Royal Copenhagen Golf Club

Advisory Report on the Golf Course incorporating the STRI Programme

Report Date: 11th July 2014
Consultant: Alistair Beggs

for excellence in sports surfaces

www.stri.co.uk

CONFIDENTIAL

Date of Visit:	1st and 2nd July 2014
Visit Objective:	To review prevailing course condition and to offer advice on on-going management. Indicator greens at the 5th, 8th, 12th and 18th were performance tested as part of the STRI Programme.
Present:	Mr Martin Nilsson – Course Manager Mr Alistair Beggs – STRI
	Post inspection discussions were held with members of the green committee.
Weather:	Warm and sunny temperature 21ºC.

Contents

Executive Summary

- The STRI were invited to undertake an inspection of the golf course following our initial inspection in April 2012. The brief this time was to review progress made since then and to offer advice, particularly on managing clover contamination of playing surfaces, to review the management of green surrounds and to provide guidance on improving the texture and performance of fairway turf.

- Greens were offering good surfaces for play and showed further progress towards the fescue dominated objective identified by the Club. The sward composition on most of the greens is first class with fescues dominant in all greens apart from the 1st and 18th. Here environmental factors favour annual meadow-grass and will continue to do so while shade and air flow issues prevail.

- White clover is a widespread contaminant particularly on the fescue dominated surfaces and discussions were held on how to best manage this given the strict legislative constraints and the current ban on herbicide use.

- Performance data gathered from the 5th, 8th, 12th and 18th greens were largely very positive and indicated improved consistency, particularly in respect of green speed. Smoothness and trueness values were largely improved upon last time and were within the target range apart from the 18th where values were less favourable. Moisture and firmness readings revealed good strategic progress in line with organic matter data which is very good. Organic matter levels have increased a little in the surface but not significantly so.

- Mixed fescues dominate on green surrounds as they do on the greens themselves. However, there are two main issues – contamination from white clover, which is a major visual blemish, and contamination with ryegrass for example approach at the 1st, rear of the 10th which is both a visual blemish and has a negative impact on playing performance. These issues need to be tackled in a different way (see recommendations). Advice was given on improving visual performance and masking contamination with clover as well as helping to control the problem.

- Fairways show a good cover of grass in general terms. The texture of turf on some holes for example 9, 15 etc. is coarser and more open than I would expect on a site of this type. The soils are generally light and reasonably free draining, but it was felt that intensifying programmes of sand dressing will not only reduce the impact of worm casting (over time) but should help to improve turf texture as well. This programme of work will need to be augmented with physical refinement practices for example brushing/scarification etc.

- The renovation programme carried out by Tom MacKenzie in 2008/09 has resulted in bunkers with great visual appeal. We emphasised the importance of having a consolidated sand base of approximately 100mm in depth, but only the top 20mm should be fluffed and disturbed. Deer interrupt the delivery of this recommendation so it was suggested that the Club consider light contamination of the sand with topsoil in an attempt to stabilise it. This should be done on a trial basis to selected bunkers.

- This course has unique character and is a wonderful environment in which to play golf. The strategic objectives the Club has are entirely appropriate and correct and it is important that the virtues of the running game are enhanced and maintained by a programme that encourages firm surfaces and fine fescue grasses. The fundamentals are in place, programmes merely need fine tuning in an effort to improve presentation and reduce the impact of weed species.

- Staffing levels are low for a facility of this quality and the maintenance compound needs investment. One of the main recommendations made in the report is for the Club to aspire to carry out more pedestrian mowing. For this to become a reality the investment in at least one if not two more full time members of staff is justified.

Key Observations

Greens

- I am entirely satisfied and fully support the Clubs strategy to promote fescue grass species across the site. Most of the greens at Copenhagen are dominated by this desirable fine leaved and disease tolerant turf type and as a consequence putting surfaces provide excellent year round playing characteristics.

The quality of surface provided at Copenhagen on this occasion was first class with fescues dominant in most cases.

- The percentage of contaminant grasses varied a little from green site to green site with surfaces such as the 9th and 10th showing higher percentages of bent, but only the 1st and 19th showing high percentages of annual meadow-grass. This latter species is undesirable for a number of reasons, but its presence in these greens is environmental (lack of air flow and lack of sunlight) rather than a product of the greenkeeping programme. Whilst the Club should endeavour to promote fescues on these two sites the battle will always be more difficult because of reduced sunlight levels in particular. Tree removal needs to be considered, particularly at the 18th if this surface is to improve in the long term. It should be noted how much poorer this green is compared with the other indicator greens when the performance data are studied (see below).

- The texture of the turf is very good on most greens, but the visual appearance of many is destroyed by the presence of white clover.

White clover contamination is the main problem on the greens at Copenhagen.

- On most other courses in Europe white clover contamination in greens turf would be corrected using a selective herbicide. Here in Denmark and particularly at Copenhagen Golf Club because of its status and location in a national park, traditional herbicides are not allowed. We must therefore look at other means to control the clover and this will be a pioneering challenge and one that may take a few years to perfect. The answer lies in combining refinement pressures with the use of iron sulphate as a desiccant to provide a package of stress which impacts the clover more than the base fescue sward (see recommendations).
- Beneath the surface, green profiles were in good order. There were no signs of significant compaction, root development was good and strong (shallower beneath the 1st and 18th) and there were no signs of thatch development at the base of the turf.

