

Certification report

OLYMPIC GOLF COURSE – RIO 2016

Certification Stage

OnCourse® - Developments Programme

Produced by:

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1. EXECUTIVE SUMMARY

OBJECTIVE AND SCOPE

I, Alexandra Betâmio de Almeida, being an accredited GEO verifier, have been engaged by the GEO Management Team to report on our recommendation regarding the certification of the Olympic golf course project. This engagement has been formalised on April 2013.

The purpose of our verification was to verify conformance to the OnCourse® Developments programme, the international voluntary sustainability standard for golf developments which outlines key sustainable development principles and practices, and as consequence with the criteria used as a framework for the effective integration of sustainability into the Design and Construction process.

The recommendation is informed by a review of the fundamental sustainability opportunities and challenges the project is likely to generate, to ensure that it has the potential to deliver the very highest standards in sustainable development.

The Olympic Golf Course – Rio 2016 formally enrolled in the OnCourse® Developments programme on April 2013. The project has been classified as falling within the category “*Medium Scale Projects*” for the purposes of the GEO OnCourse® Developments programme.

This verification report relates to the statements included in the Sustainability Blueprint, prepared by Fiori/ECP Environmental Solutions and submitted to the Golf Environment Organization on August 2014. The report summarises the observations and findings identified by the verifier during the site visits and related meetings from July 2013 to February 2016.

The verification has been conducted in accordance with the GEO verification procedures. The verification included amongst other procedures, a comprehensive review of ECP’s documentation, planning and constructions procedures, buildings and

golf facility inspections and interviews with management and staff of the project team.

The opinion is formed on the basis of these procedures, which included:

- Examining, on a test basis, information to provide evidence supporting the statements in the Sustainability Blueprint and other documentation;
- Evaluating the appropriateness of strategies used to reach the goals.

I confirm that the information provided by Fiori/ECP Environmental Solutions is true and accurate to the best knowledge of the Verifier preparing this report. I have obtained all the information and explanations, which to the best of my knowledge and belief were necessary for the purpose of my verification. Nevertheless, the verification procedure cannot guarantee that all misstatements have been detected.

The Findings are based on verified objective evidence relevant to the time period for the assessment, traceable and unambiguous, and I have acted in a manner deemed ethical, independent and objective.

TIMELINE

- | | |
|--|----------------|
| • Project team assembled | April 2013 |
| • Project appraisal report | April 2013 |
| • Project enrolled in program | April 2013 |
| • Sustainability Blueprint established | April 2013 |
| • Planning and Design phase: site visit and report | July 2013 |
| • Sustainability Blueprint approved | October 2014 |
| • Construction phase: 1° site visit and report | October 2014 |
| • Construction phase: 2° site visit and report | March 2015 |
| • Environmental Management Plan approved | September 2014 |
| • Golf Construction complete | December 2015 |
| • Final verification visit and report | March 2016 |

METHODOLOGY

This report presents a summary of key findings and recommendations and is based on evidence collected through reading documents (Appendix A), observing the work on site (site inspection, Appendix B) and interviewing with local personnel.

The discussion with the Project Team and other parties included the following key tasks:

- Overview of the policy and legislative context,
- Review of the main components of the project;
- Appraisal of the sustainable blueprint against core sustainability concepts;
- Appraisal of key sustainability issues generated by the project, in order to identify and understand the main opportunities and challenges in relation to the GEO sustainability agenda;
- Advice and guidance on fulfilling the project's sustainability potential through the subsequent stages of the process.

These tasks have been informed by:

- Review of documents provided by the project team, namely:
 - Gil Hanse, Golf Architect (Hanse Golf Design)
 - Carlos Favoreto, Owner's Representative (Fiori/Tanedo S.A./ECP Environ)
 - Richard Brogan (PGA Tour Design Services/Construction Services)
 - Daniel Cortinhal, architect (ECP Environ)
 - Pedro Évora and Pedro Rivera, architects (Clubhouse and Maintenance Facility projects, RUA Arquitetos)
 - Neil Cleverly, course superintendent (Fiori/ECP Environ /Progolf),
 - Antonio Miranda and Gil Zdanowski (construction supervisor, Progolf Brasil and Jacobsen dealer for Brazil)
 - Mario Rotnitzky (Landscape and Native Plant Nursery, agronomist engineer, ECP Environ)
 - Janice Peixoto (EMP, environmental geographer, ECP Environ)
 - Dra. Luciana Andrade, biologist
 - Dra. Diana Rocha, biologist

