

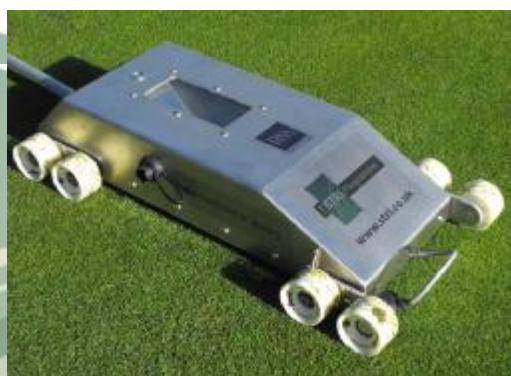
Annual Agronomy Report incorporating the STRI Programme



Largs Golf Club

Report Date: 20 August 2012

Consultant: Richard Windows



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Report Title	Annual Agronomy Report incorporating the STRI Programme
Sports Facility Name	Largs Golf Club
Date of Visit	16 August 2012
Visit Objective	To review the annual condition of the course, take objective measurements of green performance and confirm ongoing maintenance requirements.
Present	Mr Francis O'Donoghue – Green Convenor Mr Tom Sirrell – Green Committee Mr Iain Barr – Course Manager Mr George Morrison – Deputy Course Manager Mr Richard Windows – Turfgrass Agronomist, STRI Ltd

Executive Summary

- The condition, presentation and playing quality to all playing surfaces are in excellent condition and have received superb feedback this year.
- Accurate, conscientious and skilled implementation of sound greenkeeping principals combined with commitment and enthusiasm from the greenstaff continue to deliver high levels of conditioning and presentation on a consistent basis throughout the year and in response to varying weather conditions.
- Largs continues to be one of the best presented and conditioned inland courses we visit.
- Playing qualities to the putting surfaces were very good and can be polished to an excellent standard with ease due to the firm agronomic foundations in place involving well managed organic matter levels, excellent sward species composition and a sensible maintenance programme.
- A little extra verticutting/grooming would be beneficial to refine sward texture over the next couple of weeks and to remove surface organic matter accumulations at the sward base.
- Despite applications of calcium carbonate (lime) and additional phosphate soil pH and phosphate levels remain very low meaning applications should be continued again this season.
- Green approaches, surrounds and fairways were superbly presented and maintenance programmes to these areas should be sustained.

- The bunkers were in excellent condition. It was felt using pure perennial ryegrass turf for bunker surrounds and faces would be most beneficial in the future rather than the tall fescue material currently used.
- Rough management to areas of naturalised rough involving cutting, clipping collection and scarification would be an excellent long-term maintenance programme to implement but will require additional investment into resources and time.

Greens

Observations & Comments

The performance of the greens has been excellent again this season. Feedback regarding their performance and consistency of condition has been very positive. It has widely been regarded that the performance and consistency of the greens have been at their best this season.

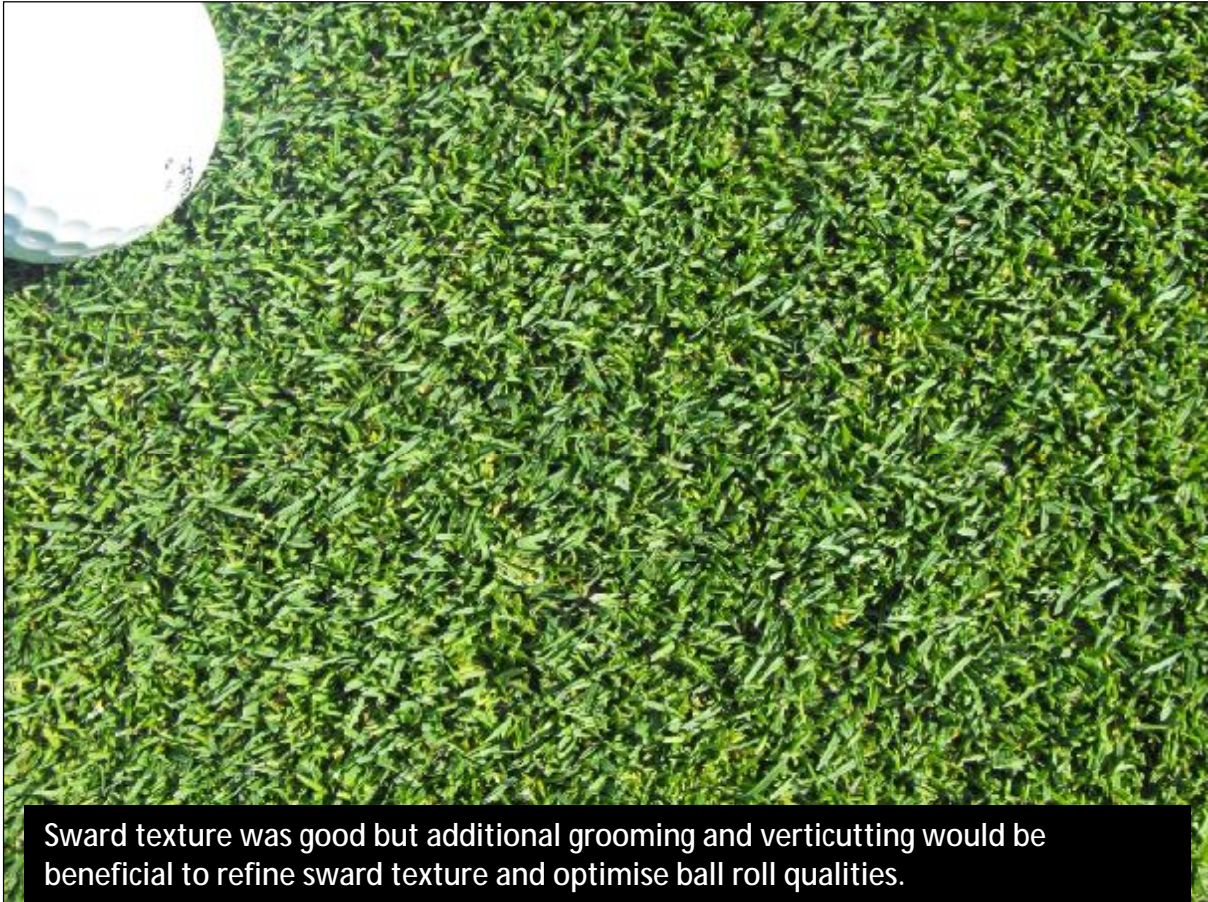
The performance through the winter last year was very good with firm, playable and consistent surfaces throughout this period. Despite the very poor spring weather, turf and playing quality during the spring to early summer period was good and sensible mowing heights adopted during this period did result in slightly slow pace but helped protect the surfaces for rapid improvement once the weather finally warmed up.

