



Sustainable Golf Renovations

Guidelines

RESHAPING THE GAME



Photo Credit: Clyde Johnson, Seacroft Golf Club



Contents

Foreword	4
The Opportunity	5
Getting Going	7
Step by Step	9
Focus Areas	11
Conclusion	25
Expert Advice	28
About GEO Foundation	31
Acknowledgements	33

Foreword

What is a renovation? It can be difficult to define. Renovations can involve both large and small changes, encompassing projects with substantial budgets as well as those driven solely by in-house staffs' time and effort. What these projects often share is the intention to improve and generate greater value and productivity from the land – making it work harder.

Any facility considering a 'renovation' project is setting out to address a problem or improve upon a situation. Going all the way back to 1764, when The Old Course transitioned from 22 to 18-holes, golf courses have been undergoing incremental improvements. These course adaptations have been carried out to keep pace with the evolving nature of the sport - adjusting to increasing swing speeds or changes to the ball's performance and its ability to cover ever greater distances.

Today, alongside the rapidly changing sport, other external forces are exerting influence on

golf facilities worldwide. Escalating time constraints on individuals, rising costs, pressures on natural resources, and an increasingly competitive market collectively are driving a fresh surge of investments and innovations in golf course changes.

These factors have led to more facilities investing in advancements, technologies and upgrades, while also diversifying their golf offerings. As part of the strategic planning for these investments, there is an acknowledgement of the need to bolster the facility's resilience against these external pressures.

Incorporating resilience against elements beyond the facility's control must now be at the core of all future investments. Global pandemics, escalating extreme weather events, and the strain of living costs are beyond individual

control, but their impacts can be mitigated by diversifying businesses, securing control over water and energy supplies, minimizing reliance on external supply chains where feasible, and enriching the local environments.

We've collaborated with the golf industry to produce this publication, with the aim of compiling examples of these improvements and fostering a stronger drive towards incorporating a resilient and innovative approach into future course enhancements.

GEO Foundation 2023



Photo Credit: Tim Lobb EIGCA Aloha GC

The Opportunity

The focus of this publication is not solely on making changes, but rather on considering the broader scope of opportunities available to us. When we propose a change, we need to ensure we are carefully contemplating the whole range of possible multiplier benefits and the intended and unintended consequences of the investment and proposed change.

This means, not only improving the golf course, but also maximising its operational efficiency, reducing overall resource consumption long term, and amplifying the positive impacts we generate on the course, the environment, and the community who experience our course daily. Course improvement entails more than just altering physical features or infrastructure; it necessitates a shift in organizational mindset to be successful. It also means evolving our perspectives on the course - how we perceive it and how we manage and maintain it.

The expectations of the golfer also play a vital role in assessing the value of a proposed change – sometimes opportunities can be unveiled through conversation and collaboration. What we must start with though is the core objective of solving what we need to solve, before we skip too far on with ideas of what is possible or what we can do.

Every golf course possesses some room for improvement, even if it's just by a small percentage. When the moment in a course's history arises that the supporting voices are loud enough to take the important step to propose change, then that is the moment to take a step back and carefully evaluate all the options to ensure that the opportunity is properly realised and crucially no opportunities are missed.

“ We searched for small improvements everywhere and found countless opportunities. Taken together, we felt they gave us a competitive advantage... Perhaps the most powerful benefit is that it creates a contagious enthusiasm. Everyone starts looking for ways to improve

Sir David Brailsford

**\$360
million
spent in 2022,
in the US,
on course
improvements**



Established to engage credibly and visibly in the modern sustainability movement. Fostering nature; doing more to conserve resources; taking climate action and creating more value for communities – strengthening golf's image and long-term vitality.



Photo Credit: J_Sjoman, Stokholm Golfklubb - (re)GOLF



Getting Going

When embarking on a course improvement project of any kind, the viability and economic sensibility of the project must be carefully tested to ensure what is done is what is needed and will importantly have a demonstrable positive impact on the course itself in both the short- and long-term.

The early project discussions about the size and scope of the work are so vitally important in helping avoid overspend, redundant work and unforeseen negative impacts on the golf course in the future.

There are many aspects that an existing course needs to consider before undertaking this work:

- Good oversight and governance of the overall project decisions and direction.
- Consensus among the membership (if applicable) on the problems that need to be solved.
- A sound group of independently minded advisors and experts to guide the project.

These three steps can be summarised as ensuring you have in place good management, a well-defined design brief and trusted advice. These are the basic building blocks needed before a project can move into defining the specific solutions – which are entirely dependent on the kinds of course improvements being sought after.

Unfortunately, countless examples can be found of improvement projects getting underway without this proper early planning and due diligence, which can in the worst-case lead to long-term damage to the course and financial standing of the facility.

A project timeline or phasing is the other key factor that it helps to consider. Not everything needs to be achieved in one go and patience is needed by all if there is to be long term success. An overarching long-term masterplan of the planned changes, perhaps over 10 - 15 years, providing clear reasoning and projected budget costing for each change is a powerful tool for gaining decision maker's consensus and sensibly panning changes within the means of the business.

It may seem slightly strange to publish something that seems so removed from the golf course land as this, but the fact is that before we can get excited about new bunker styles, or smoother bigger putting surfaces or an old aerial photo that we found in the clubhouse archive – organizing ourselves is critical – the club; the management; the members – all must be ready to embark on the project and fully ensure it is a positive change for the course that places it on new more resilient foundations capable of delivering even greater things.



Boards and decision-makers should lead, not follow. It takes a certain confidence to do this job properly. Along the way, the superintendent is an indispensable resource. They don't need to lead the process, but they can certainly provide their own informed professional insights and connect the facility with outside consultants who are experts in golf architecture, course construction, irrigation, engineering and local marketing. That process starts by shifting the terms of course renovation from wants to needs.

Bradley Klein
Golf Writer
USGA Green Section Record, October 07, 2022. Volume 60, Issue 18

**The great
triumvirate**
**Club + Course
Management;
The Membership;
The Professionals.**



Photo Credit: William Watt (Countours) - The Gunnamatta Course

Step by Step

The process of getting from beginning to end in a course improvement project can be a daunting one. Below is a high-level step by step guide to getting the project off on the right foot.

Step One

Before embarking on the process aim to define a very clear brief for what the facility requires out of the project.

That should involve:

- Identifying the need for the improvement.
- Being specific about the issues to be addressed and prioritise them.
- Agreeing target timescales for the project.

This brief can prove invaluable to help gain membership agreement, and to guide the overall project management, keeping it in line with the stated need and avoid mission creep or overspend on the way.

Step Two

Put in place a steering group or similar collective of committed course representatives (more than two) with the remit to be able to make an agreed level of decisions, without the need for membership-wide consultation.

Consider also having focus groups within the membership to provide feedback on decisions

that may affect certain player groups such as for low handicap golfers or senior players.¹

The role of the steering group is to liaise with the project team, help gather information and make decisions to maintain momentum. Importantly, they also need to have very clear decision-making processes in place and know clearly when wider membership or board-level approval is needed, where relevant.