Green Surrounds

- Many of the green surrounds have essentially been re-designed and re-built over the last six or seven years. In the main, the fescue dominated turf has established well and it is interesting to note that the smooth stalked meadow-grass content of it has declined to nothing in most cases. The main problem on these areas is contamination from white clover and once again this is destroying the visual appearance of these areas and spoiling the golf experience. It should be stressed that it is more of a visual than a performance blemish (and this is true on greens as well), but nevertheless it needs to be controlled and the current equilibrium is not satisfactory.

White clover contamination is significant on green approaches for example at the 4th (left hand photograph), and on green surrounds 15th (right hand photograph).

- Clover is an increasing problem and we must find a way of both discouraging and masking the impact it has on the golfing eye.
- The other problem on surrounds and approaches is contamination from perennial ryegrass. This is a more difficult problem to solve, because ryegrass will not respond particularly well to pressures exerted by refinement or sulphate of iron.

Perennial ryegrass contamination in the front left approach at the 1st.

- We discussed various options to overcome this issue and the only real solution will probably be re-turfing and the best option for this may be indigenous turf (see recommendations).

Tees & Fairways

- The main issue with the tees is turf refinement and an increase in scarification/verticutting work will be necessary to improve this. There may be merit in increasing sand topdressing applications here as well which will reduce productivity and result in a finer sward.

- The same issues exist on fairways. Some swards are quite coarse and lateral growing for example 9th, 15th etc. whereas others are more fine leaved for example 4th, 17th etc. There is a need to improve grass texture on fairways as well as tightening density which will help to exclude contaminant weeds such as plantains, daisy and white clover. In addition we discussed the potential merits of sand topdressing which overtime will not only improve surface drainage and turf texture, but should also reduce the worm casting issue which is particularly problematic during the winter. Further advice is given in the recommendations section.

Bunkers

- The renovation programme master minded by golf architect Tom MacKenzie seems to have worked very well and the new bunkering is very much in keeping with this style of golf course. The question was raised about the ideal depth of sand in bunkers and I made the point that it matters less how much sand is in a bunker and more how much the base sand is compacted. Some links bunkers contain an indeterminate depth of sand, and all but the top 12 – 15mm is consolidated. This is your challenge. It is not the depth of sand more the depth of loose sand at the surface that causes the problem and this gets worse when the sand dries out. Managing the moisture content of the sand through irrigation can help and in some instances base liners can help, but my fear is that with likely damage from the deer, liners will not work very well at Copenhagen. Therefore, the best approach may be to look to ameliorate the sand with a small amount of native topsoil to make it easier to pack and consolidate. This technique may also allow the finished mix to retain a little more moisture and resist deer damage.

Machinery & Resources

- The greenkeeping compound is not commensurate with the status of the Club or the course and needs investment.
- Whilst the greenkeeping team of six (five plus one part time) is adequate there may be a need to increase this compliment if for example pedestrian mowing options are explored further (see recommendations).
- I do feel that more regular pedestrian mowing will result in enhanced performance and presentation and the Club should have an aspiration to implement this technique in the future given that it will also help strengthen green perimeters and immediate surrounds by reducing the regular turning of triple machines.
- There will be a need to equip either the greens triples or a new set of pedestrian hand mowers with groomer units to implement refinement recommendations made later in the report.

Performance Data

Performance data were taken from indicator greens at the 5th, 8th, 12th and 18th using standard STRI equipment and protocols. The testing procedures were carried out in exactly the same way and on exactly the same greens as in the spring of 2012.

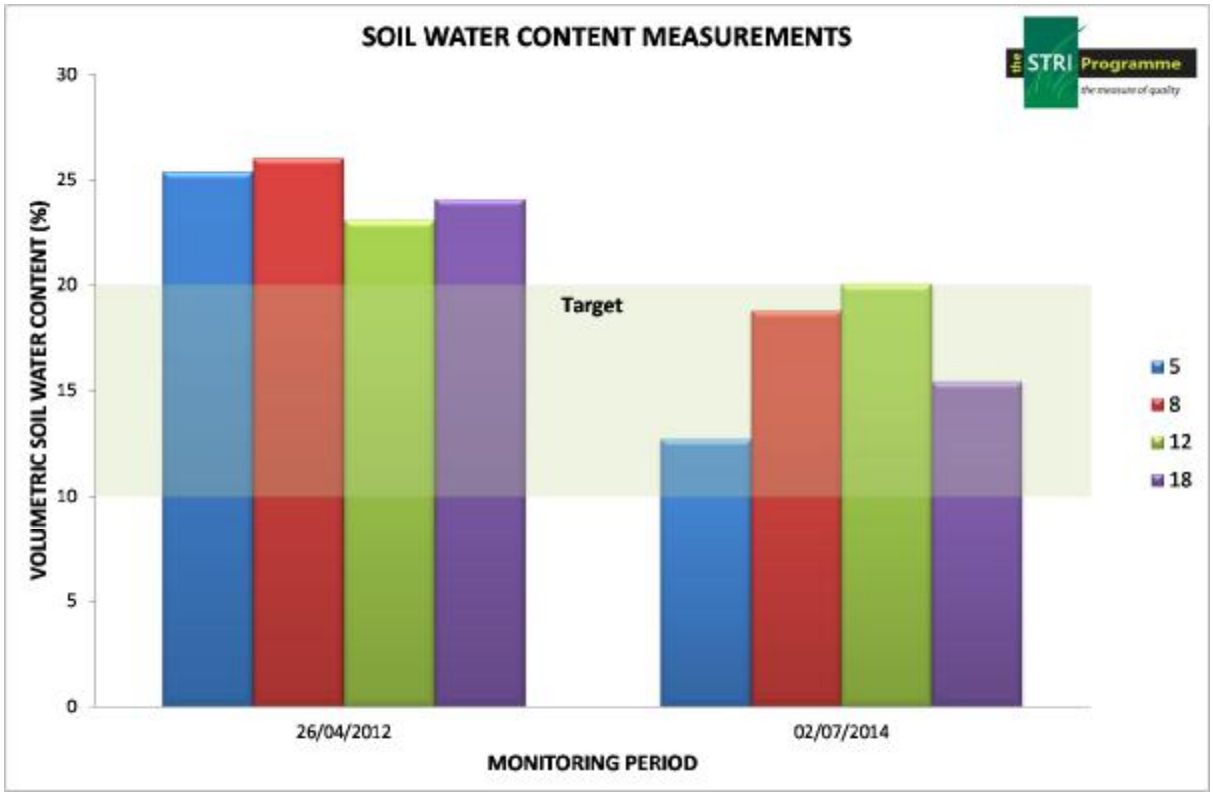
On this occasion greens were mown at 4.5mm and single rolled apart from the 12th which was not rolled.