Disease was excellently controlled with no scarring and minimal fungicide input due to the maintenance programme in place and sensible use of modern fungicide technology.

A change was made to the Dalhousie medium-coarse sand during autumn renovation last year and this move has facilitated additional dressings being made to the greens throughout the season as well as helping to optimise surface firmness. As we will describe later in the report, greens firmness was at the top of the target range despite wet weather recently and was an excellent attribute. What is more, pitch mark damage was almost none existent due to the excellent firmness of the greens but also perhaps the improved repair from the golfers.

The soil chemical issues that were identified last year resulted in applications of Microcal with the rate varying on a greens specific basis in addition to increased phosphate over the past twelve months. These applications have improved the vigour and density of the sward but have had limited effect on the soil chemical status of the soil meaning further applications are required.

A slightly more intensive sward refinement programme has been implemented this year with more regular use of the turf iron roller combined with increased frequency of Primo MAXX growth regulator application. These amendments, in addition to the routine refinement programme, have delivered superior and more consistent ball roll qualities throughout the main season. As such firm agronomic foundations are in place these operations have been implemented with no negative effect on turf health and quality.



The underlying soil profiles beneath the greens are in excellent condition. The upper soil profile is very sandy with minimal accumulations of organic matter and root development is strong and dense beneath all the surfaces. The accumulation of previous top dressing through the upper 150 mm of the soil profile combined with excellent organic matter control is the reason for such rapid surface drainage and excellent year round performance.



In summary, the putting surfaces are in superb condition and continue to improve each year in response to the excellent maintenance programme implemented. Additional refinement combined

with a change to straight sand top dressing has elevated the standards that are achieved on a consistent basis and in response to varying weather patterns. In simple terms we are delighted with the condition and performance of the greens.

Performance and Agronomic Assessment – STRI Programme

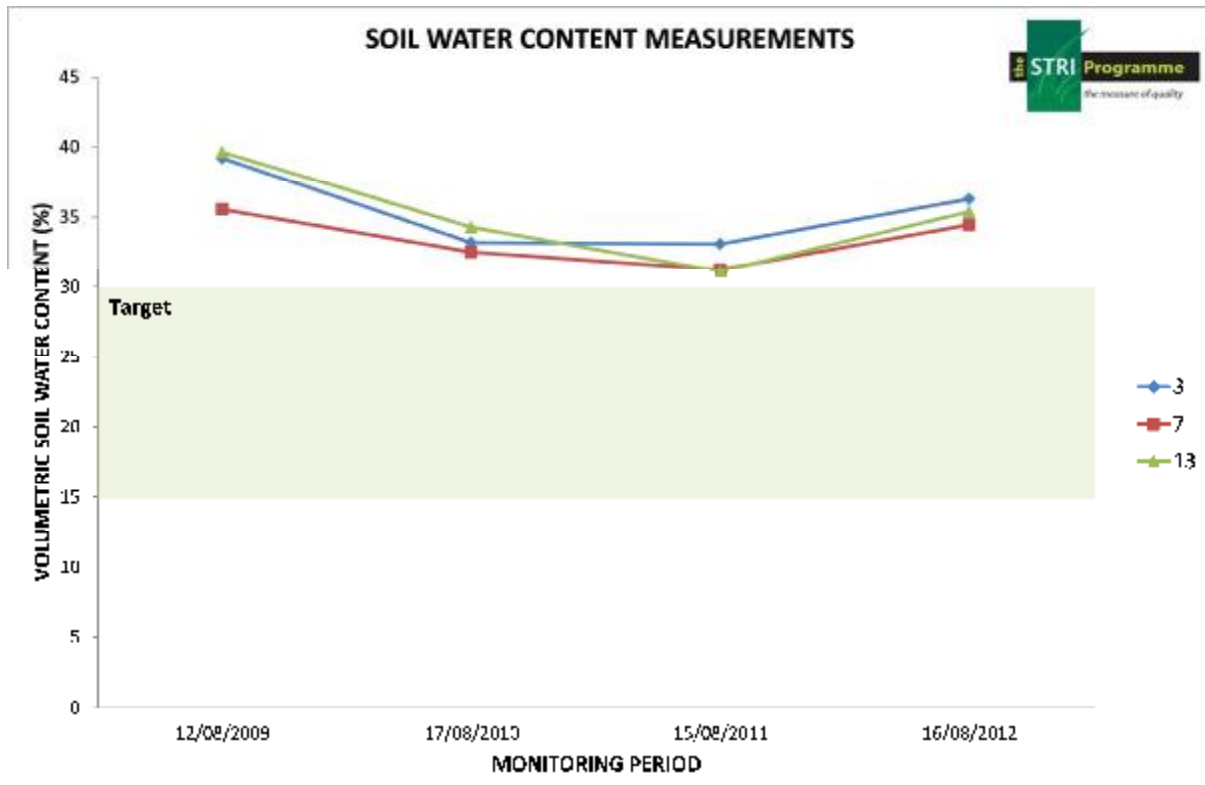
During the visit we measured the performance and agronomic condition of the greens. The speed, smoothness/trueness and firmness of selected greens were measured to define how they were performing on the day. Additional testing was also carried out to determine the moisture content, organic matter content and chemical status of the upper soil profile. Our aim was to conduct a thorough and accurate assessment of the greens to highlight the areas in need of attention. The same greens as tested previously were selected for the assessment. The results are shown in the table below.