The steering group will become crucial to the project and must have a suitable term that covers the project's projected timeline to provide continuity. This should help ensure the project maintains pace and help to avoid delays in critical project pathways.

Step three

Take stock of any other opportunities or benefits available to the facility at this time. The proposed changes should not only address the fundamental issues identified in the brief, but it can also offer a way of delivering:

- Greater operational efficiencies,
- Reduced overall resource use and annual costs,
- Improved playability for all golfers.
- A more resilient facility long-term.

Matters of Time

There are some elements of a course improvement that have a direct bearing on a projects timings. These sensitive items need careful consideration when creating your brief and projected timelines:



- Will parts of the course need to be closed off?
- Will we require planning permission?
- When can we plant/seed the new grass?
- Do we need a bank loan to finance the project?
- Are the materials/equipment needed readily available?
- When are the professionals we'll need available to work?
- Can I carry out the work at this time of year?

It is important to create spaces that embrace diversity and challenge traditional notions of golf. By being open to new ideas and avoiding preconceptions, you can revolutionize golf and make it more accessible and enjoyable for all ages and abilities. As architects, we are in a good position to use our craft to break down barriers and redefine the future the game by creating spaces that are fun, inclusive, and sustainable.

*Christine Fraser
Golf Course Architect*

1. <https://www.usga.org/content/usga/home-page/course-care/green-section-record/60/18/wants-vs--needs-in-golf-course-renovation.html>

Golf It!, Glasgow, Scotland

Architect: Scott Macpherson Golf Design | Full Course & Facility Re-design

Owner: The R&A

55°52'40.86"N 4°10'39.75"W

The team have transformed the original 18-hole public golf course into a space focused on community, introducing people to the sport of golf. The main focus of this renovation was to create an accessible golfing site that allows players of all ability to learn and master the game. The change from 18 to 9 holes has allowed for a more practical routing and for the entire site to be used to its full potential. The renovation works here also created wildflower meadows, a wetland area, woodland trails and protected areas for water voles.



Photo Credit: Scott Macpherson



Part of the process you go through is, what are the goals?"

"What are you trying to obtain if you're working at one of those great old courses? Is it purely trying to recapture the character and the aesthetics? Is it trying to recapture the playing characteristics? Is it trying to address issues pertaining to more modern golf? Is it all of the above?"

*Bill Coore ASGCA
Golf Course Architect,
Coore & Crenshaw*



Photo Credit: Dave Sansom

Focus Areas

A course improvement can focus on many areas of a property. This section showcases some of the leading renovations that have taken place in recent times and provides guidance on building in sustainably-led thinking into your next project.

Early identification of what areas of the course to focus on can help to define the need for the project. Gathering feedback from members and guests by establishing open and confidential communication channels can help to gauge the player's experiences. This feedback is valuable to help prioritise need and spotlight issues previously unknown.

Depending on your final goal your focus areas will change. Ask the questions:

- Are we trying to climb the rankings charts?
- Are we trying to improve course conditions in all or some specific areas?
- Do we need to decrease overall operating costs?
- Are there upcoming land leases or easements that are pending renewal soon?
- Is pace of play or safety concerns a big problem?
- Are we trying to change the number of rounds we have a year?

These types of questions can help to focus attentions on the priority areas of the course for change. The following pages go into more detail of some of these typical areas.

Golf Course Items: Expected Life Cycle

A publication by The American Society of Golf Course Architects (ASGCA) highlights the importance of assessing the conditions of your key course infrastructure.

No two golf courses are alike except for one thing: deferring replacement of key items can lead to greater expense in the future, as well as a drop in conditioning and player enjoyment. The following information represents a realistic timeline for each item's longevity.

Component life spans can vary depending upon location of the golf course, quality of materials, original installation and past maintenance practices.

Visit: [asgca.org/resources/publications](https://www.asgca.org/resources/publications)

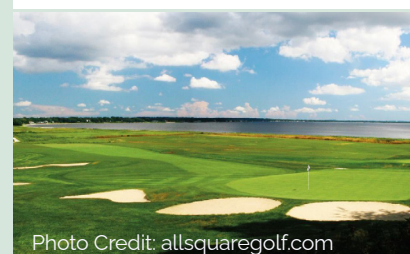


Photo Credit: allsquaregolf.com



Photo Credit: NGF.org

ITEM	YEARS
Greens (1)	15 – 30 years
Bunker Sand	5 – 7 years
Irrigation System	10 – 30 years
Irrigation Control System	10 – 15 years
Pump Station	15 – 20 years
Cart Paths – asphalt (2)	5 – 10 years (or longer)
Cart Paths – concrete	15 – 30 years (or longer)
Practice Range Tees	5 – 10 years
Tees	15 – 20 years
Corrugated Metal Pipes	15 – 30 years
Bunker Drainage Pipes (3)	5 – 10 years
Mulch	1 – 3 years
Grass (4)	Varies

NOTES: (1) Several factors can weigh into the decision to replace greens: accumulation of layers on the surface of the original construction, the desire to convert to new grasses and response to changes in the game from an architectural standpoint (like the interaction between green speed and hole locations). (2) Assumes on-going maintenance beginning 1 - 2 years after installation. (3) Typically replaced because the sand is being changed – while the machinery is there to change sand, it's often a good time to replace the drainage pipes as well. (4) As new grasses enter the marketplace – for example, those that are more drought and disease tolerant — replanting may be appropriate, depending upon the site.



Focus Areas

There are some commonalities to draw out from the following focus areas (detailed throughout the guidelines) in relation to sustainability-related matters. These are common issues that should be considered for all types of course improvement:

- Use local materials where possible and suitable.
- Comparable data and real-world insight into issues is very helpful.
- Improve staff time efficiency.
- External advice and expertise are often needed.
- Golfer expectations must be pro-actively addressed.
- Ensure the correct identification of the root of the problem trying to be solved.

- Ease of access for golfers and maintenance staff.
- Correct turfgrass selection.
- Appropriate green speeds.
- Growing conditions i.e. shade, air circulation, drainage.
- Ongoing maintenance requirements.
- Sourcing of suitable rootzone materials..



Bunker Edges - a myriad of options.

Bunker Modifications

Bunkers are one of the most expensive items to maintain on your course. Staff time being the primary contributor to that fact. They are also an intrinsically linked hazard of the sport and rightly or wrongly an expectation of the golfer to see them.

When undertaking a bunker renovation there will be factors of strategic play, style, positioning, historic reference, degrees of difficulty, drainage and effectiveness of placement that will be carefully considered.

Greens Renovations

The green complexes of a course are one of its defining features. They are the most intensely managed part of a course and require the greatest attention to detail to get right.

Problems arising can range from poor turfgrass, to a lack of pin positions to shrinking surfaces or playing too difficult/easy. When going into a greens change, consider the wider picture beyond the putting surfaces. Look at the whole green complex, the strategy of the hole and persistent problem areas.

Key sustainability considerations should include:

Bunker Sand

Bunker liners and associated technologies can provide a long-term, cost-effective solution to bunker construction in the right circumstances. Local experts should be consulted on the cost-benefit case for these. Contributing factors in favour will be: areas with intense rainfall, high wind velocities, steep sand-faced bunker styles.

