Largs Golf Club

Advisory Report on the Golf Course incorporating the STRI Programme

Report date: 7 August 2013
Consultant: Richard Windows

CONFIDENTIAL

Date of Visit:	2 August 2013
Visit Objective:	To review the annual condition of the golf course, take objective measurements of green performance and confirm on-going maintenance.
Present:	Mr Bob McLaren – Green Committee
	Mr Keith Howie – Secretary
	Mr Iain Barr – Course Manager
	Mr George Morrison – Deputy Course Manager
	Mr Richard Windows – Turfgrass Agronomist STRI
Weather:	Warm, dry and breezy. Approximately 40mm of rain has fallen over the 7-10 days before the visit with 9mm falling in the 24 hours before the visit.

Contents

Executive Summary

- The general presentation, conditioning and performance of the golf course were superb.
- All the playing surfaces were in immaculate condition with superb standards of turf quality.
- The general condition and presentation of the golf course at Largs continues to improve in response to a superb maintenance programme expertly delivered by the Greenstaff combined with consistent direction and investment into the course by the Club.
- There is no doubt Largs is one of the best conditioned inland courses we visit and is a superb example of a sustainable golf course in action.
- Playing qualities to the greens was superb and have been throughout the season. Due to the density and strong growth of the turf, some additional verticutting would be beneficial to improve pace over the next couple of weeks.
- The greens could be a little firmer in response to rainfall and more intensive organic matter reduction using the Graden sand injection machine is recommended to effectively deal with slightly high organic matter accumulations in the top 20mm of the soil profile. It is hoped this is done in August if not October this year.
- Greater applications of sand topdressing should be extended into the green aprons to improve surface firmness.
- Due to increased buggy traffic and the greater popularity of powered caddy cars, it is important to invest more time and maintenance into traffic routes from green to tee and tee to fairway. The aim should be to implement regular verti-draining combined with intensive sand topdressing to ensure 25-30mm of sand accumulates at the sward base thereby optimising durability and stability.
- Teeing platforms are an area for further development mainly to improve surface levels on selected surfaces, increase the size of the remaining smaller tees (e.g. 8) and provide separate grass winter tees wherever space permits.
- Tree management involving conifer removal and thinning of existing dense plantations remains an important part of winter maintenance to optimise the aesthetic and also ecological quality of the course.

Key Observations

Greens

The condition of the greens both in terms of agronomic quality and playing performance have steadily improved over the past decade. This year is no exception. The putting surfaces are superbly consistent between all greens and performance has been excellent this season. There is no doubt the greens are some of the best inland surfaces reviewed this year. The reward for a consistent and sensible maintenance approach over the past decade is now being gained in terms of consistent year round performance and in response to varying weather patterns. The Greenstaff and the Club should be very proud of the superb putting surfaces that are being produced on a routine basis.

Previously weaker greens such as 5, 6 and 13, where annual meadow-grass populations were greater, now support a far more even and consistent blend of browntop bent with annual meadow-grass. The previous patchy nature to these greens has been eliminated and disease incidents to all the surfaces are minimal.

Turf texture and ball roll qualities have been very good and the programme of Primo Maxx growth regulator combined with verticutting and regular rolling is delivering high quality and consistent performance on a routine basis throughout the season. Increased intensity and frequency of verticutting has been achieved this year combined with more regular applications of Primo from three-weekly to fortnightly applications. Rolling has also been increased with an average of three operations each week and sometimes daily rolling is implemented. There has been no detrimental effect to the sward in response to the increased verticutting or rolling, but better playing qualities have been produced. These refinement operations can be achieved due to the excellent agronomic foundations in place involving a consistent sand dominated soil profile, good root development and ever improving sward species composition.

Action has been taken to rectify the soil chemical status of the soil by two applications of Microcal (calcium carbonate) to gently increase soil pH and spring applications of phosphate to increase levels within the soil. Both these applications were felt to have significantly improved turf health during the winter and accelerated the spring growth response. Soil analysis from the samples taken during the visit will inform whether additional rectification measures are required.

The aeration week during August last year was once again successful, but visual analysis of the organic matter accumulations in the upper soil profile do indicate levels remain slightly high as per the results taken last year and these are confirmed by recent organic matter analysis in the laboratory (see below). For this reason, we do feel it important to implement a more intensive organic matter reduction programme involving the Graden sand injection scarification machine. As organic matter levels are very much restricted to the top 20mm of the soil profile, nothing more drastic, aggressive or disruptive than this operation is required. We simply need to remove and dilute these small accumulations to provide optimum surface drainage; underfoot firmness and consistency between wet and dry weather patterns. One or two operations over the next 12-24 months should be sufficient to rectify these minor underlying issues allowing sand topdressing to be sufficient thereafter to maintain levels within the desired target area.

Sward texture, botanical composition and turf quality is excellent to the greens in response to the superb maintenance and sward refinement programme in place.

Organic matter accumulations in the top 20mm of the soil profile (see red arrow) remain a little high, meaning Graden sand injection scarification is recommended.

Green Aprons

The presentation and quality of the green aprons are superb. The excellent mowing patterns combined with superb sward texture define these surfaces between greens and fairways and are some of the best we have seen. Improving surface firmness and thus ball release characteristics remains an important objective via verticutting and sand topdressing.

The green aprons were immaculately presented, but work to improve surface firmness via verticutting and sand topdressing should be achieved wherever possible.

Fairways

Presentation to the fairways was superb.

To reduce clipping production and further improve presentation, consideration to the implementation of a Primo Maxx growth regulator fairway programme is required for next year. In addition, a more concertive programme of divot repair, ideally via the Members, would provide an additional polish in terms of course presentation.

Tees

The general performance and condition of the tees has improved significantly in response to the maintenance work and Bar Medal (fescue and dwarf perennial ryegrass) overseeding programme. Turf quality and divot recovery has significantly improved as a result.

To improve the tees further, now the other major surfaces have improved so significantly, should involve a programme of levelling and enlargement. The plan should be to level undulating surfaces

such as 17 and enlarge existing smaller tees such as 1st medal and 8th. Provision of separate grass winter tees to each hole (where space permits) would be beneficial to facilitate year round play from grassed tees. These issues should be attended to via a winter work programme over the next few years.