Performance Measurement Results							
Green No.	Speed (distance)	Smoothness (mm/m)	Trueness (mm/m)	Firmness Mean (gravities)	Firmness SEM (±)	Moisture Content (%)	Moisture Content SEM (±)
3	8 ft 0 in	22.83	10.27	99	1.2	36.3	0.8
7	8 ft 4 in	23.78	9.61	98	1.4	34.5	1.0
13	8 ft 5 in	23.97	10.18	98	2.5	35.4	1.2
3ROL	9 ft 3 in	18.20	7.51				
7ROL	9 ft 5 in	19.00	7.84				
13ROL	9 ft 0 in	20.42	8.51				

Soil Moisture Content

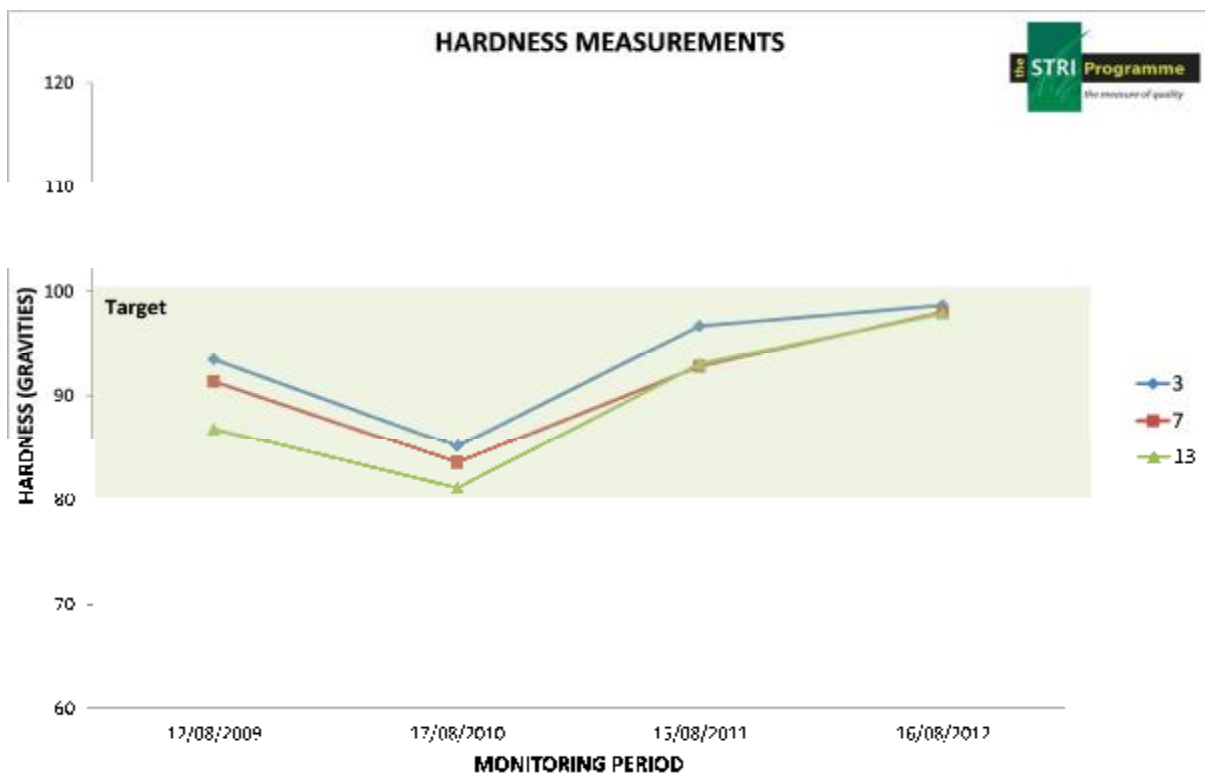
We measured the soil moisture content of the greens using a Theta probe with nine readings taken per green on a 3x3 grid pattern. Our target range is for soil based greens are 15-30%. The results taken during the visit are compared against previous results and the target range in the graph below.

- Values ranged from 34.5% (7G) to 36.3% (3G).
- These values were very consistent between the three greens but slightly above the ideal target range which is reflective of the wet weather recently.
- Due to the slightly high levels, it will be interesting to assess the firmness of the green following wet weather recently and subsequently high soil moisture levels.
- The consistency of moisture through into the green was very good indicating no wet or dry spots present.



