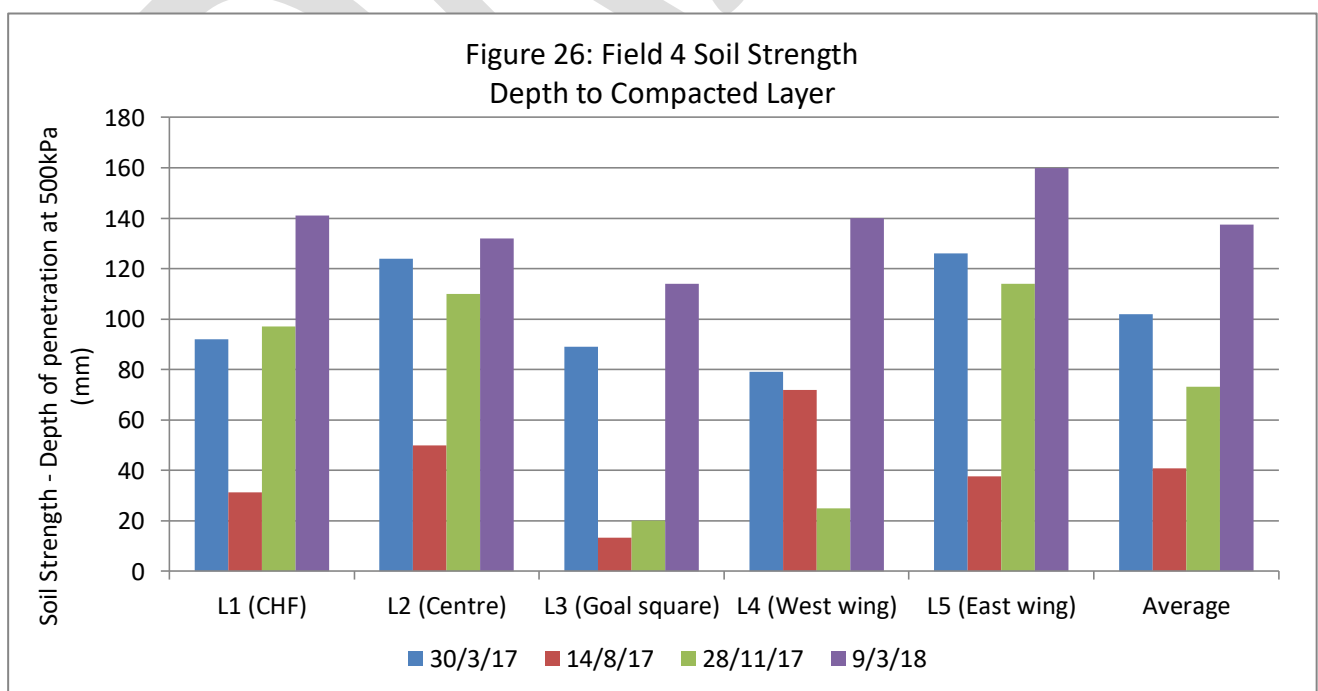


Note: On the 28/11/17 and the 9/3/18 there was a zero (0) rating for wear at all locations

Comments:

- Some high wear areas at the initial inspection due to a carryover of turf damage from the previous football season and pre-season training.
- In the spring there little or no wear recorded with complete turf recovery in most locations.
- At the March 2018 assessment there was no wear noted.
- The surface levels were within acceptable limits with no holes greater than 5mm depth.