We know the pressures on sand are rising fast and reducing bunker sand loss will continue to be a key consideration for facilities. Dr Louise Gallagher, lead author of the 2021 UN Environment Programme report on sand and sustainability states:

'Sand is the second most consumed resource in the world, after only water. Fifty billion tonnes of sand and gravel are consumed on an annual basis. We have no idea of where that comes from, or where it is produced. Knowing where sand is, is one thing, but knowing what sort of sand and for what it is used is much harder, as is knowing how much we can take and use safely.'

Quote courtesy of Golf Course Architecture, Issue 66, October 2021. Tudor Rose.



Photo Credit: GolfDren



Photo Credit: Andy Hiseman



Photo Credit: Jason Deegan

New courses should additionally have a graduated tee, designed to play between 5,500 and 5,700 yards so that golfers can experience a surmountable distance challenge. Finally, existing courses should carryout renovations or implement scorecard combo-tee (combining play from different tees on the scorecard) changes to bring existing course lengths within this range.

*Kari Haug EIGCA
Haug Sustainable Golf Course Design*

Key sustainability considerations should include:

- How many bunkers do we need?
- How much sand do we import a year and where is it from?
- How many hours a month do we spend maintaining bunkers?

Tee Changes

An increasingly important component to get correct when trying to diversify the golfing challenge and golfers that play the course. Well-positioned tees can have a significantly positive impact on the experience of all golfers, in particular female, junior and senior golfers.

Having a good selection of tee positions allows for better play distribution especially on par 3s, but that does not always mean building new tee complexes - seek out flatter fairway spots to place forward tees, also. Always consider visibility and safety issues when creating new tees.

Key sustainability considerations include around tee changes:

- Are you using all your tees or are some overused?
- How much are you spending on maintaining the surfaces?
- Are there environmental factors around a tee - overshading, lack of air movement?
- Do the slopes around the tee 'fit' their surrounds and how much additional maintenance do they need?
- Are the shapes, arrangements, access well suited for efficient maintenance and to spread wear?

Bunker Maintenance Considerations

A renovation may consist of simply replacing drainage and sand. When more significant changes to bunkers are desired, these should also be done at this time, as it is most cost-effective to consolidate projects. Courses should also consider cleaning and reusing sand when at all possible.

1. Drainage, drainage, drainage - when it comes to bunkers, nothing is more important than drainage.
2. Sand selection - all sands are nowhere close to being equal. Choose a sand based on accredited lab tests.
3. Shapes, sizes, location and depth - get a golf course architect involved and evaluate decisions on these key factors.
4. Edges - the objective should always be to simplify edge maintenance by eliminating any potential sand contamination.
5. Liners and technologies - it's helpful to review how recent technology improvements have impacted bunker construction.
6. Design for maintenance and longer bunker life - courses spend more resources on bunkers than on any other part of their course.
7. Maintain them - after all the work is done, golfer expectations are going to be high.



The official monthly publication of the Golf Course Superintendents Association of America (GCSAA).

For the full article by Jerry Lemons, ASGCA, see: <https://gcmonline.com/course/environment/news/renovating-bunkers>

Innovation in Action

Belleair Country Club, Florida, USA

27°56'32.68"N 82°48'30.50"W

Architects: Dana Fry (ASGCA) and Jason Straka (ASGCA), Fry/Straka Global Golf Course Design, LLC | Complete Restoration of 1924 Donald Ross Course

Belleair CC is the oldest existing golf course in Florida. Having gone through numerous changes over the last 125 years the course was fully restored to the 1924 Donald Ross version. The work saw the greens lowered and contoured to their original form and all bunkers recreated. Luckily, Ross' very detailed drawings from 1914 and his later 1924 remodel, along with many old photographs, were found which helped ensure the renovation work was as close to the original designs as could be. New varieties of turf were planted with the intention of requiring fewer maintenance inputs, and over a dozen more acres were converted to no-maintenance centipedegrass.



Photo Credit: V. Halyard

"We were trying to mimic, or recreate, every bunker edge, every green shape, every green contour as much as we could uncover and find, and then bring that back to life – including all the strategy that goes with it,"

Jason Straka ASGCA, Fry/Straka Global Golf Design

Hyderabad Golf Club, Hyderabad, India

Architect: Forrest Richardson (ASGCA), Forrest Richardson Golf Course Architects | Complete Re-routing 17°23'37.12"N 78°24'15.58"E

Most of the historic Hyderabad Golf club sits within a 600-year-old Fort, nominated as a World Heritage Site. The re-routing of the course takes its inspiration from the historic Fort weaving its way the course through the walls and passageways. This creates a strong connection to the unique history and cultural present. Additional tees were created with the course now playing 4,281m from the front and 7,068m from the back. A new location for the driving range was found to open up views from the clubhouse and the 1st and 18th holes.



Photo Credit: Hyderabad Golf Association

The Classic Golf Club, Fukuoka, Japan

Architect: Benjamin Warren, Artisan Golf Design | Re-routing and Redesign

33°46'13.37"N 130°38'41.63"E

The course is routed with three 9-hole loops. As is common in Japan, each hole has two side-by-side greens. This convention started as a way to offer play on a bentgrass green in the winter months, and on a zoysia green in the hot summer months. However, like many courses built in 1990s Japan thanks to the availability of heat-tolerant bentgrass cultivars, The Classic has been maintaining side-by-side bentgrass greens since its opening day. Including practice putting greens, a total of 56 greens are being maintained daily. The renovation will see the number of greens reduced to a more typical one per hole. The savings in manpower, resource use, and maintenance costs will be significant. The renovation will also add a new strategic aspect to the course. The design and placement of the new greens will create more engaging angles of play for the golfer. A full bunker renovation will complement the new greens.



Photo Credit: Benjamin Warren

'Reducing the maintained area of the greens will be a sustainability win. But it is the opportunity to transform the playing experience which is most exciting. The redesign to one green architecture will enable us to re-route golf holes and create new angles of play.'

Benjamin Warren, Artisan Golf Design

Resource Pressure - GC2030

The R&A | Industry Research

As part of the Golf Course 2030 initiative, The R&A has looked at the supply and future of sand and aggregates, the cornerstone of golf courses. The report, *Golf Course Aggregates: An Overview for a Sustainable Future*, has highlighted the importance of finding alternatives to sand and aggregates and looking at new constructions and techniques to reduce the finite and expensive resources.

The R&A state, 'The status quo is not a sustainable option. We need to build resilience into golf courses'. Changing the source and type of sand and aggregates used will have knock-on impacts further than just cost and presentation, and all of these must be considered when looking at new renovations.



Photo Credit: The R&A

Focus Areas

Drainage Changes

Drainage is perhaps the most important of considerations for a golf course seeking improvements. Even on the most sandy linksland site, excessive moisture build up creates problems.

A drainage problem can also be a great opportunity to create new course features, open up old drain runs to create open swales, grass hollows/soakaways and regrade surfaces to not only improve playing strategy, but also surface water movement and introduce new habitat types to the property.