Surface Firmness/Hardness

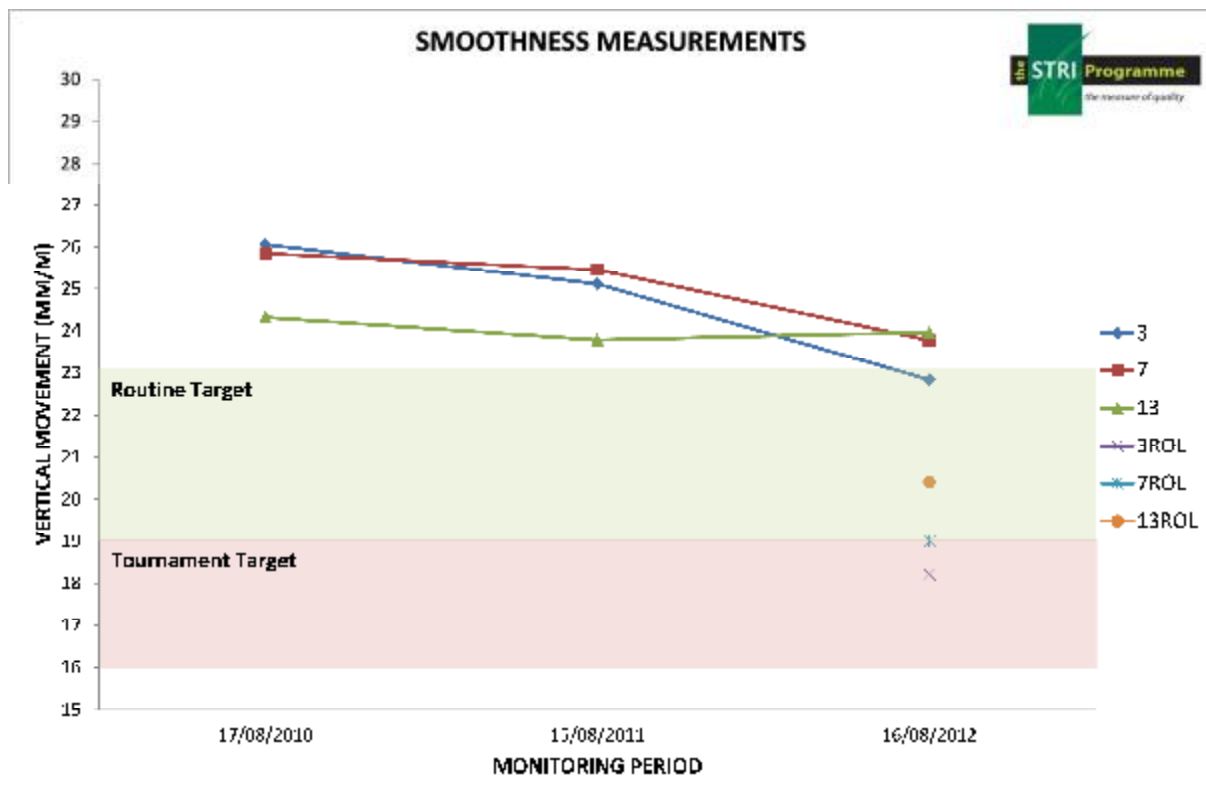
The Clegg Impact Hammer was used to assess the hardness of the greens and 9 readings per green were taken on a 3x3 grid. The target range for parkland greens is between 80-100 gravities where shots from a well struck 7-iron impact, release, spin and stop. The results taken are compared against the target ranges and previous data and are shown in the graph below.