Weather conditions on the day of testing were warm and dry with a daytime temperature of 20ºC. Testing took place between 14:00pm and 16:30pm in the afternoon.

The table below summarises the results.

Performance Measurement Results							
Green No.	Speed (distance)	Smoothness (mm/m)	Trueness (mm/m)	Firmness Mean (gravities)	Firmness SEM (±)	Moisture Content (%)	Moisture Content SEM (±)
5	9 ft 10 in	21.5	6.5	123	2	12.7	0.6
8	10 ft 2 in	22.9	8.0	114	3	18.8	0.6
12	9 ft 12 in	23.0	7.9	118	2	20.0	0.9
18	8 ft 5 in	27.4	8.7	120	2	15.4	0.4

Soil Moisture Content

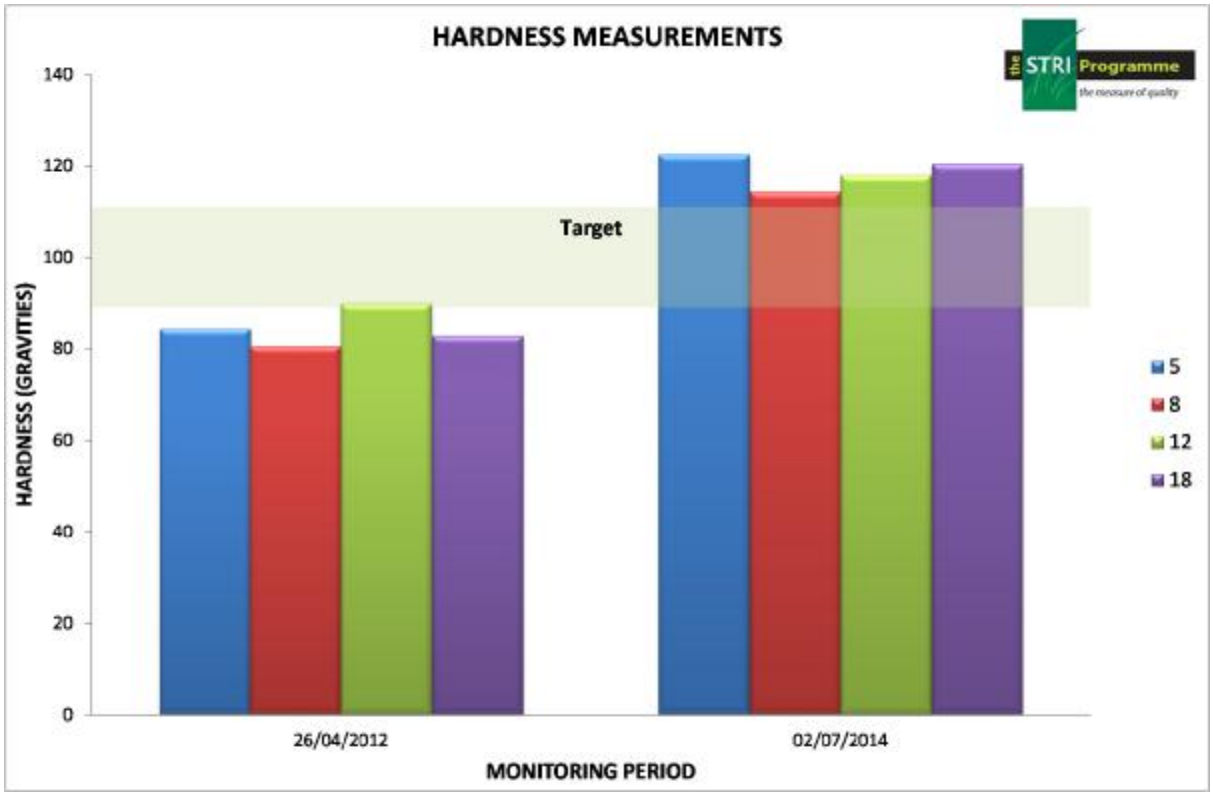


- The above graph shows the volumetric moisture content readings taken from the indicator greens. The four bars on the left hand side of the graph represent the data from 2012. The bars on the right hand side of the graph represent the data taken on this occasion. In general terms the greens were drier than they were in the spring of 2012 and this is to be expected given raised evapotranspiration rates at this time of the year. On this occasion all four greens sit within the ideal target range of 10 – 20%. However, there is a little too much variation between greens with the 8th and 12th greens showing increased moisture over the 5th and 18th greens.