Rough

The main issue to stress regarding the rough was the need to implement more regular verti-draining and sand topdressing into areas of high traffic from greens to tee and tee to fairway. As buggy traffic is increasing and powered caddy cars are becoming increasingly popular, greater pressure shall be imparted on the traffic routes, meaning grass cover retention and maintaining a stable surface underfoot will become increasingly difficult, especially in wet weather. For this reason, efforts to build up a 25-30mm layer of sand at the sward base to these areas will significantly improve surface drainage, underfoot firmness and sward durability. Additional budget is required to achieve this objective.

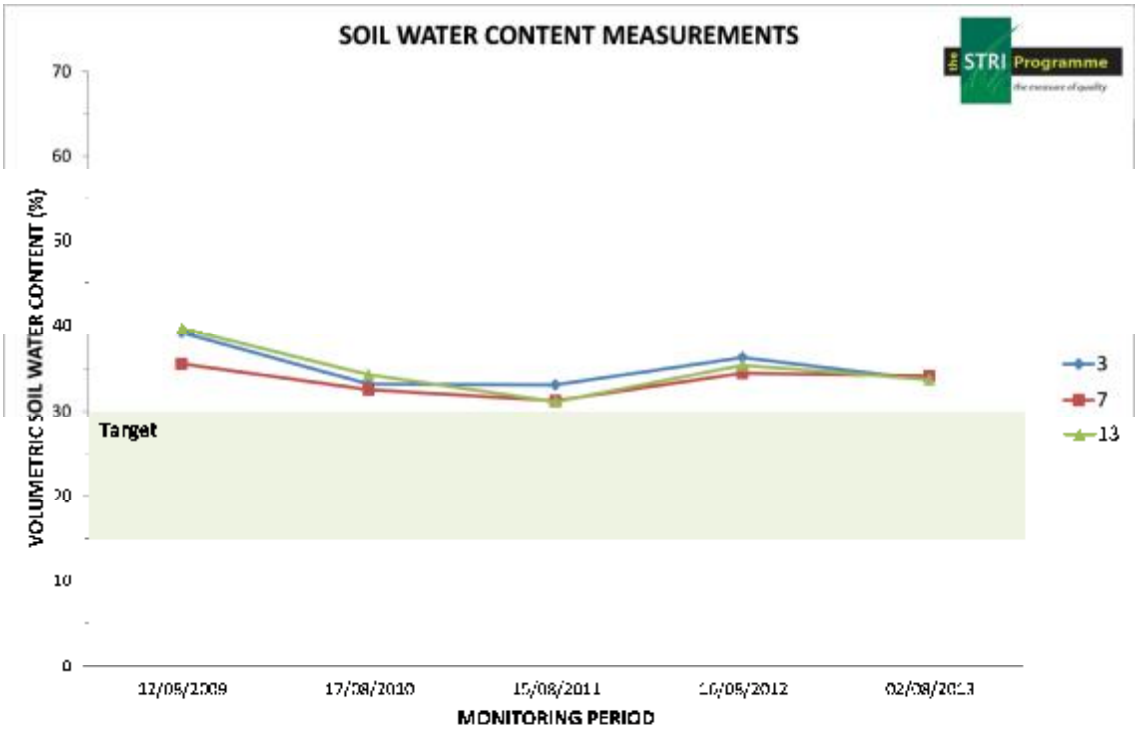
Improving the traffic routes via sand topdressing and regular aeration is an important objective to improve surface drainage and underfoot stability.

Performance data

The full suite of STRI Programme measurements were taken during the visit to identify on-going maintenance requirements and accurately assess the performance of the surfaces. The results are shown in the table and graphs below along with interpretation where necessary.

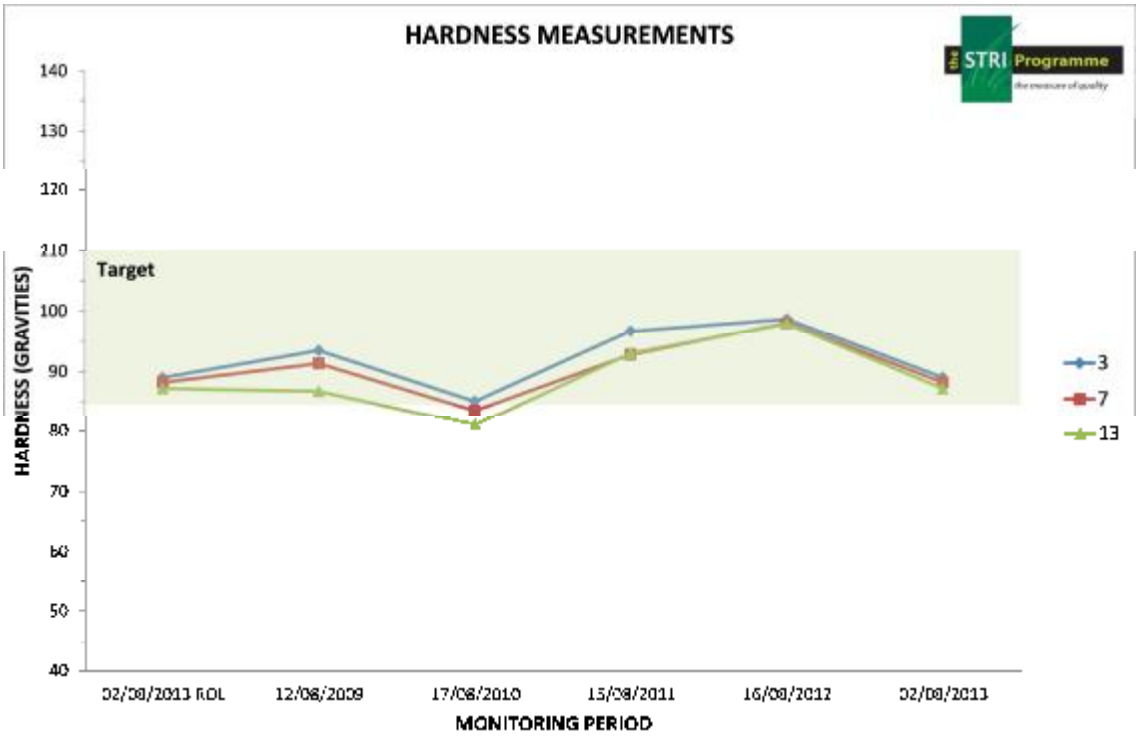
Performance Measurement Results							
Green No.	Speed (distance)	Smoothness (mm/m)	Trueness (mm/m)	Firmness Mean (gravities)	Firmness SEM (±)	Moisture Content (%)	Moisture Content SEM (±)
3	9 ft 0 in	17.0	6.7	89	1	33.7	0.5
7	8 ft 11 in	17.0	6.4	88	1	34.2	0.6
13	9 ft 7 in	17.2	6.3	87	2	33.7	1.0