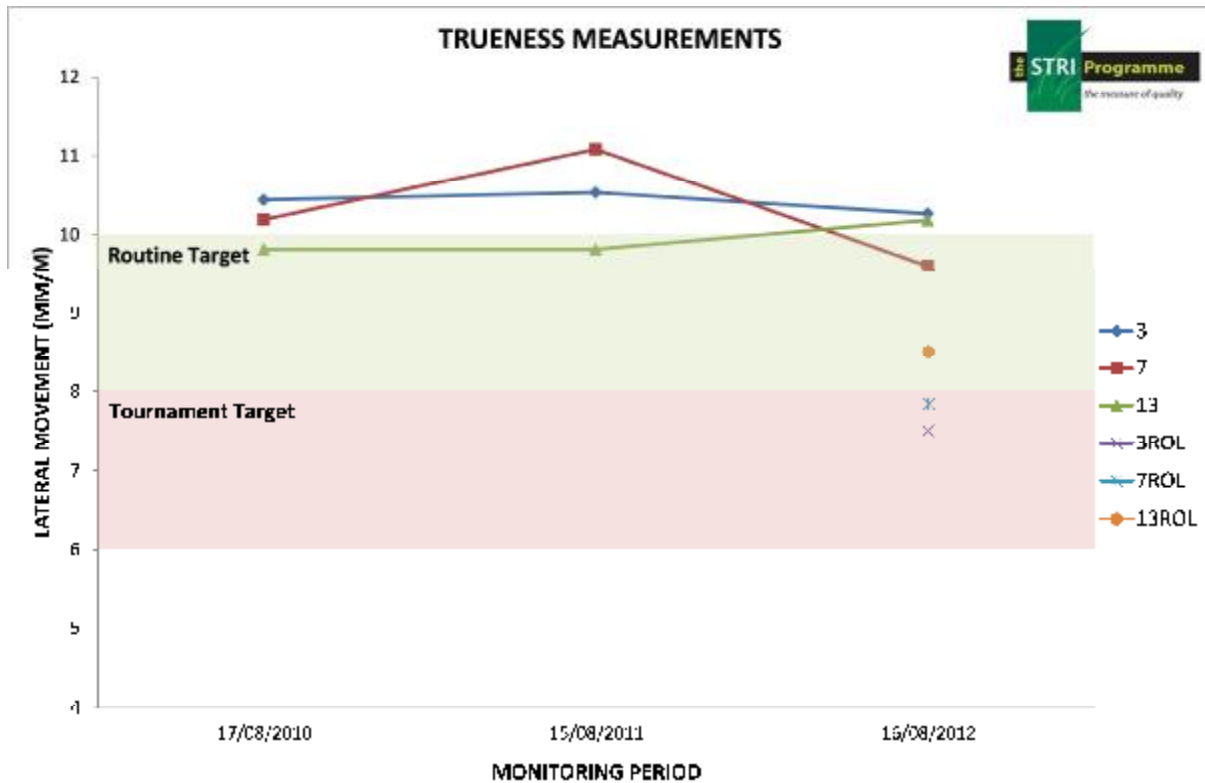


- Values ranged from 98 gravities (7G & 13 G) to 99 gravities (3G).
- These levels are excellently consistent between greens and also at the top end of the ideal target range which is superb considering the wet weather recently and high soil moisture levels.
- These values are some of the highest we have received for parkland courses and are very much reflective of the excellent organic matter management and sensible top dressing programme over the past few years.
- Such high values are the reason for minimal pitch marking and subsequent deformation under play during wet conditions. They also provide the ideal foundation to provide firm year round playable surfaces which the Members have now enjoyed for several winters over the past few years.
- Sustaining such excellent levels of firmness remain one of the main maintenance objectives over the next few years which should involve sensible aeration combined with regular sand top dressing inputs.
- The consistency of firmness through each individual green was good indicating no hard or soft spots present. However, the back of certain greens, e.g. back left of 13 were slightly softer meaning pin positions should be located into these areas of low traffic intensity as often as possible.

Smoothness & Trueness

The smoothness and trueness were assessed using the STRI Trueness Meter™. The readings obtained were compared against last year's values and desired target ranges for main season play. The results are shown in the bar charts below.

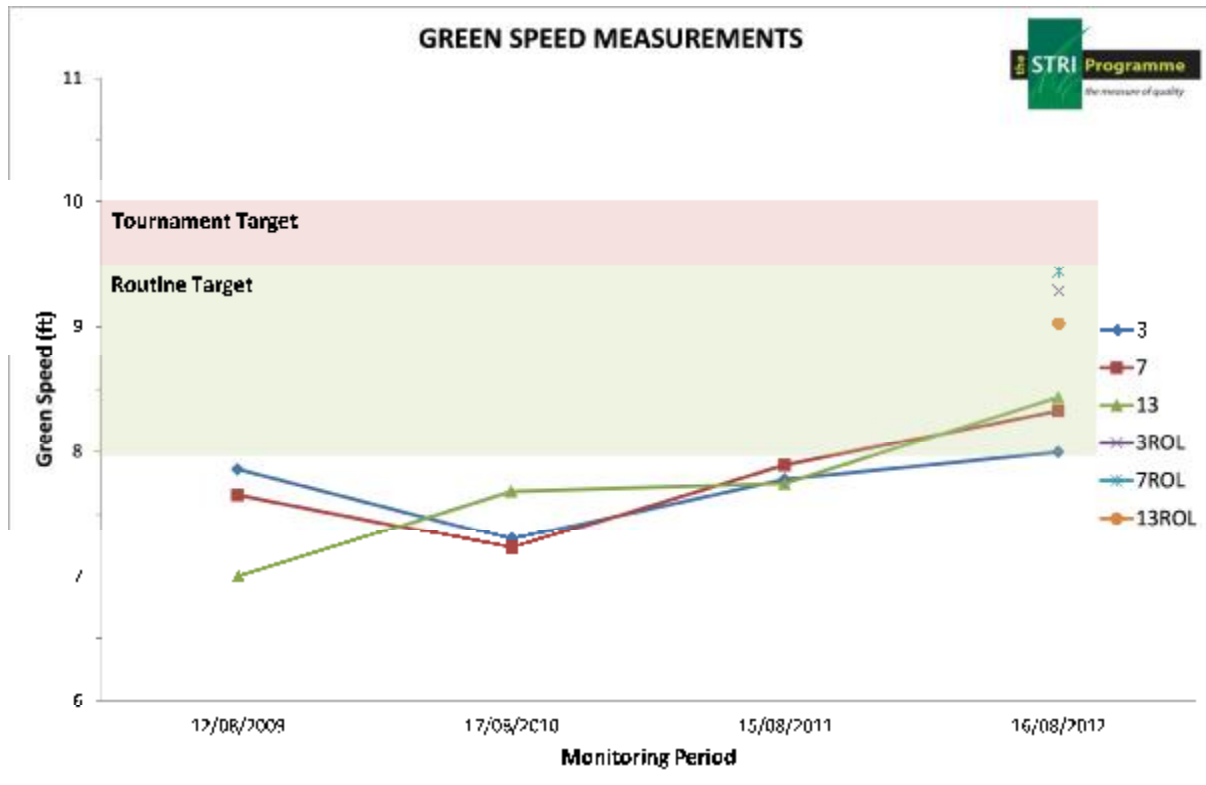




- Smoothness values ranged from 22.8 mm/m (3G) to 23.9 mm/m (13G). These values are within or slightly outside the challenging target range for routine play and are reflective of the excellent feedback obtained this season.
- Values ranged from 9.6 mm/m (7G) to 10.2 mm/m (3G). These values were within or just outside the routine target range which again supports the positive feedback from the player's recently and throughout this season.
- Both smoothness and trueness values are particularly pleasing bearing in mind the low intensity of the refinement programme recently, i.e. involving alternate mowing and rolling each day.
- To assess the performance of the greens following additional refinement, all three surfaces were measured again following a Turf Iron roll. This operation significantly improved smoothness from 18.2 mm/m (3G) to 20.4 mm/m (13G) and trueness from 7.5 mm/m (3G) to 8.5 mm/m (13G).
- Such values were within the top end of the tournament target range to the low end of the routine range. These are excellent and show how simple and easy it is to elevate ball roll qualities with minimal effort due to the firm agronomic foundations in place.
- To retain such excellent standards of ball roll quality, sustaining the existing refinement programme throughout the remainder of the season and next year is the objective. A little more verticutting/grooming may be beneficial during periods of strong growth to refine the lateral growth on the browntop bent component of the sward.