'I think a sustainable approach will likely be mandatory in the years to come, addressing climate change, extreme weather events, or limitations on water usage and resources. Architects will be required not just to create high-quality playing surfaces, but also courses requiring less input, and improve the ecology of the site with minimal impacts. The real challenge is going to be not only addressing existing problems, but creating courses that adapt quickly to new future conditions. We need to shift the mindset from addressing the existing issues to one where we are ready to evolve to new scenarios. Flexible, cost-effective, and inclusive solutions would be preferred in this sense and will ensure the success of your course.'

Giulia Ferroni EIGCA,
LGD - Leeds golf Design

Saadiyat Beach Golf Club, Abu Dhabi

Supplier: Atlas Turf | Turfgrass Change

24°32'33.83"N 54°26'20.85"W

A change in irrigation water from potable to more sustainable treated sewage effluent (TSE) in 2020 created the need for a change of turf species at Saadiyat Beach Golf Club. Working with Atlas Turf International, the club found the best species and variant available to suit their soils and climate. The club transitioned from Bermuda grass to Pure Dynasty Pasbalum. This species of turf is better suited to the TSE and the change has resulted in a reduction of chemical application and cost savings without impacting the quality and playability of the course. An interseeding technique was used here to minimise the course closure time and cause minimal disruption to normal operations. Within two months the Pure Dynasty had reached full coverage and operations were back to normal.



Photo Credit: Troon International

'[It is] a more sustainable turf species year-round. Being able to reduce our chemical applications through this period has been a huge advantage to the property. We have also been able to give the Saadiyat Beach Golf Club members and guests a better golfing experience by providing a better playing surface.'

Bryan Cox, Saadiyat's Senior Assistant Superintendent.

Castiglion del Bosco, Italy

Architect: Paul Smith Design | Bunker & Drainage Restoration, & Turf Change

43°04'58.87"N 11°25'14.42"E

A significant amount of work was carried out including the improved strategy of the golf holes, lengthening of the course, restoration of all bunkers and the introduction of new drainage all led by Paul Smith. Turfgrass® were also brought on board to provide agronomic advice which resulted in the turf species in being changed to a more drought-tolerant species. This change, coupled with the targeted irrigation system, and renewed drainage system throughout has enhanced the courses efficiency dramatically by reducing the overall water demand and improving playing surfaces.



Photo Credit: Steve Carr

'As with all great courses, it is important to continue to invest and evolve and that is what we are doing... ensuring world-class playing conditions all year round, and resilience in a changing climate.'

Phil Smith, Phil Smith Golf Design

Key sustainability considerations include:

- Do we need to install plastic pipe to fix the problem?
- Can we re-grade an area and shift surface water in other ways?
- Are there waterways or lakes near by to consider?
- Is this a easy to maintain solution considering access, water table fluctuations and potentially more frequent storm events?

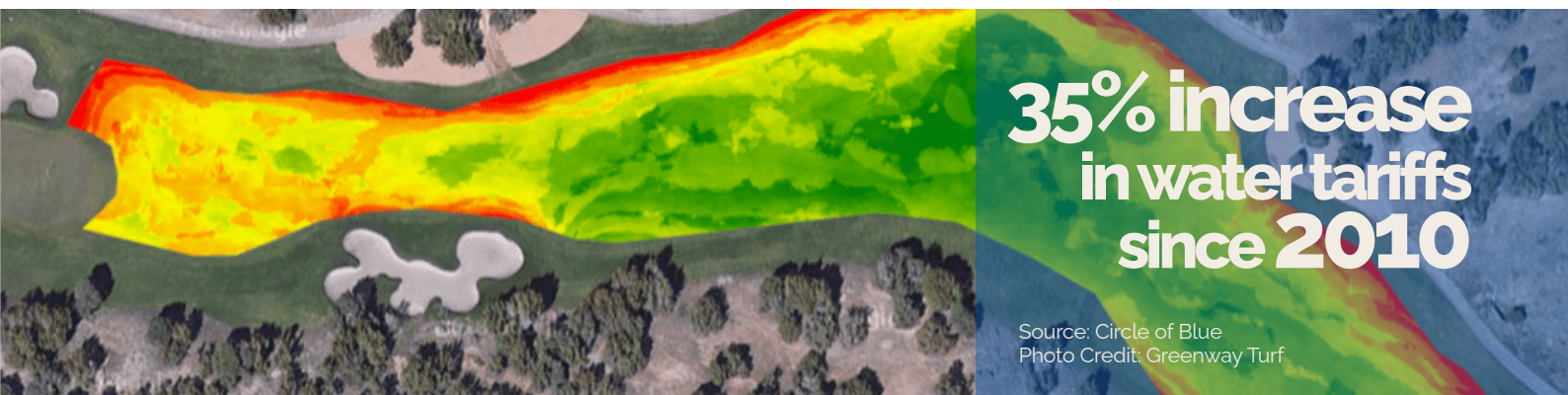
Turf Change

There can be a number of reasons why a change of turf is needed: a change in the climate, new better-suited variants available or a change in the water source, for example, moving to a recycled water source.

In particular, those courses in warm season or transition zones have the greatest potential to see benefits from changing turf types or just being certain they have the best-suited grass type for their climatic conditions.

Changing your turf type is a significant decision to take when undergoing renovation. Expert opinion should always be sought when a change to a turfgrass type is being proposed.

Sometimes it can also be a process of introducing a new species into the existing grass sward to help combat a problem of an aggressive grass taking over the putting surfaces.



Focus Areas

Key sustainability considerations include:

- Is the change in turf type going to solve the issue?
- What types are available in your region and are they readily available?
- Can a local or on-site nursery be used for the project?
- Are there other environmental factors that maybe causing the problems that you are aiming to fix? One part of the golf course may have a very different micro climate to another.¹

Irrigation Update

Irrigation updates range from new nozzles to a whole new pump and mainline system. The exact level of change required should be advised on by an expert. A well-calibrated irrigation system can have very significant improvements in playing surface quality.

Early consideration should be given to an audit of the distribution uniformity of the sprinklers before you undertake any project, giving you a baseline of system's performance and help identify potential problem areas on the golf course.

'A well maintained and monitored irrigation system can be one of the most powerful tools for the superintendent in their aim to reduce water usage and improve their turfgrass quality. When planning an upgrade be sure to understand where your problems are and use expert independent advice to help you understand what the most cost effective solution is.'

Paul Granger
President of AASI Golf

Once the performance level of the system is established, then upgrades to fixtures and fittings can be considered - along with any sprinklers that need to be added/removed or repositioned. This is an opportunity to consider design changes as part of the project such as mowing lines, bunker placement, green sizes.