Soil Moisture Content



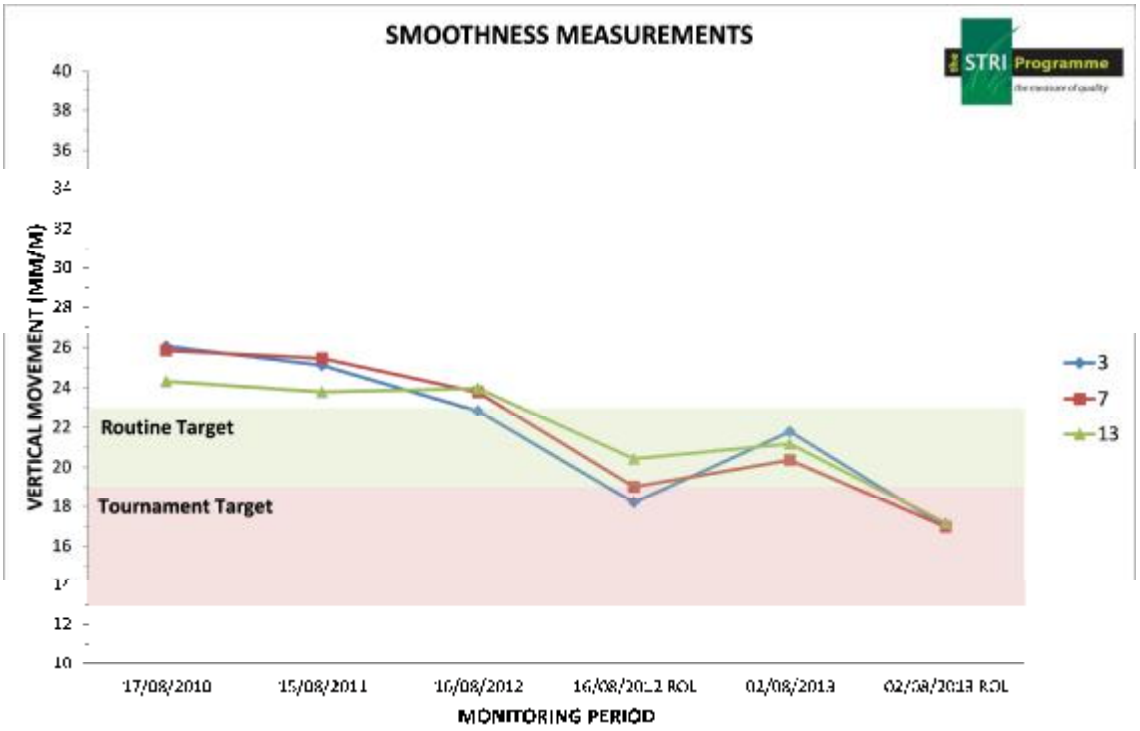
- Soil moisture values were very consistent between greens and were just above the ideal target range.
- The slightly high values are reflective on the wet weather recently but also moisture retentive nature of the upper soil profile due to slightly high organic matter levels.
- Efforts to reduce organic matter accumulations by more intensive reduction operations will reduce moisture retention and deliver improved surface firmness following rainfall events.