Green Speed

The speed of the greens was measured using a Stimpmeter and two measurements were taken to each of the indicator greens. The results taken during the visit are compared against the ideal target ranges and previous data in the graph below.



- Values ranged from 8 ft (3G) to 8 ft 5 in. (13G).
- These values were slightly higher than previous visits which are reflective of the more intensive refinement programme implemented this year.
- Green speed was increased significantly following a Turf Iron roll to 9 ft. (13G) to 9 ft 5 in. (7G).
- This significant increase in speed shows how easy it is to elevate green pace with minimal effort again due to the firm agronomic foundations in place.

Organic Matter Content

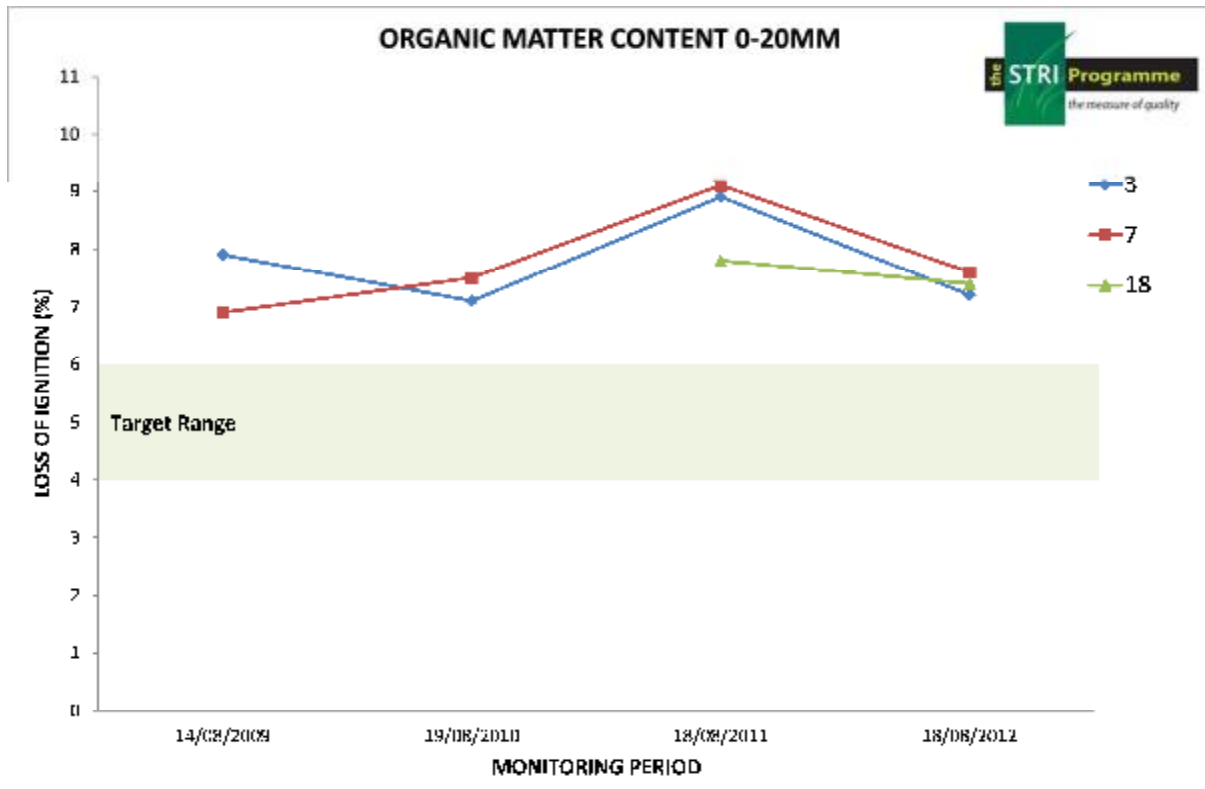
Samples were taken and submitted to our laboratory to assess the organic matter content of the upper soil profile beneath the selected greens. Organic matter content is important because high levels can adversely affect playing quality (soft surfaces) and also increase the risk of potentially damaging conditions such as disease and dry patch developing. Our target range for organic matter content is 4 – 6 % in the top 20 mm moving down to < 4 % lower down. An accurate measure of the organic matter content helps us determine the intensity of work required to hit our target levels. The results of the organic matter content testing are contained in the table below.