Interestingly it appears that the Axis application to the 12th green may well be working, helping to retain moisture on this previously dry green.

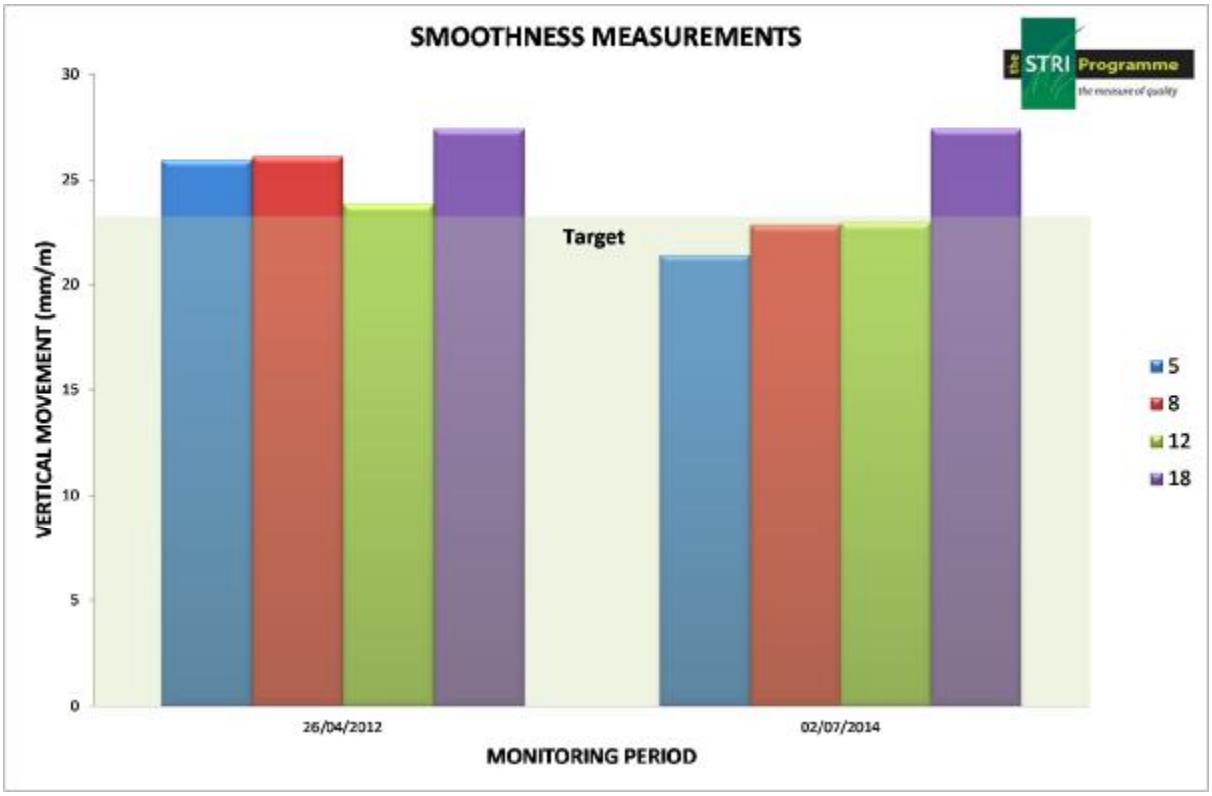
- Standard error readings were good, so although there is some variation in moisture content from green to green there is not too much variation within greens.

Surface Firmness/Hardness



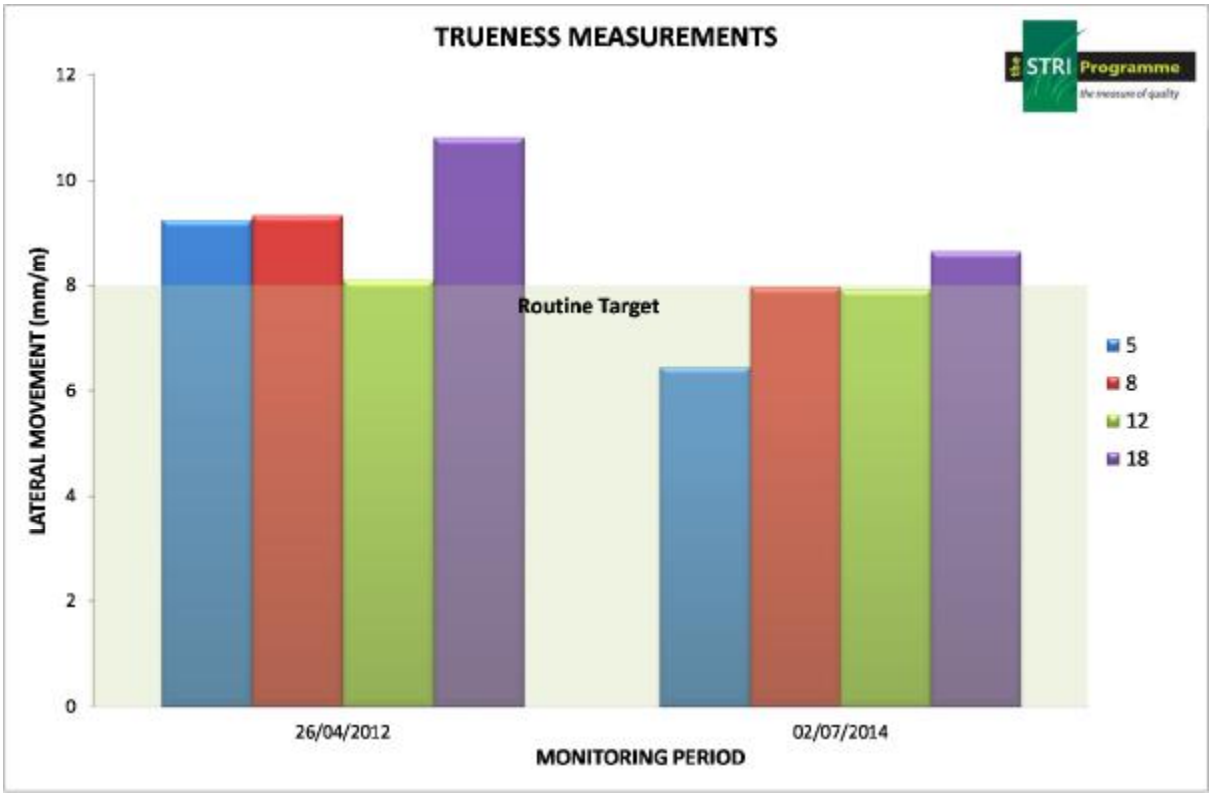
- All the test greens were significantly firmer than they were in 2014. Again this is to be expected given the time of testing.
- Good consistency was achieved here both within and between greens. Standard error readings were low indicating the absence of hard and soft spots and all four greens showed slightly above the ideal target range of 90 – 100 gravities. This result is excellent and exactly what I would expect for high quality greens dominated by mixed fescues. Firm greens are good greens and although these results slightly exceed the target range I do not see this as a problem.