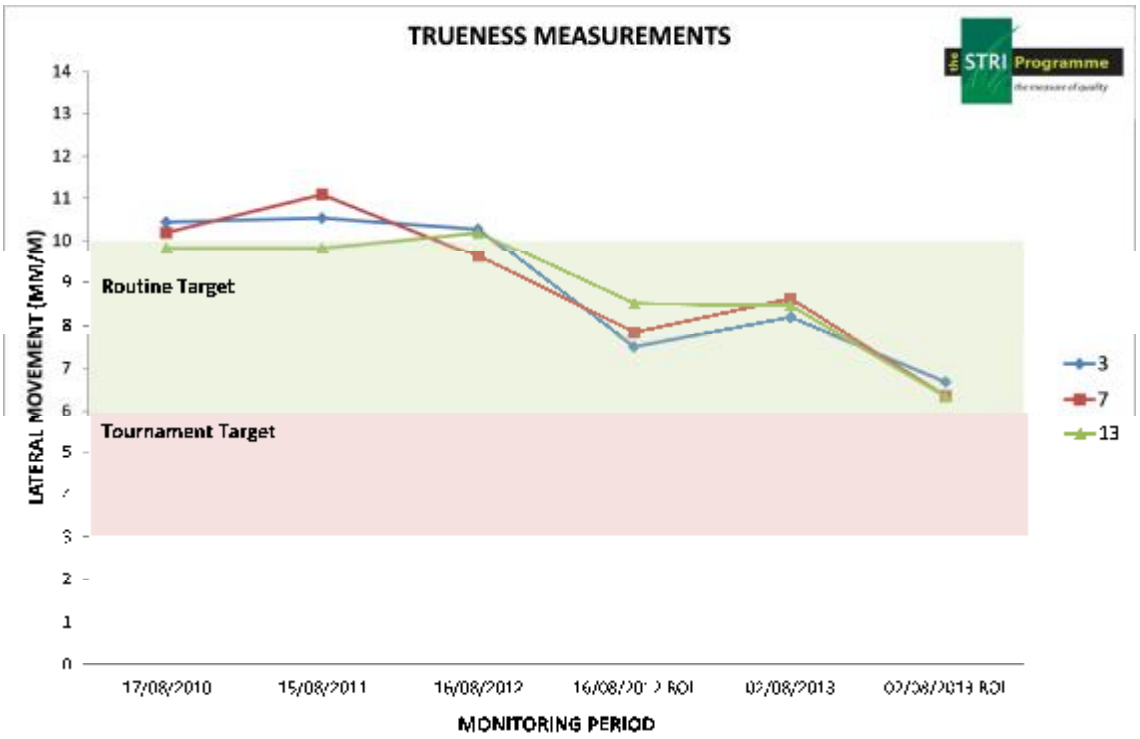
Surface Firmness/Hardness



- Surface firmness values were all within the ideal target range albeit at the bottom end.
- Firmness values have also deteriorated slightly from last year despite soil moisture levels being slightly drier during the recent visit.
- This slight deterioration is attributable to the increase in organic matter within the upper soil profile, indicating additional action in the form of removal and dilution is required to retain optimal levels of surface firmness in response to wet weather.
- The consistency of firmness between the indicator greens through each individual green was very good.

Smoothness & Trueness

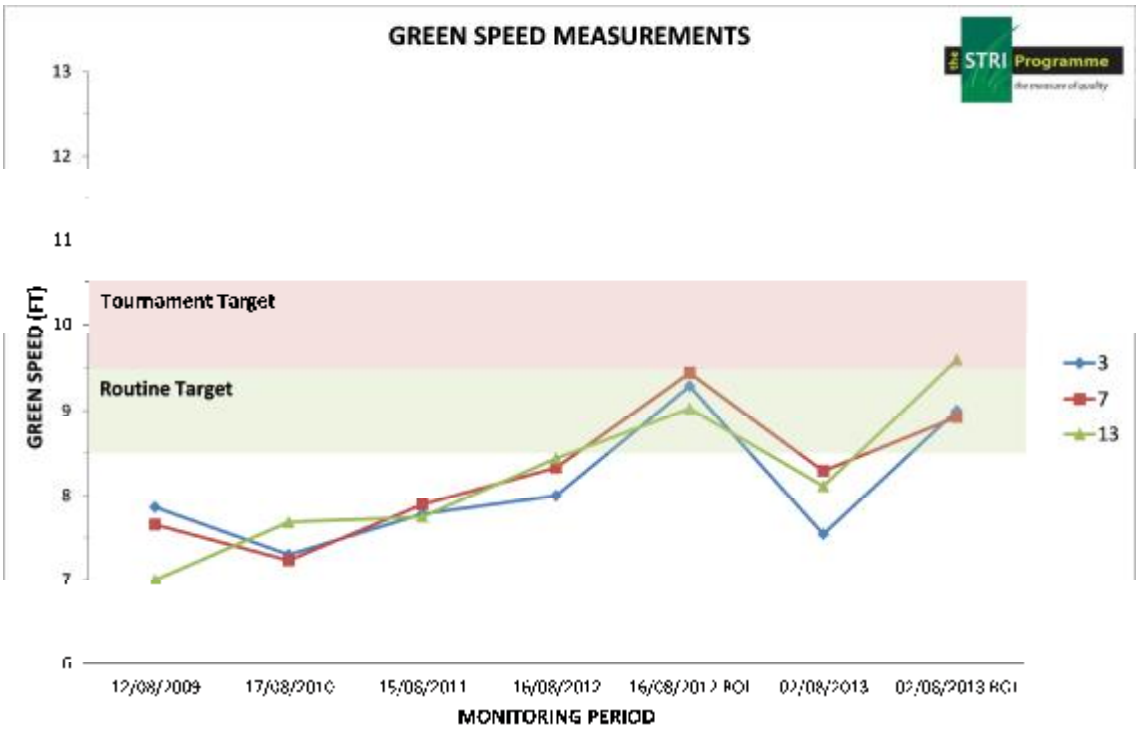




- The smoothness values obtained following a cut and rolling operation were exceptionally good and some of the best values achieved so far this season to inland courses. In fact, the smoothness values achieved were similar to those obtained for the Open Championship.

- Achieving such excellent smoothness values with relatively minimal refinement (i.e. triple mowing and rolling) is attributable to the superb sward texture, species composition and general agronomic foundations in place.
- Trueness values following a cut and roll were very good and within the lower end of the routine target range. It was felt even better trueness values would be obtained following some more verticutting over the next couple of weeks as this will reduce sward density appropriately.
- Smoothness and trueness before a roll were also very good firmly within the routine target range.

Green Speed



- Due to the density of the sward and strong growth the green speed values to the 3rd green approximately 7 hours after morning mowing was 7ft 6".
- To provide a more realistic measure of speed, the 7th and 13th greens were measured after a triple cut and speeds to these surfaces were 8ft 3" and 8ft 1" respectively.
- To increase speeds slightly and retain better speeds through each day, in response to the strong growth currently present, some verticutting should be implemented next week to thin out the sward and further improve sward texture.
- To assess speed following rolling we measured the 3 indicator greens following a Tru-Turf roll. This increased speed to 9ft on the 3rd green, 8ft 11" on the 7th green and 9ft 7" on the 13th green. This shows significant improvement in pace can be achieved by rolling.
- To optimise green speed sustaining the Primo Maxx regulator programme, increasing the frequency of verticutting in the short term and implementing regular Tru-turf rolling will continue to be achieved.