- Dr. Gabriel Rosa Amaral, forest engineer
- Dr. Marcos Felipe da Rocha, veterinary
- Site visits carried out between July 2013 and March 2016, incorporating on-site observations and discussions with members of the project team;
- Meetings with stakeholders, namely:
 - Eduardo Paes (Mayor, Municipality of Rio de Janeiro)
 - Abilio Fernandes (Manager, Marapendi Municipal Natural Park)
 - Carina Flores (Sustainability Coordinator, Rio 2016 Organising Committee for the Olympic and Paralympic Games)
 - Márcio Galvão (Executive Director, Brazilian Golf Confederation)

On July 2013, I conducted an initial verification to confirm the project implementation status for the OnCourse® Developments programme. Following this first visit, ECP developed and implemented an action plan based on the report's Recommendations & Action Steps (GEO Verification Report, July 2013) and reviewed the sustainability blueprint. During the verification process, which occurred between April 2013 and March 2016, I was able to reflect with Fiori/ECP and key stakeholders on the progress, achievements and measures implemented and to compile, evaluate and summarise the evidences, views and expectation of Fiori/ECP and other parties.

This report does not that reflect the order and detail of all discussions, but rather a synthesis of points raised in the meetings to draw together the final stage of the certification process.

2. PROJECT DESCRIPTION

The return of golf to the Olympic Games and the choice of location

The Olympic golf course is located in the Barra da Tijuca area, General Moyses Castello Branco Filho Avenue, nº 700 (area bordering the Marapendi lagoon, south of the Avenida das Americas, three miles from the Athletes' Village), in the same zone that will concentrate the greatest number of Rio 2016™ Olympic Games venues.

The actual Olympic golf course project covers approximately 97 hectares and comprises an 18 hole championship golf course, practice area - driving range with four practice holes, putting green and a short game practice area with green and greenside bunker and four practice holes, and the additional components: the Clubhouse (1,200 sq. m²), Golf Academy (700 m²), Maintenance Facility (1,100 m²) and parking lot.

All major strategic planning issues have been examined by the appropriate Brazilian authorities and the 2016 Olympic golf course is part of the 2016 Olympic master plan, a new urban area located in Barra da Tijuca, in Rio de Janeiro.

The 2016 Olympic golf course is an initiative of Fiori Empreendimentos Imobiliários Ltda., the company responsible for managing and funding construction of the Rio 2016 Olympic golf course. Fiori aims to introduce the premier 18-hole public golf facility in Rio de Janeiro, creating ideal conditions for promoting a quick and expressive rise in the numbers of people practising the sport.



Fig. 1 the 2016 Olympic golf course site (Photo:<http://www.pga.com/golf-courses/golf-buzz/2016-olympic-golf-course-site-seen-above>), before the beginning of construction (April, 2013).

Following the conclusion of Rio 2016, the venue is due to become the city's first official golf course with 18 holes and academy that is open to the public. The Golf Academy will be the main tool in this process of offering conditions for the first contact with the sport, and the venue will provide the opportunity to create a huge legacy for the sport in Brazil. This will benefit not only Rio de Janeiro but also the whole region and Brazil.

Compliance with laws and other regulatory frameworks

According to the technical report “Explaining the Olympic Golf Course”¹ (published by the Municipality of Rio de Janeiro on May 12, 2015), all the documents submitted by the owner (Fiori) comply with the Municipality by-laws and regulations. The Olympic Golf course project received the Municipal Installation License n. 000956/2013 on April 19, 2013, granted under the Complementary Law n.º 125/2013, from 14 January 2013.

The majority of the Olympic golf course area is within the Environmental Protection Area (APA in Portuguese) of Marapendi. The estimated area for the APA of Marapendi is 10 km² and the project area has approximately 1 km² (10% of the APA area). The

¹ <https://drive.google.com/file/d/0BwMjq4G-w-9eMEo1cHF6TFhwREE/view>
<https://medium.com/prefeitura-explica-golfe-ol%C3%ADmpico>

APA of Marapendi corresponds to 20% of the whole Barra da Tijuca area and the project area corresponds to 2% of this area.