Smoothness & Trueness



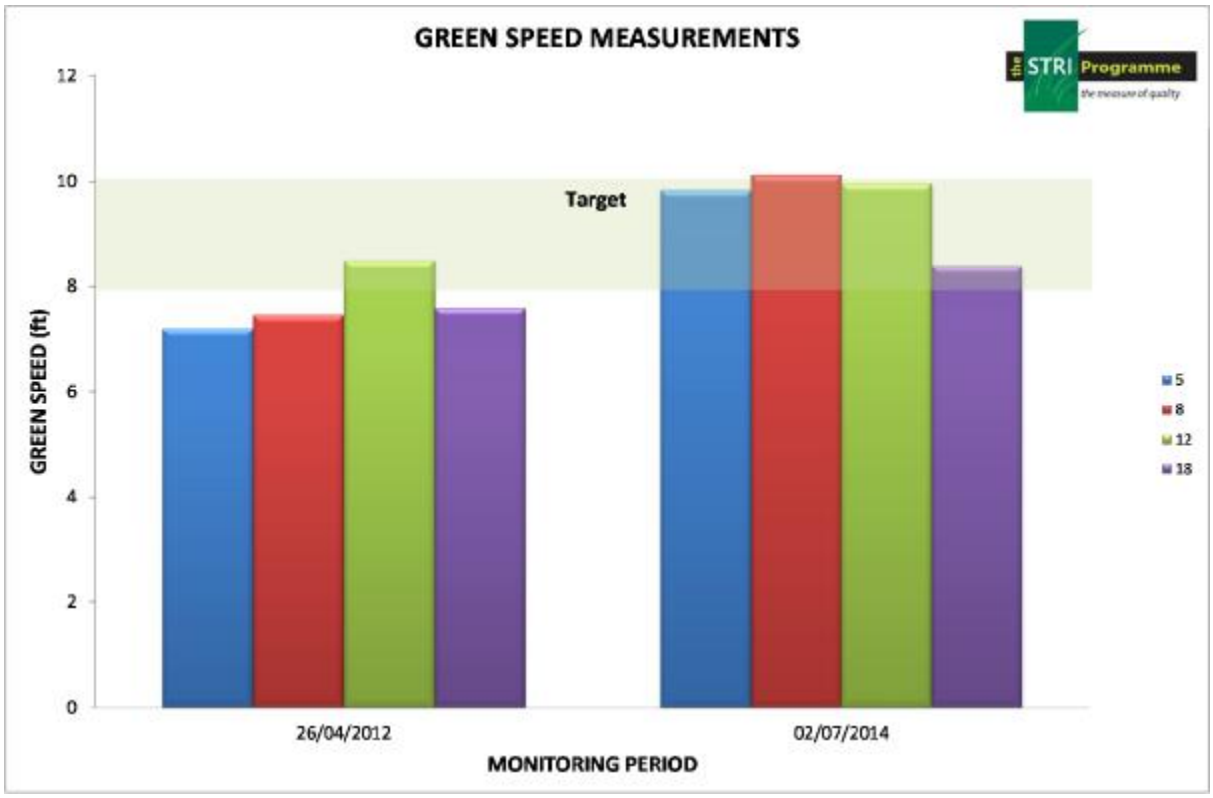
- Smoothness is a measure of vertical deflection and is measured using the STRI Trueness Meter. This unit has a high resolution level and will pick up imperfections caused by spike marks, pitch marks, disease aeration or pest damage. The smoothness readings on this occasion were very good and with the exception of the 18th were noticeably better than the results obtained in the spring of 2012.