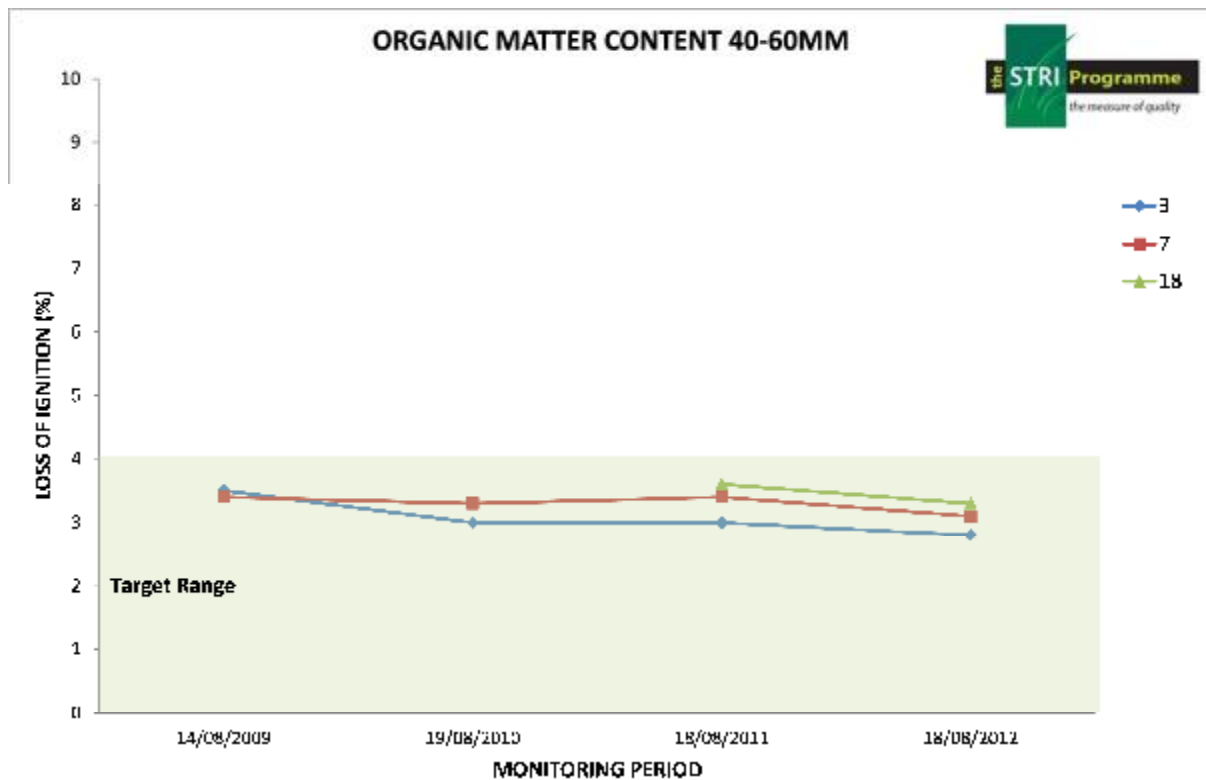
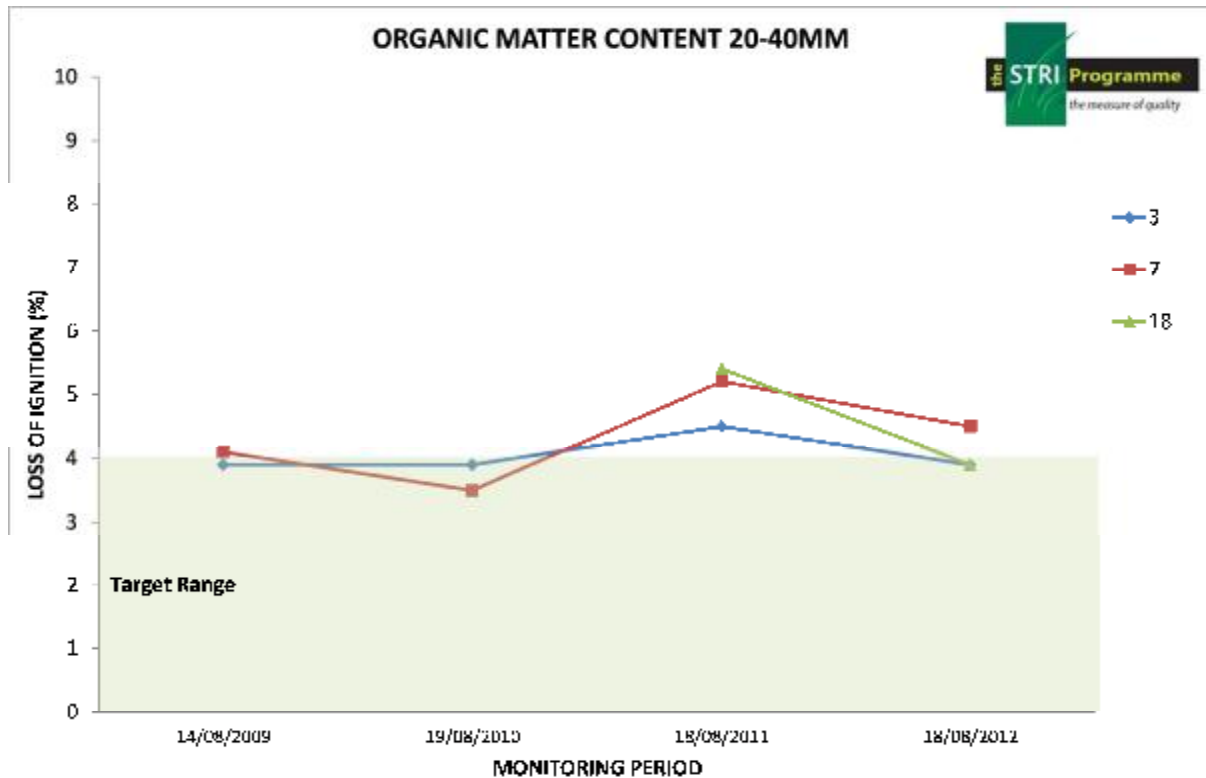
Organic Matter Content

Loss on Ignition (%)

	Green 3	Green 7	Green 13
0-20 mm	7.2	7.6	7.4
20-40 mm	3.9	4.5	3.9
40-60 mm	2.8	3.1	3.3
60-80 mm	2.7	2.9	3.2

The following graphs show the above results against the ideal target range and in comparison to previous results.





- Organic matter values were slightly higher at 0-20 and 20-40 mm last year probably due to the wet weather experienced throughout the last couple of seasons.
- To combat this, a change to straight sand top dressing (Dalhousie medium-coarse) was made in response to additional aeration work.