The interventions proposed for the implementation of the project are also in accordance with the permitted use for the ZCVS of the Marapendi APA (Additional Law n.º 125 from January 14, 2013).



Fig.2 the golf course area, the Nelson Mandela Municipal Park and the Natural Municipal Park of Marapendi (Explaining the Olympic Golf Course, Prefeitura do Rio de Janeiro)

As a compensation measure, the Rio de Janeiro Municipality established a new park near the project area, the Nelson Mandela Municipal Park, with an area of 1.6 million m². Together, the two parks occupy a total area of 3,2 million m².

The restinga vegetation located in the new park area serves as habitat for several endemic species, some of them rare, besides being the feeding and reproduction area for species of migrating animals. Thus, it is very important to generate continuity and connectivity among the existing floristic communities, located in the Olympic golf course area and the Natural Municipal Park Marapendi.

Conditions Prior to Project Initiation

The site occupies a sandy, partly marshy area, inshore from the Atlantic Ocean in Rio de Janeiro's Barra da Tijuca neighbourhood. The area is bordering the shore of the Lagoon Marapendi, the lagoon located between the wooded area (south of the golf course) and the barrier island. The local ecosystem forms a specific ecological community, denominated as the Restinga ecosystem - a coastal ecosystem (sandbanks).



Fig 3 the Marapendi Lagoon – the shores of the lagoon (classified as Permanent Protection – Marginal Strip Protected Area, 30 m) and the degraded area (2013).

The mischaracterization of the natural environment, which occurred between the middle of the 1980-decade and the beginning of the 1990-decade, created a large area of degraded land, mostly due to the effects of sand mining activities. During this period the area was also used as a deposit for concrete pre-molded parts for the construction of school buildings, under the use of private engineering companies.

Due to the anthropic activities in the area, large areas of native vegetation had been cleared or degraded, resulting in adverse effects on biodiversity and in the growth of exotic vegetation.

In conclusion, the site suffered from severe environmental degradation, the environmental profile indicated that the main environmental problem was the loss of biodiversity/degradation of habitats due to deforestation, exotic invasive plants, wetland/woodland mismanagement.

3. THE PLANNING AND DESIGN PROCESS

Vision and Principles

The Fiori and the project team were strongly committed to the concept of sustainable golf development, both during the planning and construction phases of the work, protecting and enhancing the natural environment in the area.

Taking into account the ecological sensitivity of the site and surroundings, the landscape and environmental aspects led all the phases of the planning and design process in order to plan and design-out environmental impacts and to minimize the needs for technological fixes, e.g. topographic change and disturbed areas across the entire site were minimized, buildings included passive design features and materials and colours were chosen to promote their integration with their surroundings, with prevalence for colours corresponding to natural local materials (wood, stone, clay, sand), reducing the visual impact of buildings in such a sensitive landscape.

Through a sensitive and professional approach to planning and conceptualization, the project team correctly identified and defined sustainability outcomes, and was truly committed to realizing them.

Core Sustainability Concepts

The strategies presented in the Sustainability Blueprint allowed technicians, engineers, architects and biologists, the opportunity to take appropriate action on all design, construction and operational considerations, including environmental, social and economic issues associated with:

- Improving the Quality of Habitats,
- Protection of the Environment,
- The rational use of Water and Energy,
- Promotion of Social and Cultural Integration.

During my initial site visit, I found that ECP/Fiori, true to its vision of improving the local habitat, intended to regenerate the local environment long before IOC's decision and had started to implement a research programme, focused on native plant propagation, and to grow a local nursery with the species collected from local seeds.



Fig.4 the native plant nursery – designed to preserve native plants, protect wildlife and the natural habitat (2013).

The list of fauna and flora species occurring in the area, including rare, endemic and endangered species, is available in the technical reports elaborated by ECP. The following studies were handled to SMAC and INEA (local authorities) during the pre-implementation stage.

- Preliminary inventory of Wildlife – Phase I (April 2013, ECP)
- Forest management plan - Phase I (April 2013, ECP)
- Native Flora, inventory rev 1, Phase I (April 2013, ECP)
- Native Flora, transplanting plan (April 2013, ECP)

The implementation of ECP's Work Plan (management of areas with native species seeding, areas with Native Species Transplanting and areas to be preserved) during the construction phase took into consideration the conclusions and strategies presented in these reports.