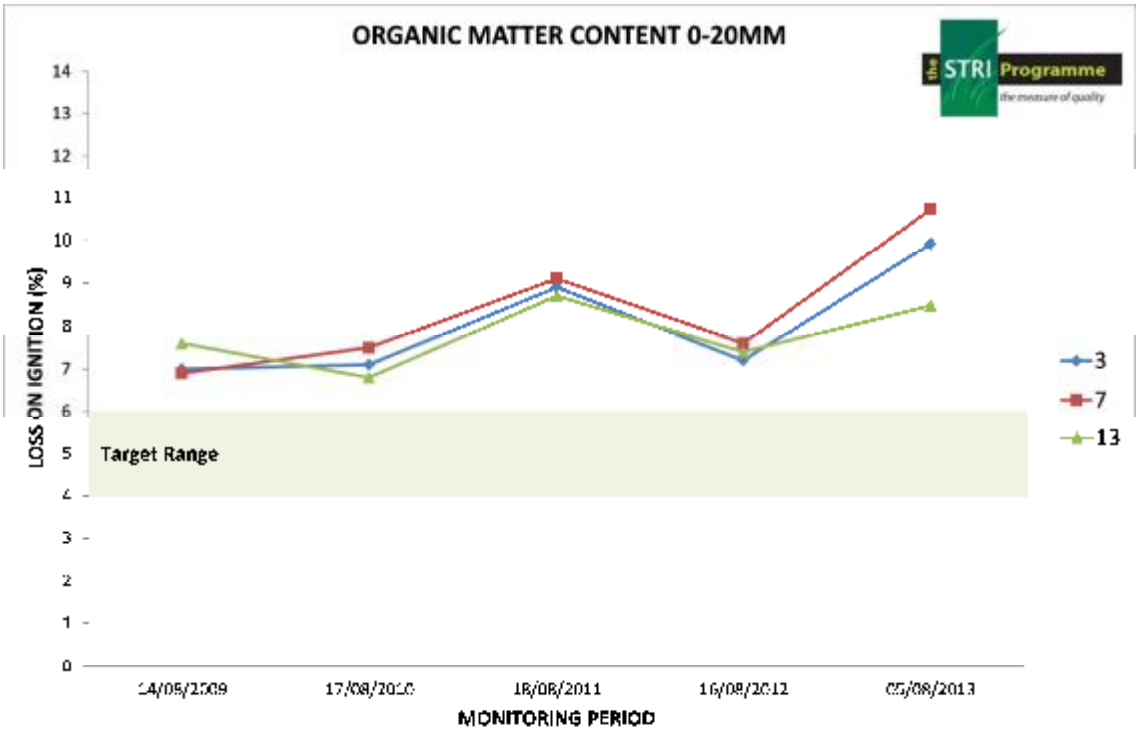
- Regular Stimpmeter readings should be taken to inform the necessary maintenance operations on a routine basis to sustain target speeds.

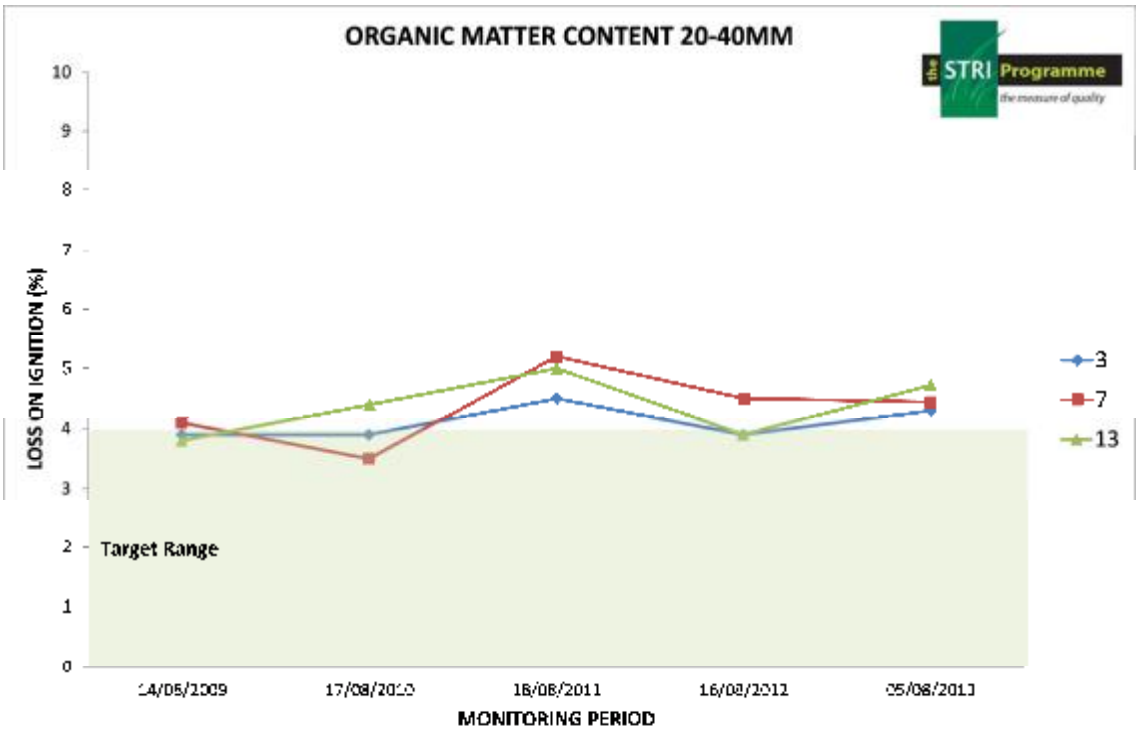
Organic Matter Content

Samples were submitted to the laboratory for organic matter analysis at 10mm increments through the top 40mm of the soil profile. Comparison of previous results taken at 20mm increments can be made by adding 0-10 and 0-20mm values and dividing by two and similarly 20-30 and 30-40 values and dividing by two to provide on-going analysis at 20-40mm. The results are shown in the table and graphs below along with interpretation where necessary.