- The 5th green was the smoothest and along with its counter parts at the 8th and 12th sat within the target range of 23mm or less. The exception was the 18th green where the higher proportion of annual meadow-grass caused this surface to be less smooth. Interestingly this green has not improved in terms of smoothness over the reading obtained in late April 2012. This proves what we are finding more widely in the UK - annual meadow-grass generally does not provide as smooth a surface as a fescue dominated sward.



- Trueness readings largely mirror those of smoothness. Trueness is a measure of lateral deflection and is again measured using the STRI Trueness Meter.
- On this occasion readings were generally better than they were in 2012 with the 5th green once again being the truest of those tested.
- With the exception of the 18th which again was the least true and sat outside the ideal target range of 8mm/m or less the 5th, 8th and 12th all sat within the ideal target range for summer play.

Green Speed



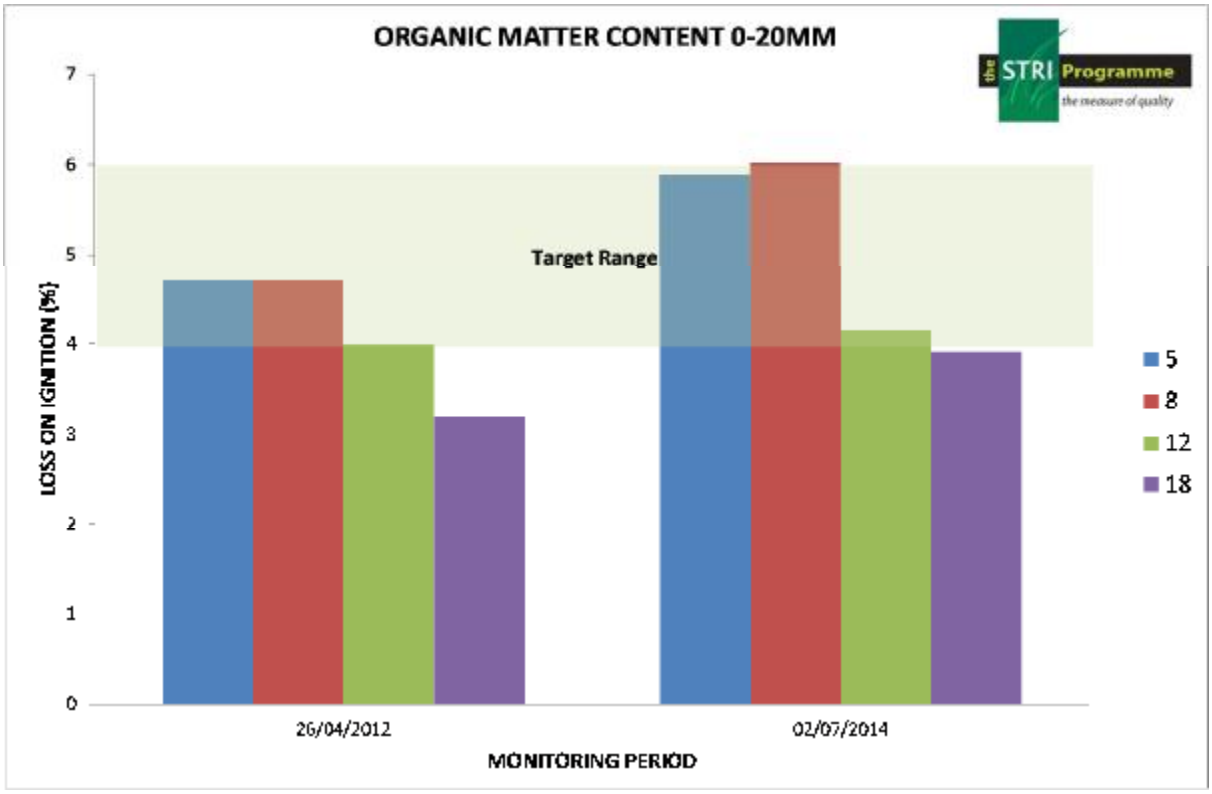
- Green speed readings were better than they were in the spring of 2012 and this is to be expected given the additional refinement and mowing inputs having been made at this stage of the season.
- Once again the 5th, 8th and 12th greens performed very well at the higher end of the ideal target range of 8 – 10ft.
- The 18th green performed poorly again and although the green speed here was within the target range it was very much at the lower end of it. Interestingly it is usual practice to double roll the 18th green in order to provide similar speeds here as the rest of the course. On this particular occasion the second roll was not carried out. This exercise proved that the second roll is necessary and that it should very much continue in order to obtain better consistency between greens across the site.