The initial Vegetation Inventory for the area summed up a total of 7,295 specimens, native and exotic, with a special note on the species classified as endangered and

endemic by the local law. With regard to wild fauna, the initial inventory done by ECP on June 2013, during the planning and design stage, identified 118 species.

ECP has developed a forest management plan, including invasive species control (mimosoid trees, casuarinas and albizias) and maintenance of native plant communities, using native seed and plant materials for permanent revegetation and landscaping.

The Golf course and native areas

Gil Hanse's project has a definite minimalist links design with a very links-style routing, with large greens and wide corridors - sandy, rough ground lining wide fairways and some holes which are tree lined and have a more parkland flavour.

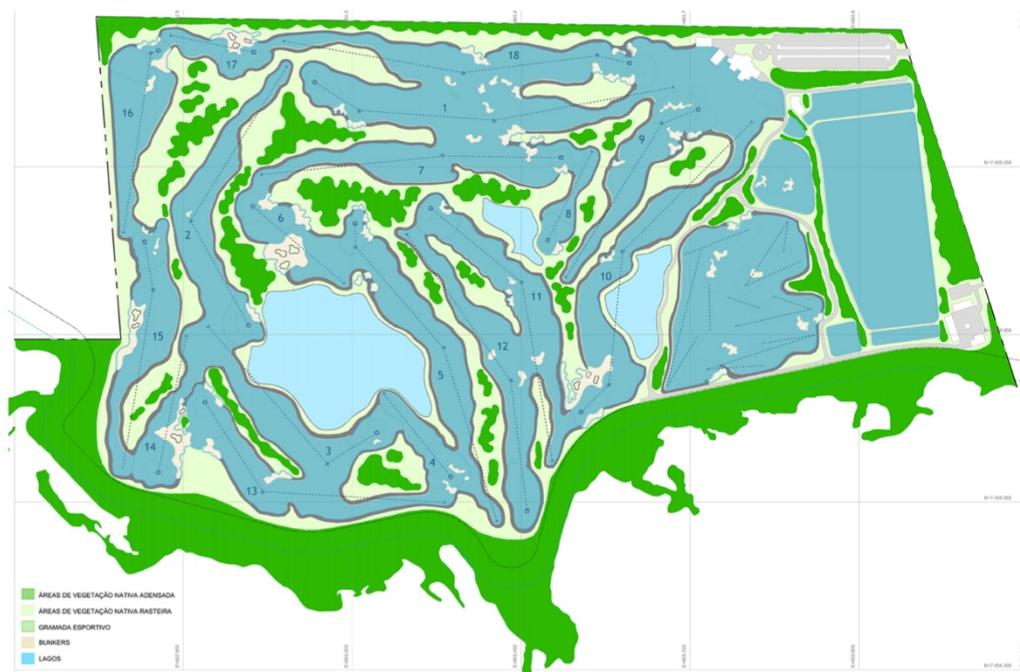


Fig.5 Olympic golf course project, initial layout (Hanse Golf Design, March 2012).

The golf course has been designed to be beneficial in many aspects, namely:

- A public golf facility catering to the emerging Rio golf market, with a specific focus on youth play and programs that grow the game.

- A golf course ensuring the use of native vegetation, the natural heritage regeneration and the respect to local environmental regulations with site-specific conditions, one which embodies the natural beauty of Rio de Janeiro while respecting the environmental and sustainability goals of the Rio 2016 Olympic Games and the City of Rio de Janeiro.
- A golf course bringing people in contact with the existing features, biodiversity and ecology of the site, one which is easily walked and conducive to speedy play - despite some slightly hilly terrain, the routing of the golf course allows players and visitors to walk through the course. Such an approach will provide the golfers the opportunity of enjoying the natural setting within the site, and the scenic views outside the site (lagoon and woodlands).
- A golf facility designed to minimize construction costs and to be efficient in its maintenance and golf operations, one which combines a state-of-the-art championship golf course for the Olympic Games and a sustainable course in the legacy mode, with a focus on the ease of maintenance.