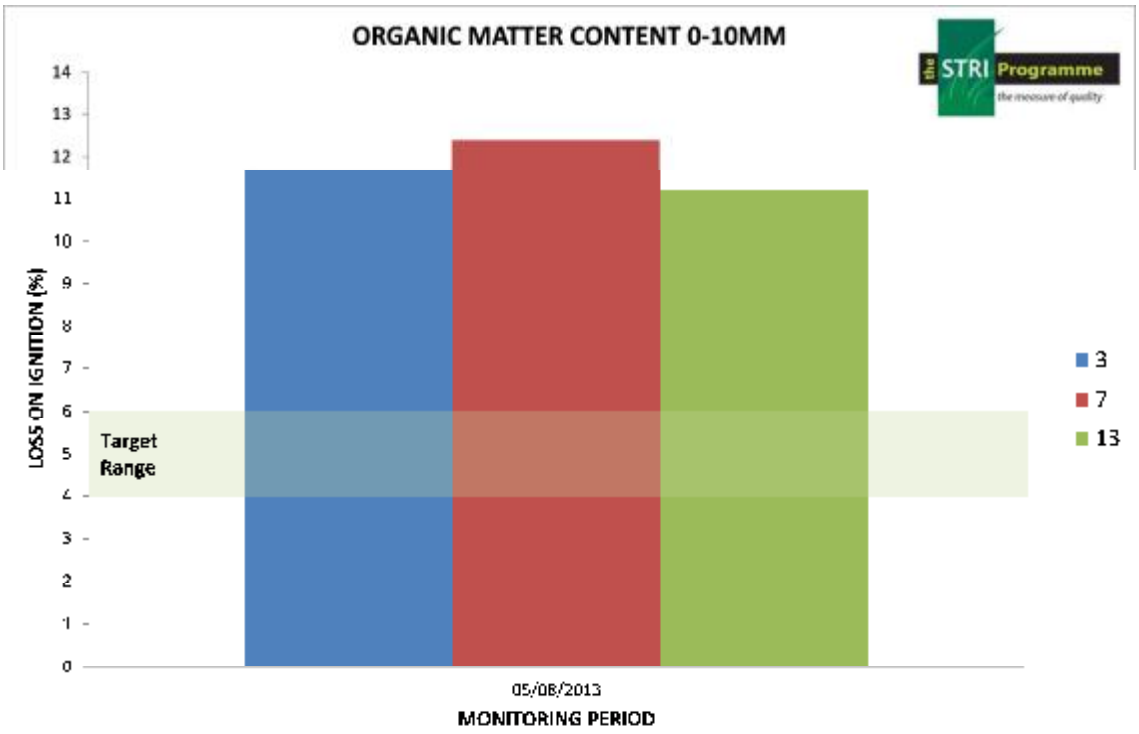
Organic Matter Content				
Loss on Ignition (%)				
	Green 3	Green 7	Green 13	Green 14
0-10 mm	11.7	12.4	11.2	10.4
10-20 mm	8.2	9.0	5.8	7.0
20-30 mm	4.7	5.0	5.6	5.4
30-40 mm	3.9	3.9	3.9	4.2

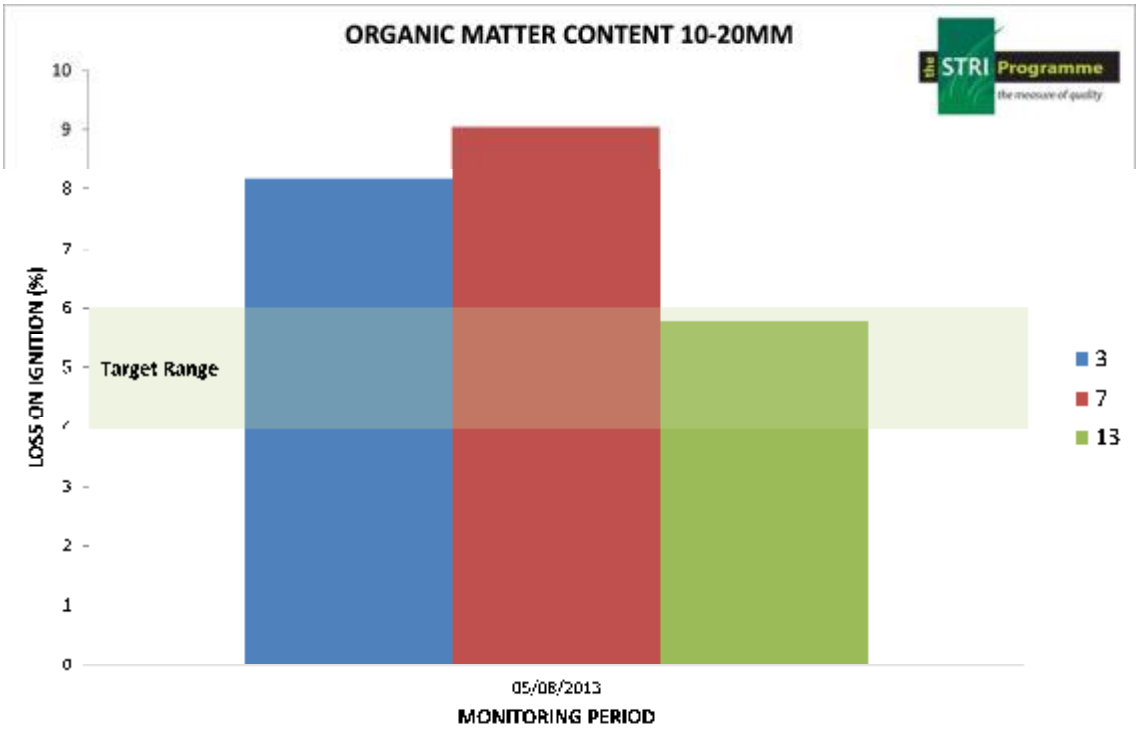
Graphs for results at 0-20 mm and 20-40 mm are shown below to illustrate the ongoing trend since 2009.





- The organic matter levels at 0-20 mm have increased significantly since last year at 0-20 mm and were well out of the ideal target range.
- Values at 20-40 mm are just outside the target range showing higher than desirable organic matter levels are restricted to the top 20 mm of the soil profile.
- Increased cultivation operations should therefore be restricted to the top 20 mm of the soil profile.
- To assess the top 20 mm in more detail, we can show the analysis at 0-10 mm and 10-20 mm respectively in the bar charts below.





- Analysis of these results shows that values are significantly higher than target at both 0-10 mm and 10-20 mm. The exception is interestingly the 13th green, which was lower at 10-20 mm.
- The higher than desirable organic matter levels in the top 20 mm of the soil profile are clearly the source of the softening to the greens in response to the recent rainfall.