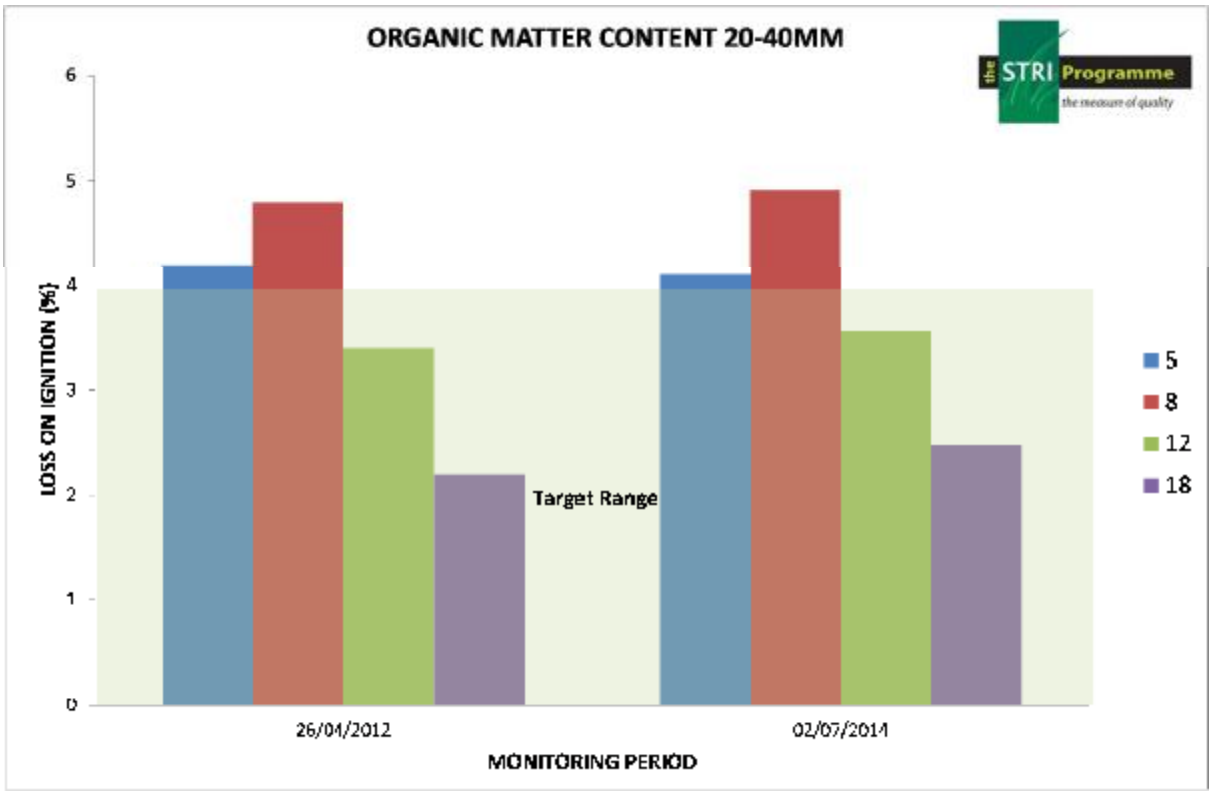
Organic Matter Content

Organic matter samples were taken from beneath the indicator greens and the table below summarises the results.

Organic Matter Content				
Loss on Ignition (%)				
	Green 5	Green 8	Green 12	Green 18
0-20 mm	5.9	6.0	4.1	3.9
20-40 mm	4.1	4.9	3.6	2.5
40-60 mm	4.6	4.4	4.3	2.7
60-80 mm	3.3	4.0	2.9	2.7

The following graphs illustrate trends since the last inspection in April 2012.





- In summary organic matter levels in the top 20mm and 20-40mm depth ranges (the critical areas) remain very good.

- In the top 20mm all greens show within the ideal target range and although all greens show a slight increase since 2012 (the 5th and 8th show the largest increases) this is not significant. Nevertheless this trend needs to be noted and reversed over the next twelve months. Increasing sand top dressing volume is the best way to achieve this in addition to ensuring routine aeration is carried out. Nothing remedial is necessary.

Soil Chemical Analysis

Samples were taken from each green for routine chemical analysis of soil pH, phosphate (P_2O_5) and potassium (K_2O). The results of the testing are outlined in the table below.

Soil Chemical Analysis			
	pH	P_2O_5 (mg/l)	K_2O (mg/l)
5	5.8	108	41
8	5.6	91	55
12	6.4	114	65
18	6.2	154	48

- There are no outstanding issues here that would suggest a change of fertiliser strategy. Potassium levels are a little low but not dangerously so.

Key Recommendations

Greens

- It is clear to me that the basic fundamental greens management programme is working well and all the inputs are combining to promote mixed fescues over and above other grass types.
- The greens where less progress is being made include the 1st and 18th. Here environmental factors such as reduced sunlight penetration and airflow are the constraining elements. The Club should work to improve these even if no immediate progress is envisaged.
- Other greens such as the 9th and 10th contain higher percentages of bent. I do not see this as a problem, but if current practices are maintained I would not see bent grasses becoming any more dominant and indeed they are likely to decrease with time.
- The left hand side of the 3rd green is weak. It was suggested that a root break trench be introduced here and that the canopy of the offending oak tree be trimmed back to the green edge. It is hoped that permission can be gained for both of these operations to be carried out. The root break recommendation should be extended to other greens where it is appropriate. The root break should be introduced to a minimum depth of 1m and the green side of any trench created should be lined with a barrier material such as industrial polythene or equivalent.
- The main problem on greens in contamination from white clover. Continue to try and gain permission to apply a selective herbicide to eliminate the weed. Even if this was only granted on a five year cycle it would make a big difference to the performance and presentation of the course. Patch plugging of smaller colonies of white clover can be considered, but do not attempt to patch plug large numbers of bigger colonies – this is likely to create as big a visual problem as the one that already exists.

- Other measures to consider include replacing the current brush system on the units with powered groomer units. These will be more aggressive and at a given setting and a given intensity they will have a negative impact on clover before they have a negative impact on fescue. The key is to find the severity of treatment and a frequency of treatment that damages the clover and weakens it. I cannot give you specific guidance on this because you will be the first golf club I am aware of to undertake such an exercise. However, I do see it as a potentially productive way forward and I would urge the Club to consider purchasing powered groomer units either for the existing greens triples or for a separate set of pedestrian units purchased for different reasons (see below).