Green Grass Brazil, a local licensed sod producer of both grass varieties used on the course — *Zeon Zoysia* on tees, fairways and roughs, and *SeaDwarf Seashore Paspalum* on the greens — has grown the grass on its Brazilian sod farms for planting directly onto the Olympic Golf Course. Green Grass Brazil began growing the grass in January 2013 in order to have enough grass inventory available to quickly plant the golf course when construction progress allowed.

Both the *Zeon Zoysia* and the *SeaDwarf Seashore Paspalum* are considered drought tolerant grass varieties. According to Green Grass Brazil and Neil Cleverly, the Course Superintendent, *Zeon Zoysia* has low water and fertilizer requirements, grows a dense mat and has an extremely high-quality playing surface, which helps with weed suppression. This feature of *Zeon Zoysia* is critical because the maintenance team does not have permission to use herbicides. *SeaDwarf Seashore Paspalum* stands up to the salty water conditions that will be used to irrigate the greens at the site.

The Clubhouse

The Clubhouse has been designed to comprise of a basement and a ground floor. The initial layout was as follows: electric golf carts area offering parking for 30 carts, golf bag and trolley store, offices for caddie master service, reception area, food and beverage facilities, a pro-shop, staff offices, offices for manager and administration, toilets and gents and ladies changing rooms, lounge area, multipurpose room, parking area, etc.

From the entrance a generous inclined pathway heads towards the golf course, with a privileged view. Through this path the architects implemented successively the gym, restrooms and locker rooms, Pro--Shop and reception, culminating in the plaza which leans onto the course from one side and houses the administrative headquarters and social areas. Above it, the translucent roof captures rain water and provides shade. An internal garden acts as an extension of the surrounding landscape.



Fig. 6 the proposed clubhouse – designed, built and operated to be a green building (RUA Arquitetos, 2013)

The Maintenance Facility

The maintenance building has been designed to comprise of a ground floor. The initial layout was as follows: back-of-house facilities, wash-pad area, M&E area and

maintenance workshop area (for daily repairs, storing of maintenance materials, small tools and equipment), chemicals storage area (to provide secure storage of all fertilizers and pesticides), compost plant and waste storage area, equipment room, mess room facilities for working personnel and Training Centre.

The maintenance area was planned to reduce operation costs and environmental impacts. The golf facility's operating and maintenance issues were considered during the preliminary design phase, contributing to improved working environments, reduced energy and resource costs, and prevented system failures.

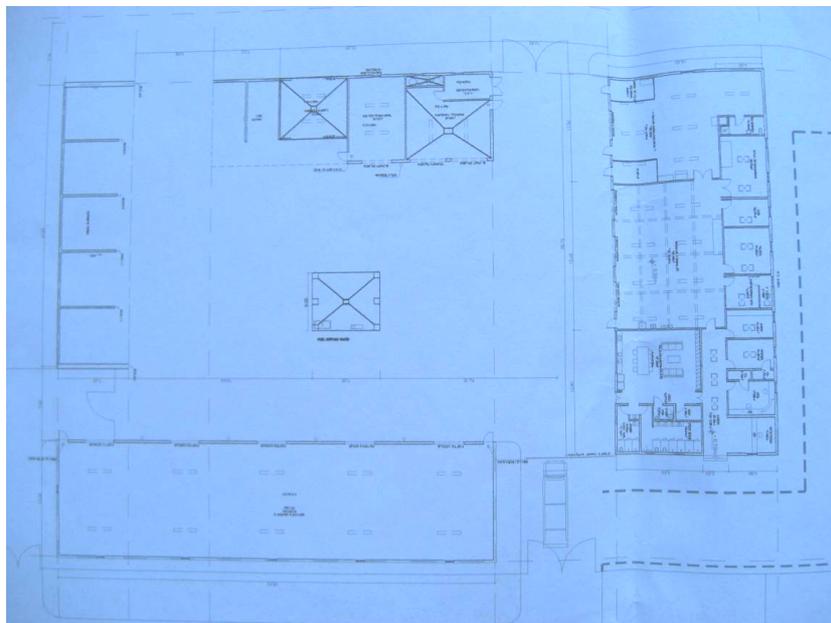


Fig. 7 the maintenance building – designed to maximize operational efficiency of operations while minimizing environmental impacts and risks associated with health and safety issues (April, 2013)

4. THE CONSTRUCTION PROCESS

Environmental Monitoring

The evolution of the implementation of ECP's work was made through periodical reports, from July 2013 to December 2015. A copy of these reports was sent to GEO and SMAC and INEA (local authorities).