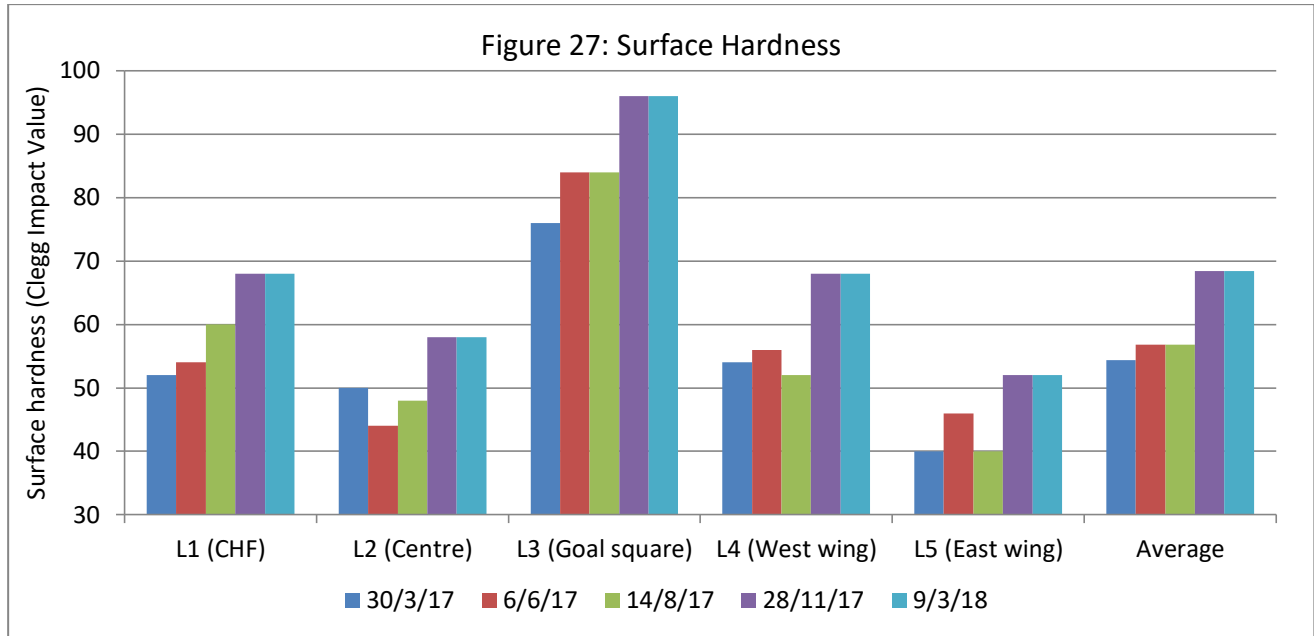
Soil strength (compaction):



Comments:

- At the initial assessment the compacted layer was at about 80 – 120mm. West wing (closest to the pavilion) was the most compacted.
- At the November 2017 assessment the average for soil strength improved to 73mm, however, the two highest wear areas (goal square and the west wing) were highly compacted with only a penetrometer reading of 20 – 25mm.
- At the March 2018 assessment the compacted layer was beyond 100mm at most locations. The goal square remains the most compacted area of the field. The recent vertidrainage had effectively relieved the compaction.

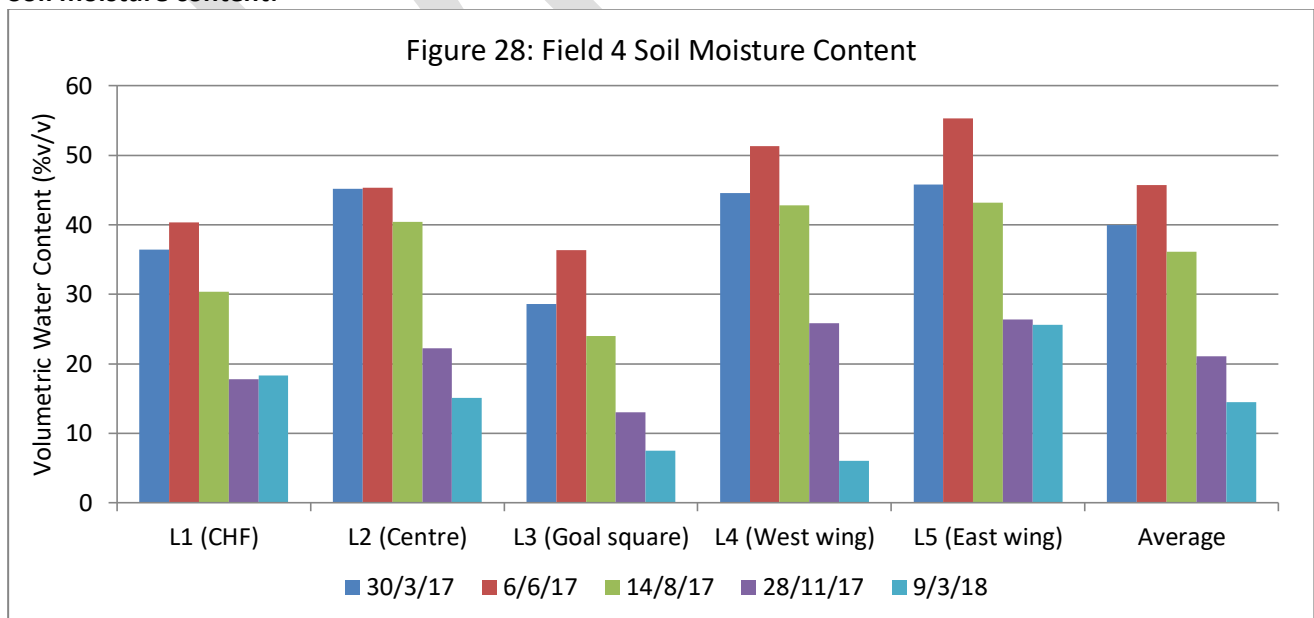
Surface hardness:



Comment:

- The initial surface hardness was relatively low and reflected the accumulation of thatch. While the value was low it was still well within the acceptable limits.
- At the November 2017 assessment the surface was considerably harder and reflected the dry soil conditions. The result was exactly the same for the March 2018 assessment.

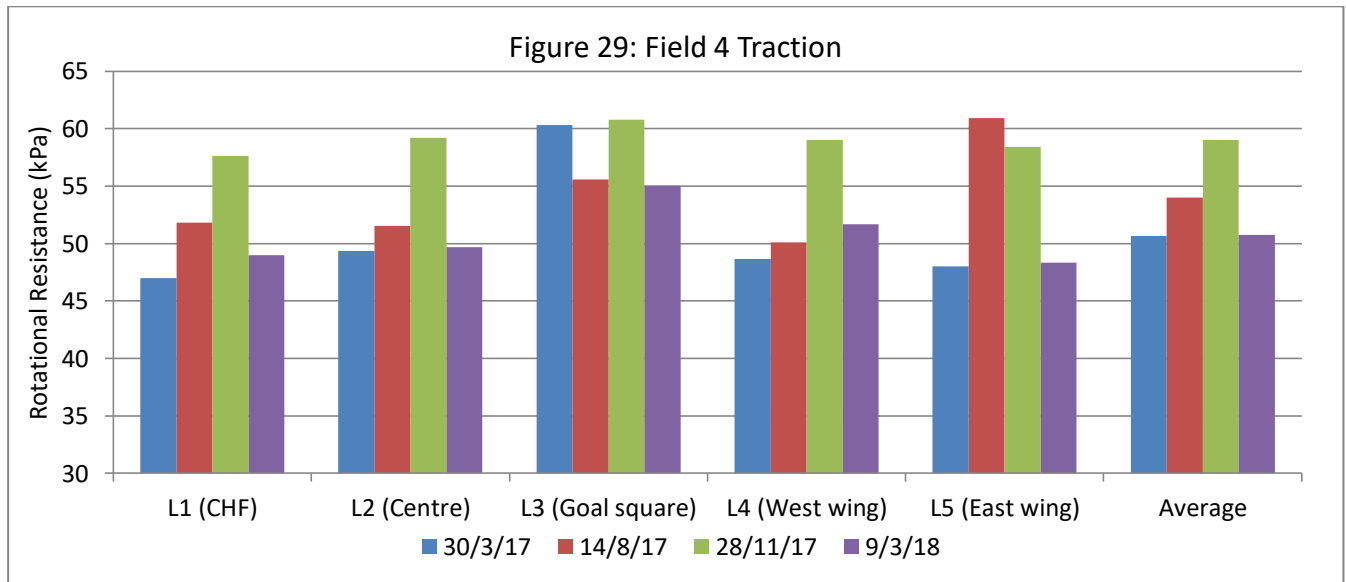
Soil moisture content:



Comments:

- The initial soil moisture content was relatively high and reflected the irrigation regime towards the end of summer and the retention of water by the thatch layer.
- In November 2017 the irrigation schedule was modified to provide drought stress to the *Poa annua* in the field and consequently the soil moisture content was substantially lower than previous assessments.
- The moisture levels in March 2018 reflected the extended dry weather and were very low. Notably the couch was not affected by the low soil moisture content.