1. <https://www.gcmonline.com/course/environment/news/managing-microclimates-on-golf-courses>

Headingley Golf Club, England

353°51'29.62"N 1°34'54.95"W

Booth Golf & Leisure & Ken Moodie (EIGCA), Creative Golf Design | Practice Area Renovation

Ken Moodie and Booth Golf and Leisure teamed up to transform the club's small chipping area into a modern practice facility. The team created an area where longer shots could be taken and utilised artificial turf teeing areas to protect the integrity of the turf (particularly in winter) and minimise maintenance requirements. The inclusion of two bunkers all practice of the full short game. Booth sourced all soils and fill material from local projects. By taking this inert fill, Booth was able to fund the construction. This kind of clever sourcing reduces costs for the club and ensures the use of recycled materials.



"The whole team working collaboratively on this project, has been crucial in delivering this outcome, and we offer our thanks to everyone involved."

Rob Bristow, Booth Golf and Leisure

Key sustainability considerations include:

- Can you reduce overall water demand?
- Are you applying the correct amount of water?
- Are there cost savings to be made with greater investment in the system now?
- Where does the water come from and is that reliable both in terms of quality, quantity and unit cost?

Vegetation Clearing

The environment around the golf course sets the stage for the main act - the golf holes.

This 'stage set' is a vitally important

part of golfer's experience and how memorable a course is to them.

Consideration of the health of the surrounding environment should be as much a part of the course management remit as the turfgrass surfaces.

Without a proper plan for managing these, sometimes large areas of the property can become overwhelming, and if left, can begin to encroach on the golf holes themselves.

Crowding of golf holes with excessive vegetation can cause a m  le of problems related to course maintenance as well as playing strategy.

Vegetation such as tree plantings, large shrubs or rough grasslands can begin to negatively impact the golf holes, and without timely and careful management, the health and quality of these habitats can be impacted too. As living ecosystems, golf courses require to be allowed to evolve and mature - a environmental vision and plan is needed to ensure the natural environment compliments the golf holes as well and maximises the positive benefits for nature.

Key sustainability considerations include:

- What is the goal for the management of the out-of-play areas?



North Berwick Golf Club, Scotland

Contractors: Greentech Sports Turf, Applied Irrigation & Dunbar Plant | Turf Nursery

56°03'28"N 2°45'29"W

An area previously used as a turf nursery, but left to go fallow for several years, was identified for restoration. The primary objective was to secure a long-term sustainable and locally well-adapted turf that could be used by us for course repairs. The soils beneath the top 30 40 cm (12"-16") was good sandy loam material, which when mixed with the more organic top layer, was thought a suitable growing medium for the new turf. Additional suitable material was brought in from local house constructions meaning 100% of the rootzone was generated onsite or from the local neighbours. The old nursery's irrigation system was renewed and within eight weeks the 100% fescue seed was germinating.



Photo Credit: North Berwick GC

'This has been a great project to be a part of as we have worked with a host of contractors sharing their expertise, learning about a construction project and ultimately future-proofing this site as a resource for the West Links finished in six weeks.'

Kyle Cruickshank, Head Course Manager

Innovation in Action

Stockholm Golfklubb, Sweden

Architect: Christian Lundin (EIGCA), (re)GOLF | Full Course Redesign

56°38'58.33"N 12°44'16.95"E

After deciding to restore the course to the original design, Lundin was brought in to lead the project. Opting for a true restoration, Lundin ensured he combined modern technology with the historic designs. This has allowed for the playing experience to be the same as in 1932 without reverting back to the maintenance standards. All 92 of the course's bunkers were restored using photographs as reference. The project was undertaken in two phases with the course reopening for eight weeks after 45 bunkers were restored. It then closed again to allow the project to be finished.



Photo Credit: J_Sjoman

Woking Golf Club, England

Architect: Tim Lobb (EIGCA), Lobb + Partners | Vegetation Removal

51°18'27.33"N 0°35'33.42"W

As a natural heathland course that had recently become dominated by oak woodland, it was important to restore the heather around the course. By creating a tree management programme for the purpose of heathland restoration and reintroducing the heather through an onsite nursery, the club has been able to significantly improve the light and airflow as well as open up views across the course. As a result of the reintroduction of heather, the site has created a new set of forward tees to ensure that the heather hazard (which can be tough to escape from) is not too penal for players.



Photo Credit: Jason Livvy

'The heather restoration and tree management improvements have had a long-term benefit to the way the golf course plays now, strategically. This will benefit not only the golf course, but also improve the natural habitat of this land for generations to come.'

Tim Lobb EIGCA, Lobb + Partners

Stockton Golf & Country Club, California, USA

Architects: Pelz Player Greens | Greens and Driving Range Renovation

37°57'37.87"N 121°21'33.32"W

In an area where there are water restrictions and often droughts the use of synthetic surfaces becomes of particular interest. The team here carried out some traditional renovation work (extending grass greens to minimise wear and tear and provide more pinnable areas) as well as creating an artificial putting green and a large teeing ground for practice. This has proved valuable for training events as well as social non-golf events helping the club to host weddings without damaging playing surfaces that were previously routinely torn up following these non-golf activities.



Photo Credit: Stockton Golf & Country Club

Skamania Lodge, Washington, USA

Architect: Brian Costello (ASGCA), JMP Golf Design | Full Course Redesign

45°41'21.55"N 121°54'41.33"W

The original 18-hole course was set amongst heavily forested, hilly terrain, which would take an average of five hours to play. After assessing the options, the decision was made to create one 9-hole, par 3 course full of holes that require all-star approach shots, as well as an 18-hole putting course. The change in design and approach has allowed for faster, more enjoyable golf to be played while still leaving golfers with a memorable experience. Both courses have been built using synthetic turf, reducing the amount of maintenance required, allowing the maintenance teams to focus efforts elsewhere.

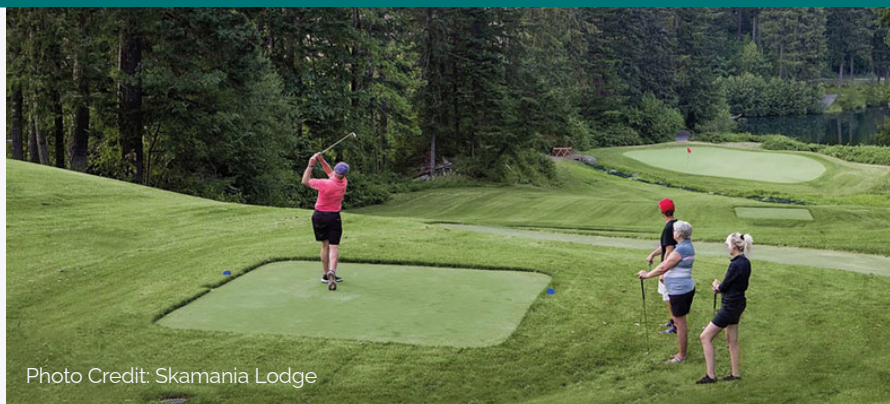


Photo Credit: Skamania Lodge

"We explored numerous routings to keep existing green sites, reverse holes and find new holes until we settled on one that kept six original green sites and created three new greens. The engineering beneath the synthetic turf and the topdressing within the surfaces replicates the characteristics of real grass when receiving tee and approach shots."