Phase 1:

- Detailed Project of Transplantation and Handling of Native Vegetation – July 2013;
- Inventory and Wild Fauna Management Planning – June 2013;
- Inventory and Fauna Management Planning- Requests – August 2013.

Phase 2:

- (8) Monthly Report on Native Vegetation Transplantation's Operations – from July-August 2013 to February-March 2014;
- (8) Monthly Report on Fauna Management's Operations – July-August 2013 to February-March 2014.

Phase 3:

- Observation Planning for Artificial Lakes, Planting and Transplanting Native Species – October 2013;
- Project for the Removal of Exotic Vegetation on the stretches of Native Vegetation and in the SPB – October 2013;
- (7) Quarterly Report on Permanent Observation of Artificial Lakes, planting areas of native species and transplanting of native species – from March-May 2014 to September-November 2015;
- Observation Planning for Wild Fauna – October 2013;
- Project for the Relocation and Rescue of Fauna – October 2013;
- Planning for Management and Observation of the Capybara population (*Hydrochoerus hydrochaeris* Linnaeus, 1766) – August 2015;
- (7) Quarterly Report on Observation of Wild Fauna – from March-May 2014 to September-November 2015.

The data presented in the monitoring reports was assessed by review of the detailed project documentation and records, as well as by interviews with personnel at ECP, by observation of established procedures and practices and by site inspections carried out prior to the construction and during the construction phase. This has enabled the verifier to assess the accuracy and completeness of the reported monitoring results.

The golf course project involved the planting of about 500,000 seedlings from 54 species and more than 15.000 individuals were transplanted, e.g. 33,2 ha of resting habitat were re-naturalised/preserved.

Since the initial fauna inventory (June 2013), and with the management of the native vegetation through the planting and transplanting operations during the construction phase, the counting went from 118 species to 263 species (November 2015), including mammals (16), avifauna (143), reptiles (42), fish (8) and insects (54).

Golf course and native areas

Groundbreaking began early April 2013 and the grassing phase started in May 2015. The course was ready for grow-in August 2015. In order to benefit from a second complete grow-in schedule, the test event was held in the first quarter of 2016, on March 8.

During the construction phase, the detailed design has continually evolved toward minimizing the area of intensively-managed turf to the absolute minimum required to create a playable golf course for all skill levels, taking into consideration the source of water supply and the optimization of the golf course irrigation. These areas were complemented, where necessary, with the use of indigenous local grass species.



Fig.8 Olympic golf course project, final layout (Hanse Golf Design, December 2015).

- The course routing has been laid out to align with natural characteristics of the ground, to benefit from the stunning natural topography and landscape character, and to minimising the overall amount of intensively-maintained areas.
- Single storey clubhouse and maintenance facility to improve landscape integration.
- The initial area of transplanting native restinga vegetation (57,000 m²) was reduced to 14,200 m².
- The initial number of lakes was reviewed and reduced from 4 to 2 lakes, both located in artificially depressions created as a result of sand mining activity.
- The area of the irrigation lake was reviewed and reduced from 15,000 m² to 12,550 m² and the area of the retention lake from 40,000 m² to 30,517 m² to retain further natural habitat.

- The lakes' depth was reviewed and reduced from -12.00 m. to -4.00 m and the geomembrane liner system removed, promoting natural infiltration.
- The excavated soil was re-used on-site, during the construction of the golf course.
- The position of the putting green/driving range area was reviewed and scaled-down by 27% to retain further natural habitat.
- The position of the maintenance building was reviewed, allowing for a better preservation of a native vegetation area that otherwise would need to be transplanted.
- The configuration of golf holes number #3, #5, #12, #13, #14 and #15 was reviewed, which allowed to preserve native vegetation areas that otherwise would need to be transplanted.
- The configuration of the driving range and academy targets was reviewed, allowing for a short game experience (9-holes) and junior tournaments.