Organic Matter Summary

- So, the results clearly indicate we should be targeting the top 20 mm with cultivation operations to optimise surface firmness and ongoing green condition.
- Values lower down are in target and do not require further rectification.
- As levels at 0-20mm are the only area for reduction, our strategy should ideally involve Graden sand injection scarification. This would ideally be implemented during August aeration week or October. If this cannot be achieved it will have to wait until August 2014 although this is not recommended.
- Graden sand injection scarification should be achieved with one pass set to a penetration depth of 20 mm. An additional pass should be implemented at a shallower depth of 10mm to all greens.
- In the spring, solid tining and power brushing (using the Kensett TB220 or JSM Sweep and Fill) will help increase the sand content of the upper soil profile and allow significant quantities of sand top dressing be applied and worked into the sward/upper profile.
- The combination of these treatments are generally minimally disruptive to play and will quickly rectify the organic matter issues in the upper soil profile meaning longer-term deterioration will be avoided. What is more, if the situation is not rapidly rectified more intensive, aggressive and disruptive operations may be required in the future.
- Regular and routine applications of sand should continue to be made during the spring and summer to manage accumulations appropriately.

Soil Chemical Analysis

Samples were submitted to the laboratory for routine analysis of soil pH, phosphate and potassium levels. The results are shown in the table below along with interpretation where necessary.

Soil Chemical Analysis			
	pH	$P_2 0_5$ (mg/l)	K_2O (mg/l)
Green 3	4.8	1	48
Green 7	4.7	1	49
Green 13	5.0	1	43
Green 14	5.2	3	41

- Soil pH has increased significantly from 4.3-4.4 last year to 4.7-5.2 this year in response to the two calcium carbonate (Microcal) applications at 40 g/m^2.
- As values still remain a little low, a further application at 40 g/m^2 would be desirable in an effort to lift values consistently above 5.0.
- Phosphate levels remain very low meaning further inputs are required for the next year.

- Potassium levels are satisfactory meaning existing inputs should be sustained at their current level.

Key recommendations

Greens

- Graden sand injection scarification is considered important to remove and dilute accumulations that remain too high within the top 20mm of the soil profile.
- The plan should ideally involve implementing this operation during forthcoming August aeration week, but if this cannot be achieved, consideration should be given to its implementation in October.
- It is hoped one double pass should be sufficient to bring levels within the desired target, meaning routine sand topdressing should then retain appropriate levels in the future. However, annual organic matter analysis will inform the necessary treatments in this regard.
- Some verticutting was recommended to refine sward texture and reduce sward density to deliver improved green speed over the next couple of weeks.
- The Primo at fortnightly intervals should be sustained, but look to reduce the water volume in which the Primo is applied to optimise efficacy of performance. The new Syngenta XC01 nozzles will be very helpful in this regard.
- Browntop bent overseeding, as part of Graden sand injection scarification, will help improve sward species composition. Ensure the bent is oversown at a rate of 8g m^2 using a high quality mix such as Barenburg Bar All Bent.
- Increase phosphate applications in the spring. Start with a product containing 5% phosphate, e.g. 5:5:10 or similar. The main spring feed should also contain 5% phosphate.
- Apply calcium carbonate carefully at 30-40 g/m^2 in November following aeration. The Rigby Taylor Microcal is very good. Keep a careful watch for disease after treatment.

Green Aprons

- Extend more intensive sand topdressing and verticutting into the green aprons to optimise surface firmness and consistent ball release.

Fairways

- Consider a Primo Maxx growth regulator programme to the fairways next year. The purchase and subsequent use of a new high quality boom sprayer would be very beneficial in this regard to optimise the efficiency and accuracy of this process.
- More intensive divot patching would improve the quality of the fairways further, particularly to heavily played sections such as the 17th landing zone.

Tees

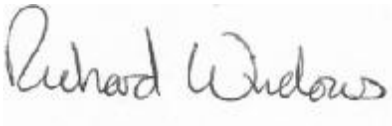
- A programme of tee levelling and enlargement would be very beneficial to improve the quality of the teeing platforms.

- The priority for enlargement and levelling would be the 1st and 8th with levelling to the 17th.
- The Medallion turf used on the 14th tee extension is excellent and would provide the ideal material for future work.

Rough

- Aim to increase the frequency of sand topdressing to traffic routes with the aim of accumulating 25-30mm of sand at the sward base.
- In addition to sand topdressing, aim to implement more regular verti-draining to alleviate compaction and improved sward health to these high trafficked areas.

Signed:



Richard Windows B.Sc. (Hons.) MBPR RIPTA
Turfgrass Agronomist
Official R&A Agronomist Scotland

STRI is completely independent and has no alliances to commercial products, services or contractors. This ensures that our design, project management and advisory services provide the best solutions for each individual client.

The STRI Programme provides golf courses with measurements and data that help to monitor and assess golf course performance. The R&A has recently developed CourseTracker (www.coursetracker.org), a free, online business management tool for golf courses, to record, review and analyse golf club performance across many areas of your business, including the golf course. STRI believes The R&A CourseTracker combined with the STRI Programme provides the tools you need to objectively monitor and assess your golf course performance.

Appendix 1

Soil Laboratory Results

STRI

St Ives Estate, Bingley, West Yorkshire, BD16 1AU
T. 01274 565131 F. 01274 561891 E. info@stri.co.uk **www.stri.co.uk**

ORGANIC MATTER CONTENT

CLIENT: LARGS GC

DATE RECEIVED: 05/08/13

DATE REPORTED: 07/08/13

RESULTS TO: RJW

SAMPLE NO	DESCRIPTION		LOSS ON IGNITION (%)*
A11952/1	3	0-10 mm	11.7
		10-20 mm	8.2
		20-30 mm	4.7
		30-40 mm	3.9
A11952/2	7	0-10 mm	12.4
		10-20 mm	9.0
		20-30 mm	5.0
		30-40 mm	3.9
A11952/3	13	0-10 mm	11.2
		10-20 mm	5.8
		20-30 mm	5.6
		30-40 mm	3.9
A11952/4	14	0-10 mm	10.4
		10-20 mm	7.0
		20-30 mm	5.4
		30-40 mm	4.2

* ASTM F1647-02a Standard Test Methods for Organic Matter Content of Putting Green and Sports Turf Rootzone Mixes (Method A)

ACCREDITED
Testing Certificate 2159 - 01

THE RESULTS PERTAIN ONLY TO THE SAMPLE(S) SUBMITTED AND TESTED

STRI

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SOIL CHEMICAL ANALYSIS

CLIENT:

LARGS GC

RESULTS TO: **RJW**

DATE RECEIVED:

05/08/2013

Lab No.	Source	pH	P_2O_5 (mg/l)	K_2O (mg/l)
A11952/1	3	4.8	1	48
A11952/2	7	4.7	1	49
A11952/3	13	5.0	1	43
A11952/4	14	5.2	3	41

Dr D M Lawson, Soil Chemist.