Brian Costello ASGCA, JMP Golf Design

Focus Areas

- What times of year can you carry out the work you want to do?
- Can this be carried out by current course staff?
- Are there legal requirements we need to be aware of?
- Will additional specialist advice or licences be required?

Practice Facilities

The practice ground is an integral part of the modern golf facility – attracting new golfers and improving the diversity of ways in which people can play the sport at your facility.

There is a responsibility to ensure we are getting the most value from the land asset that a facility has. If the productivity of the land

can increase to perform better, attract more revenue and improve the offering, then it should be carefully looked at.

It is perhaps not the cheapest option for a course renovation, in which case, it is important you have the correct facilities for your market, and properly consult members and golfers as well as a recognised design professional, to assist where redesign of areas is required.

Key sustainability considerations include:

- What kinds of practice options do we want to incorporate?
- Do we have the space and suitable access to create a new practice facility?

- Do we need to consult with specialist advisors?
- Do we have the funding available to complete the work?
- What time of year will we need to carry out the construction work to suit grassing windows'?

We work closely with facilities to gather best-in-class data to enable more informed decisions to be taken when conducting course improvement work of any kind. Our focus is on informing the prioritisation of work, and uncovering hidden opportunities that may otherwise have been missed. We believe going forward that the power of data like this will drive more effective improvement projects, control costs and drive more productivity from the lands golf stewards.

Harry Cloke. Shorehill Analytics

Foxhills 'Practice Den', England

Architect: James Edwards (EIGCA), EDI | New Academy

17°23'37.12"N 78°24'15.58"E

Identifying a space at Foxhills that was previously unremarkable and unused, James has created a stunning short game practice area that has spurred other clubs to follow suit. With substantial but well thought out earth movement and clearance, the team were able to create a large USGA spec green and surrounds as well as one teaching bunker on the way to the driving range, drawing the golfer in to practice their game. The use of synthetic turf hitting areas has reduced the amount of maintenance that might be required in a well-used practice ground, while the low level lighting allows for use beyond daylight.



Photo Credit: Foxhills Golf Club And Resort

'What is particularly gratifying for me is how we have engineered an outstanding practice solution into a space that might otherwise have been overlooked'

James Edwards EIGCA, Edwards Design International

Cherry Hills Golf Club, Colorado

Architects: Eric Iverson, Renaissance Golf Design | Ten Year Masterplan

39°38'34"N 104°57'52"W

A ten-year course improvement project for a William Flynn-designed course. The intent was to improve the playing strategy and try to add length with an eye on hosting future championships. The project reintroduced marque bunker features and greens that had been changed over the years features that defined the original design intent and character of the course. Green surfaces were expanded to recapture lost pins and shot options. Improved tree management and a restoration of a creek meant enhanced water management and flood risk reduction were important benefits to improved playing corridors and strategic interest on the golf holes.



Photo Credit: Cherry Hills/Brian Walters

'The course was covered with planted trees, bunkers had been moved or removed, mowing lines had shrunk dramatically, basically a textbook case of what happened to so many Golden Age courses...we were encouraged that the club wanted to restore Flynn's work and preserve their beautiful old greens.'

Eric Iverson, Renaissance Golf Design

Tiger Point Golf Club, Florida, USA

Architects: Nathan Crace (ASGCA), Watermark Golf | Long Term Masterplan

30°23'00.12"N 87°04'42.79"W

At Tiger Point they brought in Nathan Crace to create a long-term masterplan for the golf club to ensure that the club's future is central to forward planning. In year one of this plan, transforming over 30ac. of maintained turfgrass into naturalised areas and wildlife habitat. In year 2, a full bunker renovation was implemented to reduce total sq ft of bunkers from 120,000+ SF to less than 50,000 SF and used drought tolerant TifTuff sod for bunker faces to lower the input and maintenance requirements. These changes saved water while elevating the course's character. The course also uses non-potable water for irrigation in an effort to continually move towards a more sustainable future.



Photo Credit: Nathan Crace ASGCA

'We can increase the aesthetic of the course by creating naturalised areas throughout that not only bring back the coastal feel, but also enable the staff to re-focus those input savings in other high traffic areas of the course such as greens, tees, fairways and bunkers.'

Nathan Crace ASGCA, Watermark Golf

Focus Areas

Water systems

If your course has any kind of water system (stream, lake, pond) on or near the golf holes, you will understand the amount of time and management that these features require, and the importance of correct design and construction to ensure they stay healthy and functional.

Over time, these water systems will need to be repaired, vegetation cleared, inflows and outflows checked and unwanted sediment buildup dredged.

Any changes to these water systems should be done hand-in-hand with a specialist professional to ensure legal requirements are met, and that you are not unknowingly doing damage to your property and environment. Another factor to consider is their role in controlling water tables, floodwaters and stormwater movement. For this, you may need to look beyond your property boundaries on a watershed scale to understand the dynamics at play.

These features offer a significant opportunity for ecological benefits onsite, and review of their design and surrounding environment/vegetation can reveal many opportunities to improve biodiversity on your golf course.

Key sustainability considerations include:

- Are there any wider implications from making



Water bodies that require very different management strategy and equipment.

changes to a water feature i.e. flood risk, legal compliance?

- Is there a way to boost biodiversity opportunities as part of the project?
- Can a linked problem such as drainage be improved?
- Could any captured surface water feed the irrigation supply line?
- Are there recurring maintenance/repair practices that could be reduced as a result of a reconstruction of the water systems?

Construction Compounds

Most renovations will not require the creation of a new compound or set down area. If the project will be using external contractors, then talk to the course management team about where best to accommodate that team. Typically, around the maintenance area is a good location, but the grounds team will know the site best.

If there will be a need to have welfare facilities on site for the job, be sure to plan easy access for the deliveries and machinery needed as well as a suitable flat area as a base. Consider if this area will be useful in the future for another purpose or if the materials used can be reused elsewhere on the property. Consult with a recognised golf contractor to advise on the detailed arrangement and legal requirements for such a set up.

Key sustainability considerations include:

- Do I need legal permission for the creation of any temporary structures?
- Can I re-use any materials being purchased for the purpose?
- Will the location be visible to golfers and general public?
- Are we locating any structure or haul route close to a waterway or porous surface?

Conclusion

A course improvement project, big or small, can give a new lease of life to a course, help attract new golfers or events and gain greater recognition for the course, but equally important is that it can improve the long-term resilience and sustainability of the facility for future generations.

This document can act as a useful tool when starting out on your project planning, looking at the processes and priorities as you progress through to completing a successful project.

One of the themes that runs through the examples and guidance is striking a balance between investing in changes that have an immediate positive impact and ensuring that all changes improve the long terms efficiency and strength of the golf course.

Many of the examples included do just that – and have been included for their thought leadership and exemplar efforts to put the courses featured in a better position to prosper.

One of the fundamentals, that is repeated throughout this publication is collaboration and starting that process early, so we are not rushing to a end goal before we have properly defined what it is and how we are getting there.

What has that got to do with sustainability? The earlier conversations can happen about purpose, approach, timings, expectations and such like, the better chance there is of identifying meaningful sustainability gains, efficiencies in processes, cost certainty (as far as possible) and maximising every opportunity there is on a project to do better.