- The other option and one that could be used in combination with surface refinement is using a desiccant such as sulphate of iron to scorch the leaf blade of the clover. Again there will be a rate of iron application and a frequency of treatment that will hurt the clover before it hurts the fescue. The challenge is finding this. The starting point is the standard 40kg/hectare rate and my hunch is that better results will be achieved by using low rates on a regular basis and integrating these with gentle but frequent grooming operations. Begin the process of experimentation in good growing conditions this season.

- I strongly advocate that the Club aspire to mow these greens by hand as often as possible. Currently the Club is neither equipped nor resourced to carry out this recommendation, but it should look to be so in the next five years. Firstly the Club will need to purchase at least four high quality pedestrian units and have these fitted with powered groomer units. Secondly the Club will need to acquire at least one and perhaps two additional members of staff in order to carry out pedestrian mowing passes four or five times per week.

- The benefits of pedestrian mowing include better presentation, stronger green margins, less wear and tear on green surrounds (from the turning of triple units). The main benefit is that the greens are rolled as well as mown in one single pass. This is not achieved with triple units where the weight of the man is transferred through the wheels of the machine to the turf.

- I do not at this stage envisage changing anything else in the programme. The basic feeding, aeration, seaweed and wetting agent programmes should remain unchanged.

- Overseeding should continue at least twice a year and perhaps more regularly on the 18th green where annual meadow-grass is more prevalent. Continue to use DLF's J Fescue and Barenbrug's Bar Fescue mixes which are the best on the market.

- With these greens being slow growing and organic matter numbers well under control I do not see the need for overly aggressive topdressing. The deposition of circa 100 tonnes of the Solum compost sand mix to the greens per annum should be sufficient although the slight increase in OM levels this time should be noted. As discussed there may be merit in focussing this work through the spring and autumn as regular light dustings to allow for turf refinement work to take place in the June to September period when fescues are growing more actively.

Green Surrounds

- There would be merit in disguising the negative visual impact of clover on green surrounds and approaches. With this in mind it was suggested that the Club consider purchasing a fleet of walk over sprayers with a built in mini boom to allow applications of seaweed (algae green) and iron sulphate to these areas on a regular basis.

- Pressure should be placed on clover on green surrounds in the same way as specified above for greens.
- Sand topdressing of approaches should be intensified to ensure that they retain their firmness particularly during the wetter months of the year. If sand applications can be integrated using a combination of solid tining and or hollow coring then so much the better. Every hollow core treatment should be accompanied by further overseeding with fescue.
- Ryegrass contamination for example at the 1st, 10th etc. needs to be tackled by re-turfing. It was agreed that the best approach would be to cultivate some good quality indigenous turf at the top end of the practice ground through mowing, verticutting, topdressing and light feeding so that in two or three years' time and indigenous turf of sufficient quality and robustness could be used to replace the ryegrass contaminated sward which is removed. This type of material should be resistant to ryegrass contamination in the future and should wear better than fescue dominated commercial turf.

Tees

- Intensify sand topdressing inputs to tees as specified for green approaches.
- Look to scarify/verticut tees more regularly both to improve the texture of the turf and to discourage broad leaved weeds.
- Sand integration will be accelerated by coring it in, but once again any coring should be supported with additional fescue overseeding.
- Use sulphate of iron applications as well to apply desiccant stress to contaminant weeds.

Fairways

- Continue to brush the fairways at every opportunity with the SISIS brush.
- Augment this with scarification programmes particularly to coarse fairways such as the 15th etc.
- Look to dramatically intensify sand topdressing applications to fairways. I do appreciate that permissions have to be granted for this, but within five years the aim should be to apply circa 500 tonnes of an approved medium grade lime free sand to fairways in two 250 tonne applications, one in the spring and one in the autumn.
- In order to deliver the above recommendation the Club will need to improve topdressing storage facilities and think about an application procedure. Do the maths to work out whether hiring or purchasing a big sand spreader is the most appropriate course of action. Work on the basis that sand applications, once they have started will never stop. The benefits will be numerous including better surface drainage, reduced weed activity, reduced worm activity, better turf texture etc.
- The fairways are currently being mown with eleven bladed cylinders. I do feel that better results may be achieved with seven bladed cylinders. Try this recommendation at an appropriate time.

Bunkers

- Given the problems with deer and surface sand drying out and becoming powdery it is suggested that the Club experiment with mixing a small amount of indigenous sandy loam topsoil with the sand on a trial basis to try and create a surface and profile that can be compacted, made more stable, more water retentive and more resistant to deer. In essence I am asking to you to cheat the natural weathering process which will take place over time. Begin the process in a practice bunker and see if it makes any difference.

Conclusions

- Copenhagen is a great golf course and worthy of being in the top ten clubs in Denmark. It blends very naturally into its surroundings and they give the course a wonderful open feel – so rare in the modern game. It is worthy of comparison with Myopia Hunt Club in the United States – one of the North America's great golfing clubs.

- In order to deliver the highest surface performance ratings it is essential the club solves the clover conundrum. We know the weed impacts ball roll less than players think but its visual impact is significant and is a real problem. We must pioneer an environmentally acceptable solution to this problem.

Signed

Alistair J Beggs, BSc (Hons), MBPR RIPTA
Head of Agronomy & Ecology
Agronomist to The R&A Championship Committee

E-mail: alistair.beggs@stri.co.uk
Mobile: 07977 051372