THE RESULTS PERTAIN ONLY TO THE SAMPLE(S) SUBMITTED AND TESTED.

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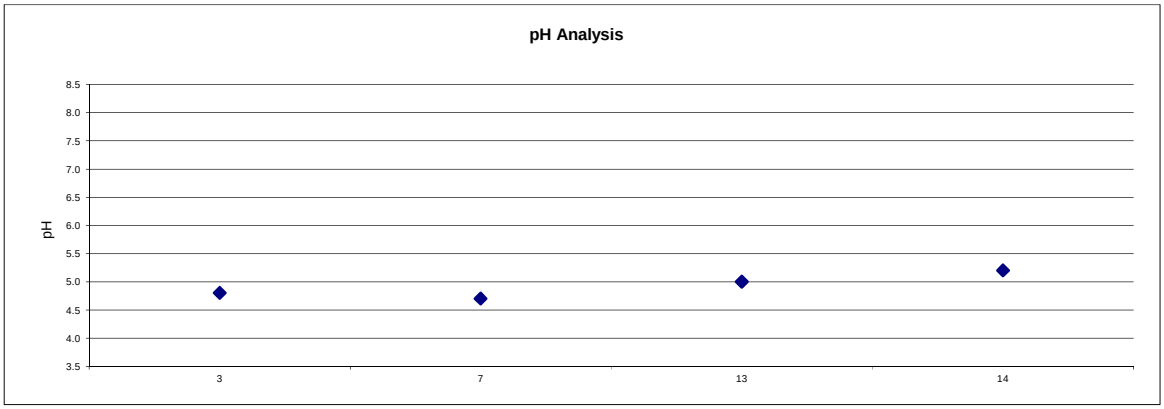
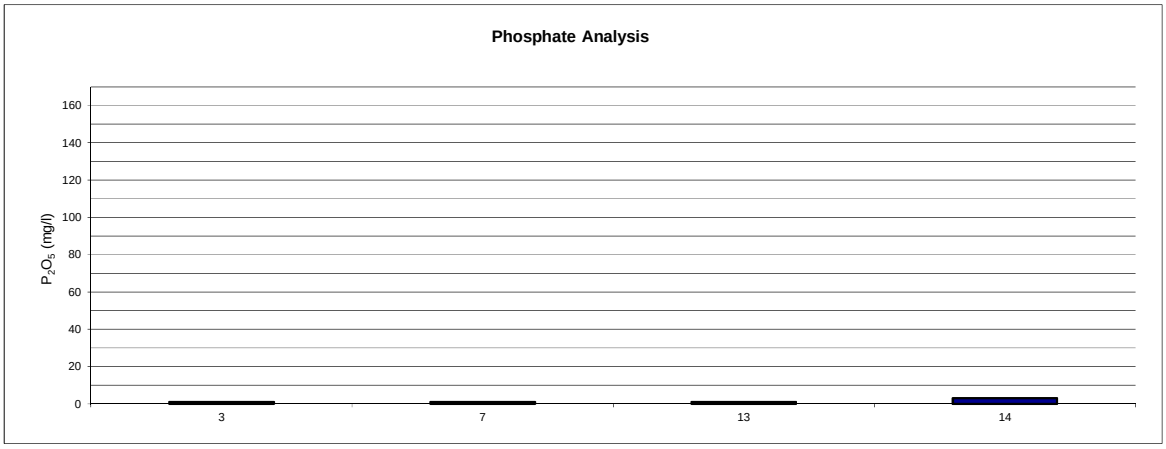
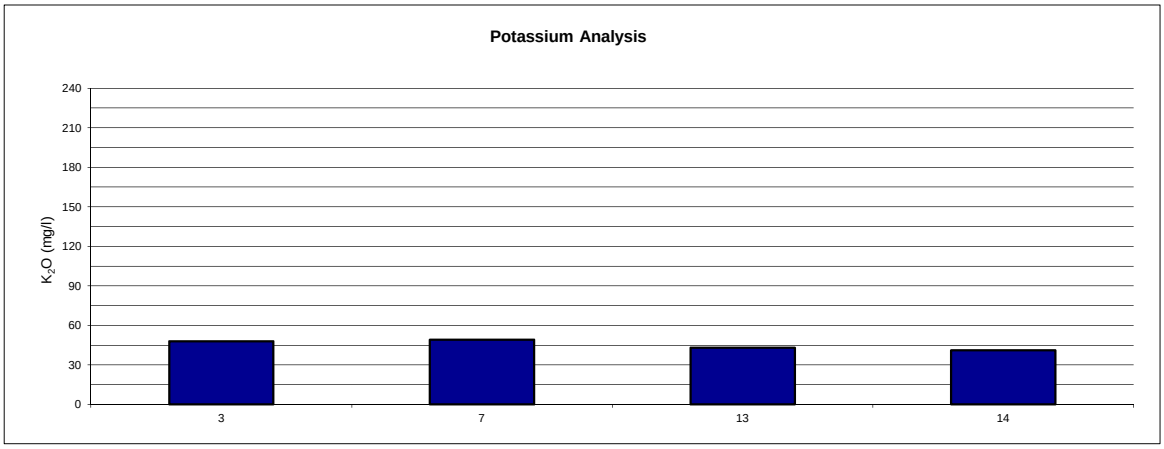
SOIL CHEMICAL ANALYSIS 0 Date: 05/08/13







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