“Many club leaders are (rightfully) weary of renovations that spiral upward in cost. There may be one large capital expenditure needed, like an new irrigation system, but then beyond that, the approach should be to hire local, try to collaborate with in-house staff and avoid significant disruption to members. Small edits every year do result in positive change long term, without major cost and upheaval – it also means catching the major issues early before they get out of control.

Eric Iverson, Renaissance Golf Design

Innovation in Action

Mesa Country Club, Arizona, USA

33°26'19.30"N 111°50'42.96"W

Architect: Andy Staples (ASGCA), Staples Golf Design | Irrigation, Greens & Bunker renovation

Mesa CC looked to improve the playability of the course while also reducing its water usage. All of the greens on the property were rebuilt to USGA standards while reconstructing the greenside bunkers to make the course more playable for a wider range of golfer. With upcoming state calls on reducing water usage, the club installed new turf varieties to avoid overseeding and a new irrigation system as well as modifying their irrigation plan - in particular, aiming to reduce the water used in out-of-play rough areas. The irrigation storage reservoir was also reduced in size. These changes all helped the club align with the state's call to reduce water over the coming years.



Photo Credit: Mesa CC

"The big news item here is the water conservation work in relation to the irrigation system upgrade, the lake reduction plan and the low water use in out-of-play areas."

Andy Staples ASGCA, Staples Golf Design

The Preserve at Oak Meadows, Illinois, USA

Architect: Greg Martin (ASGCA), Martin Design Partnership Ltd | Flood Prevention

41°56'42.69"N 87°58'41.43"W

Given the waterway that runs through the golf course it was not unusual for the course to flood after rain, interrupting golf and damaging the property. Greg Martin was brought in to alleviate this issue.

Through clever design the team redesigned the land to absorb the flood water, taking it away from the golf course. Now 20 million additional gallons of water can be controlled and held on the land. As a result of this around 14 hectares of wetland has been created and another 16 hectares of prairie land also created. These areas are where the water is held.

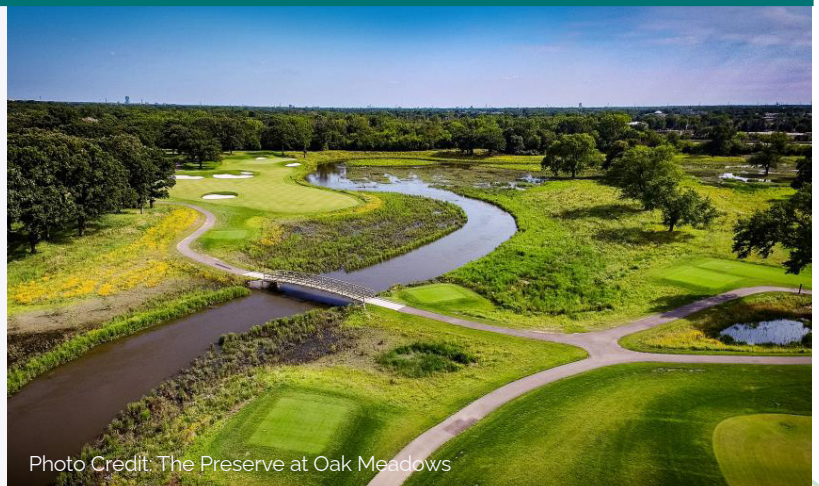


Photo Credit: The Preserve at Oak Meadows

"We wanted to build a landscape that would be in keeping with the Forest Preserve District goals - with better stormwater management, expanded wetlands, better water quality, expanded habitat and an improved Index for Biotic Integrity"

Greg Martin ASGCA , Martin Design Partnership Ltd

Union League National, New Jersey, USA

Architects: Fry/Straka Global Course Design LLC | Course re-design

39°08'13"N 74°46'54.50"W

After reshaping works finished there was a huge push around re-vegetating the golf course with a significant quantity of locally sourced native species. A variety of native grasses, shrubs and wetland species were used to recreate the rugged look of the natural local landscape and also use the vegetation to control soil erosion. Hundred of thousands of Oak, Cedar and Pine trees were planted, connecting to existing tree lines and the habitats out side the playing corridors. To ensure that the most appropriate planting mixes were used, local ecologists were brought in to advise the team. The result is a diverse golfing landscape with thriving ecosystems. Construction was carried out on 9 holes at a time, ensuring that 18 of the 27 holes were open and playable at all times.



Photo Credit: Evan Schiller

"We worked very hard and conducted all sorts of site walks with ecologists, across southern New Jersey, to get these plantings just right. We even took the construction team to Pine Valley to ensure we got the look and plant management ethos just right."

Jason Straka ASGCA, Fry/Straka

Greenway Turf

Industry Tools - Soil Moisture Monitoring

Greenway's soil moisture analysis can be used to measure soil moisture on a golf course over a large area several times a week using satellite technology, i.e. without hardware. The Karuna Technology focuses on roughs and fairways, where the largest amounts of water are consumed. The satellite system makes it possible to obtain an accurate readings on the volumetric soil moisture every three meters (ten feet) without having to take manual measurements. This typically means several measuring points per irrigation point. It is also possible to determine characteristically dry as well as wet spots over a longer period of time, for example over a season. In addition, historical measurements go back to 2018 and can be used, for example, to determine trends and to check investment measures. The system was developed by Greenway in collaboration with several leading universities (New Mexico State University, Hohenheim, Texas A&M) and companies (Compo Expert and Toro) with the aim of saving water, removing the need for staff from measurements and increasing the quality of play. It is already in use at several golf courses such as GC St. Leon-Rot, Las Campanas (USA) or Maroon Creek (USA).