Traction:



Comments:

- The initial traction readings were within the acceptable limits.
- With the onset of spring growth, reduced soil moisture and turf recovery there was a considerable increase in surface traction.
- In March 2018 the traction is still very good but had dropped as there was more leaf on the turf. The leaf tends to provide slightly less grip compared to worn couch where the stolons and rhizomes are exposed.

CONCLUSIONS

After 12 months of monitoring there are several conclusions;

1. The dry winter of 2017 had assisted in the fields coping with the traffic.
2. The oval constructed on a heavy soil type deteriorated very quickly once the rain came in August and further highlights the importance of a well-drained profile.
3. The thatch depth has a significant influence on surface moisture retention and infiltration rate even on a sand profile.
4. A sand profile that has some drainage substantially improves the ability of the surface to cope with high traffic loads.
5. A strong couch base provides a high wear resistant surface even when there is very little leaf due to the high traffic. The stolons and rhizomes are the key to providing this resilience.
6. Oversowing with ryegrass has little if any influence on wear resistance when the ryegrass establishment has not been managed correctly resulting in poor plant density. The ryegrass must be well established with high plant density.
7. The spring transition is most important to restoring the warm-season grass base. Three of the fields were exhibiting moderate recovery due to the increasing temperature, however, recovery was slow due to a lack of fertility.
8. The warm and dry summer has been highly beneficial in developing a strong warm-season turf irrespective of the soil type providing there is adequate water.

9. The poor water distribution at some sites was affecting the overall turf health, turf density and root growth.
10. Sportsfield 4, while damaged due to high traffic loads and wet soils late in the winter responded extremely well to the program of aeration, fertiliser and *Poa annua* control. At this inspection it was close to being in the same condition as it was in late summer 2017.
11. The condition of the turf in late summer has a significant impact on the performance of the surface through the winter. Attention should be given to late summer fertilising to ensure high turf density leading to winter use.
12. *Poa annua* was the most prominent weed species during the winter and all fields had been successfully treated with a selective herbicide in the spring. Consequently, the amount of *Poa annua* was very low. It was noted that on those fields that did not have a complete turf cover Summergrass germinations were widespread.
13. The hours of use data indicate that on a well-drained couch field, with a moderate level of maintenance, 30 hours of use per week over a 26-week autumn/winter period is sustainable. With a moderate increase in fertiliser and soil aeration it is expected that this could be increased. The timing of maintenance practices is also an essential element in improving the hours of use.

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PHOTOGRAPHS

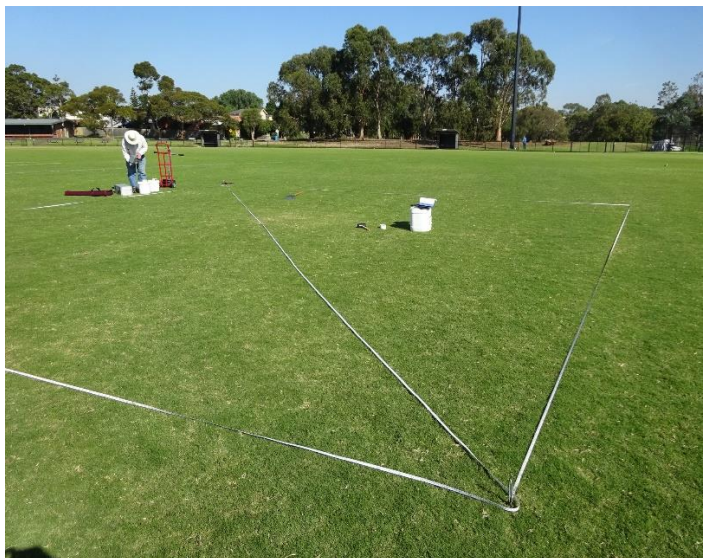


Figure 1: Typical 10m x 10m sub plot



Figure 2: Assessment tools



Figure 3: Field 1 Turf affected by poor water distribution



Figure 4: Field 1 Poor water distribution due to low pressure



Figure 5: Field 1 Turf still recovering in high wear area



Figure 6: Field 4 Excellent couch growth and density at south end



Figure 3: Field 2 Excellent recovery of Kikuyu



Figure 4: Field 1 Poor water distribution due to low pressure

DRAFT