- These amendments combined with additional sand top dressing made throughout this season have desirably reduced organic matter values at 0-20 mm and 20-40 mm which is a sign of great progress.
- Sustained sand top dressing combined with annual aeration should continue to ensure further progress is made regarding organic matter reduction towards the ideal target levels described.
- Levels beyond 40 mm are within the target range indicating the top 40 mm of the profile is where efforts to reduce organic matter should be targeted.

Soil Chemical Analysis

Samples were taken from each green for routine chemical analysis of soil pH, phosphate (P₂O₅) and potassium (K₂O). The results of the testing are outlined in the table below.

Soil Chemical Analysis			
	pH	P ₂ O ₅ (mg/l)	K ₂ O (mg/l)
Green 3	4.4	9	24
Green 7	4.3	7	39
Green 13	4.3	<1	28
Green 14	4.0	<1	24

- The soil pH and phosphate levels last year were lower than desirable and were contributing to poor sward health and vigour as well as restricting the natural breakdown of organic matter within the soil profile.
- To combat these problems, additional soil phosphate was applied in both granular and liquid form and calcium carbonate (lime) was also applied during the winter.
- These applications have had a significant effect on sward health and vigour but not on levels within the soil. They have, in fact, reduced significantly.
- Therefore, applications should be sustained again this year with one application of Microcal being made to all greens at 50 g/m² during November.
- A further soil test should be carried out in January/February to determine whether another application of calcium carbonate is required in late winter/early spring.
- Phosphate should continue to be applied as per last year.
- As soil pH and phosphate availability are closely linked, it will be necessary to sustain phosphate applications until soil pH increases significantly at which time phosphate availability in the soil will be greatly enhanced.
- Potassium levels remain satisfactory and inputs at the current level should be sustained.

Confirmation of Greens Maintenance Recommendations

The following confirms the maintenance discussions made during the visit.

- Additional verticutting over the next few weeks would be beneficial to remove surface organic material from the sward base.

- During strong growth next year, slightly more intensive verticutting/grooming should be considered to refine the lateral growth on the bentgrass component of the sward which will help deliver superior ball roll qualities on a routine basis.
- The usual programme of end of season renovation should be completed by now and this continues to form one of the main backbones of improvements over the past decade to the greens at Largs.
- Sustain regular sand top dressing to dilute organic matter and ensure the levels fall into the desired targets to optimise surface firmness and provide ideal soil conditions beneath the greens.
- Aim to place more pin positions in areas of little traffic to optimise surface firmness as well as giving heavily trafficked sections of greens a much needed rest.
- Apply a further dressing of Microcal (calcium carbonate) this autumn/winter to further boost soil pH until a consistent and stable level of 5.5 is achieved.
- Continue to apply phosphate in granular and liquid form using the 6:8:10 granular fertiliser in the autumn and 18:9:9 liquid product through the main summer season.

Other areas of discussion

Green Aprons & Surrounds

These surfaces were beautifully presented during the visit with excellent mowing patterns providing great definition between greens and fairways. The turf used around bunkers provides the seamless transition between bunkers and green surround turf, both of which heightens presentation and consistency around the greens. The level of maintenance extended into these areas over the past few years has been excellent and will certainly deliver the desirable results.



Presentation of the green aprons and surrounds is first class.

Fairways

The fairways were currently being mown at 12 mm and were providing tight, consistent and finely textured lies ideal for crisp ball striking into the wonderfully firm putting surfaces. Divot recovery has been good using the Bar Medal seed (dwarf perennial ryegrass and fescue) and this sensible programme should be sustained in the future. Of course, more regular divoting to common landing zones, e.g. 17 would be beneficial to accelerate divot recovery but this is very much dependant on additional resources.

Tees

The teeing platforms were very well presented and continued to respond well to mowing and Primo MAXX growth regulator applications. A programme of levelling slightly undulating greens would be beneficial but is an issue that requires additional investment as part of the annual winter maintenance programme.

Bunkers

The presentation and consistency of the bunkers is first class in terms of turf to the surrounds and presentation of the sand within the hazard itself. The rhizomatous tall fescue that has been used over the past couple of years has worked well but has not provided a sufficient difference bearing in mind its additional cost in comparison to pure perennial ryegrass material. For this reason it was felt appropriate to return back to pure perennial ryegrass material for all future bunker renovation work.



Rough

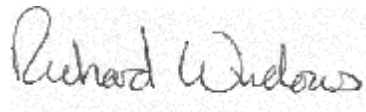
Rough grassland management continues to be an operation that requires additional maintenance attention to convert coarse and productive grassland stands, e.g. left of 10, to a finely textured wispiersward by a process of cutting, clipping collection and scarification. This would be beneficial to certain areas such as the right of 11 in addition to wider parts of the rough around the course. While this would be a very desirable objective to achieve, it is dependent on the purchase and subsequent use of the appropriate tractor mounted flail mower, e.g. Amazone Groundkeeper.

Machinery & Resources

To retain such excellent levels of presentation and conditioning to the course, it is essential to retain appropriate investment into modern maintenance machinery as well as utilising technological advances in greenkeeping equipment. Of course, the financial situation is tight but we do urge the Club to ensure they continue to fully invest in their number one asset.

The Greenkeeping Maintenance Facility and staff accommodation is very small and deteriorating in its condition. Investment into the construction of a new Maintenance Facility is important for efficient, safe and secure machinery storage as well as improved greenkeeper accommodation. What is more, investment into an appropriate wash down facility is also essential to ensure the Club concurs with existing ground water legislation. The most efficient system in this regard would be the construction of an appropriate reed bed.

Signed:

A handwritten signature in black ink that reads 'Richard Windows'. The signature is written in a cursive, slightly slanted style.

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