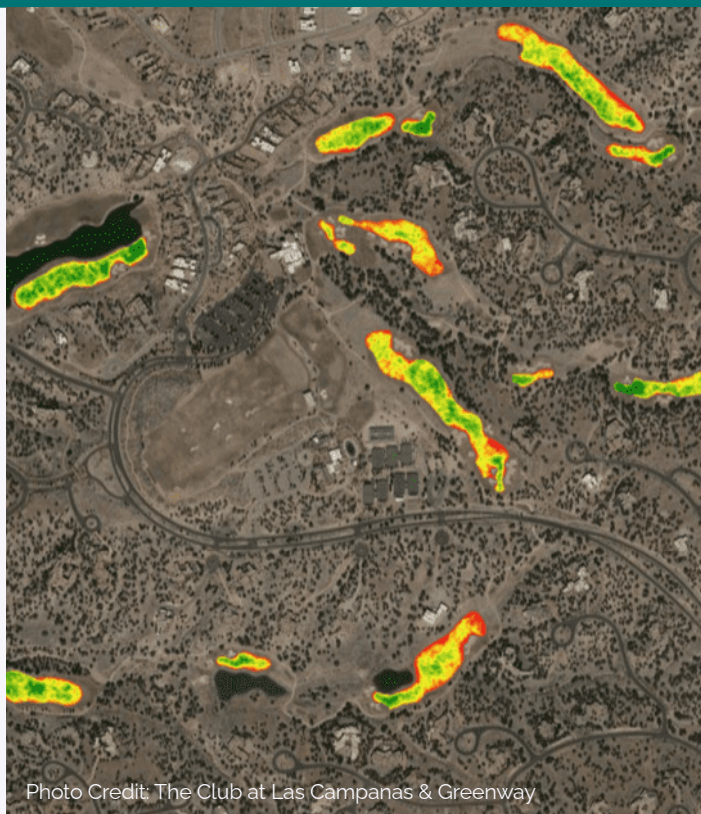


Photo Credit: The Club at Las Campanas & Greenway

Expert Advice

The importance of hiring the right experts cannot be overstated, although it can often be one of the more difficult decisions to get passed. Knowing when to bring in specialised experts can be one of the most cost-effective decisions that a facility can make. Important expertise often starts with a golf designer. They are the best-connected professionals in the industry, and not only will they provide sound design guidance, they will also help advise on the need to bring in other specialised advisors or outside contractors when needed. Other types of specialists can include irrigation designers, civil engineers, agronomists, ecologists or arboriculturists.

American Society of Golf Course Architects (ASGCA)

Established in 1947 by 14 founding fathers, the mission of the ASGCA is much the same today as when those original members outlined the articles of incorporation:

- Foster the game of golf, its growth and advancement.
- Foster professionalism of ASGCA members through education, promotion and fellowship of the world's leading golf course architects.
- Support design excellence by creating golf courses that are technically, strategically and aesthetically excellent while meeting the economic, environmental and other needs of golf course owners, developers and communities.
- Expand the opportunities of ASGCA members to better serve their clients and the game of golf.

The ASGCA are proud to have participated in the creation of the guidelines. We believe this tool can help promote sustainable golf course development, and help the golf industry continue to raise its profile as an entity dedicated to good stewardship of the environment.



Society of Australian Golf Course Architects (SAGCA)

The SAGCA was formed in 1989 with the purpose of creating a society of fellow professionals with the intent of meeting regularly to exchange ideas and experiences, encourage the highest standard of golf course design and construction, and further advance the status of their golf course architecture.

SAGCA aims to encourage the advancement of the game by highlighting its health benefits, the opportunities for social interaction and the importance of golf courses as green open spaces especially in cities.



European Institute of Golf Course Architects (EIGCA)

The EIGCA represents Europe's most qualified golf course architects. Members of the EIGCA have shown through their skill, experience and training that they are able to design and oversee the construction of golf courses to the highest standards. The EIGCA believes golf course sustainability and stewardship of the environment to be the cornerstones of golf course architecture. Golf courses can have a positive impact on the environment and the ways in which golf course architects design courses reflect the importance of environmental sustainability in golf course development.

The EIGCA's sustainable education programme, Raising the Standard of Sustainable Golf Course Development, is an important initiative in demonstrating that golf courses can be developed in ways good for all concerned. The EIGCA is proud of our input assisting GEO Foundation, which dates back more than a decade, and look forward to further close collaboration with all of the team there in the coming years.

Golf Course Builders Association of America (GCBA)

The GCBA is a non-profit trade association of the world's foremost golf course builders and leading suppliers to the golf course construction industry. Founded in the early 1970s, its members represent all segments of the golf course construction industry.

The GCBA is dedicated to advancing and continuously improving the profession of golf course construction while serving the interests of its member companies.



Photo Credit: Booth Golf & Leisure



Photo Credit: Chris Huggett, Mackenzie & Ebert - Craigend Golf Course, Royal Troon

About GEO Foundation for Sustainable Golf

Since 2006, GEO Foundation for Sustainable Golf (GEO) has worked to support sustainability in and through golf, building on a history of social and environmental value which is at the root of the game.

GEO is the only international non-profit dedicated entirely to providing a credible and accessible system of **sustainability standards, support, recognition, and capacity building** for golf courses, developments, government ministries, NGOs and local community groups.

As a central component of golf's efforts, GEO manages and assures an innovative support platform, **OnCourse®**, which provides customized project services and streamlined sustainability reporting to golf courses undergoing a renovation.

GEO offers strategic advice and planning, identification of key issues, team coordination and credible representation of the associated environmental and social value to governments, investors, members and other stakeholders.

All GEO's work follows golf's **four sustainability themes** – fostering nature, conserving resources, taking climate action and strengthening community – to practically apply the four pillars of sustainability to each situation. The objective is to tackle the broad and complex subject of sustainability by guiding **real-world decisions and taking practical actions** that make a difference.

Collaboration

At the start of your project planning, GEO can support a 'Screening Process' to determine the sustainability opportunities and challenges your property has. A renovation will typically be either:

- A project with major and defined construction period.
- Incremental improvements over a 10-15 year period.

Our direct support to the golf course team provides dedicated sustainable golf advice throughout all phases of the renovation, from early internal preparation and planning through to design, construction, reopening time, and onto a long-term sustainable golf roadmap and an **OnCourse®** profile.

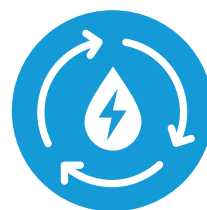
Many courses will like to have the baseline data for how the course is operating before changes happen, GEO can help assimilate this information. This can be used to target measured improvements, or highlight priority areas where the greatest benefits can be realised.

The course can seek international recognition (**GEO Certified® Facility**) for its sustainability outputs delivered through its renovation project and maintenance practices. This independent recognition gives the course the confidence to promote their achievements and gain greater awareness of the improvements work and the

process of making it happen. GEO works in partnership with the course to support communications and help to track long term the sustainability benefits being generated by the project.



Fostering Nature



Conserving Resources



Strengthening Community



Taking Climate Action



Credible Recognition

**More
than a
game**

Acknowledgements

Adam Lawrence
Andy Hiseman
Andy Staples
Benjamin Warren
Bill Coore
Bradley Klein
Brian Costello
Brit Stenson
Bryan Cox
Caspar Grauballe
Chad Ritterbusch
Chris Huggett
Christian Lundin
Clyde Johnson
Dana Fry
Dave Sansom
Eric Iverson
Forrest Richardson
Giulia Ferroni
Greg Martin
Harry Cloke
Jack Fleming-Cooney

Jacob Sjoman
James Edwards
Jason Deegan
Jason Livvy
Jason Straka
Jeff Brauer
Jeff Danner
Jerry Lemons
John Clarkin
John Holmes
John Kemp
Justin Apel
Kari Haug
Kyle Cruickshank
Libi Newell
Louise Gallagher
Lukas Kaiser
Nathan Crace
Paul Granger
Paul Jansen
Paul Mogford
Phil Smith

Rob Bristow
Rob Gavarkovs
Russ Smith
Sarah Skelton
Scott Corrigan
Scott Macpherson
Tim Lobb
Toby Ingleton
Tom Doak
William Watt

Thanks for the support



Photo Credit: Tim Lobb | Aloha GC



2 Quality Street, North Berwick.
Scotland. EH39 4HW

T: +44 (0) 1620 895100 | W: sustainable.golf