The architect's vision and the sustainability blueprint were focused on water conservation. The water management is a combination of state of the art technologies that apply the appropriate amount of supplemental water in an efficient manner (precision application of water and efficient pumping, based on detailed soil moisture and turfgrass analysis), proper plant selection (drought, disease and salt tolerant turfgrass varieties - *zoysiagrass* and *Seashore Paspalum*) and cultural maintenance practices that provide adequate turf quality while minimizing the use of water and pesticides.

The water use to irrigate the golf course comes from the irrigation lake. Both lakes are formed by the outcropping of the groundwater table and their recharging capacity has been sufficient to serve the irrigation needs.

The earth-movement was minimized in order to retain and enhance the authentic sense of place and natural beauty of the site. The golf course (greens, tees, fairways,

and semi-roughs/roughs and lakes) occupied the already cleared and degraded areas, adapting to the morphological and topographical characteristics of the ground and protecting, whenever possible, areas of higher density of vegetation and wetlands.

I was able to evaluate the work done to recover the native vegetation during the construction site visits. It was required that golf course blended harmoniously with its surroundings, thus a forest management plan, approved by the local authorities, was implemented to collect seeds and propagate this species in order to augment its establishment on the degraded areas. Seeds were collected and native plants were produced in the local nursery. Additional experiments with other native species were undertaken to create a seed and plant bank to use during construction.

As a direct result of the forest management plan, the local nursery was scaled-up in order to fully restore and enhance degraded areas, enrich local biological diversity and improve the function of the Restinga ecosystem.

The main existing ecological corridor - the Marginal Strip Protected area (MSP, FMP in Portuguese) facing the Marapendi Lagoon, was not affected by the golf course construction and remained intact during the implementation of the project.

The other existing ecological corridors in the area are the patches of native vegetation (fragments of the restinga habitat) that were maintained or recovered by the project team. ECP has elaborated and implemented a re-naturalization plan, connecting on-site habitats into the wider network - the Parque Natural Municipal de Marapendi, the Nelson Mandela Parke and the network of urban parks and green corridors in the city of Rio de Janeiro. In result of that, the existing ecological network, inside and outside the golf course area, was enhanced, promoting the Marapendi lagoon's genetic integrity.

The re-naturalised areas, located outside the area of overall disturbance, were restored as natural habitats, utilizing the dominant naturally occurring species on-site. These areas do not have permanent irrigation and will not be intensively maintained.

The forest management plan, the exotic vegetation removal and control plan (removal and ongoing control of non-native invasive species in the area) and the native flora planting and transplanting operations plan (plant and seed collection and propagation from on-site plant species) have been proven effective by rigorous evaluation (the results were reported to and verified by the Local Authority). The combination of these techniques has been a determinant factor in setting in place the conditions that will allow the Restinga biome to thrive.

Land-cover class	Area (ha)
Native areas (NA)	
Preserved Native Vegetation	12,8
Recovered Vegetation	17,2
Vegetation in recovering process	3,2
Golf (G)	
Irrigated area (greens, tees, fairways)	34,5
Bunkers	4,4
Non-irrigated area	8
Lakes (L)	
Irrigation lake	1,3
Retention lake	3,3
Buldings (B)	
Total Area NA+G+L	84,7
PSB (FMP)	9
Total plot area (approx.)	97,0

It is worth mentioning that only individuals from exotic species and invasive exotic species were removed, and those of native origin were totally preserved and transplanted, not occurring the suppression of Mata Atlântica vegetation and protected species.

The wildlife management plan and the forest management plan, the exotic vegetation removal and control plan and the native flora planting and transplanting operations plan were elaborated by Brazilian experts and the work was done by local staff. There was no artificial or assisted introduction of fauna species, obtained from outside areas.

The wildlife management plan has also been proven effective by rigorous evaluation of key species (fauna monitoring reports verified by the Local Authority). During the construction site visits, their presence was verified by means of traces, tracks and feces, and I was able to easily spot several burrowing owls (*Athene cunicularia*) with nests, capybaras (*Hydrochoerus hydrochaeris*), one Brown-throated three-toed sloth (*Bradypus variegatus*) etc.

During the construction period, all the rescued individuals in the project area were marked and transferred to be release at the Municipal Natural Park of Marapendi, following the procedures presented in the monitoring reports and approved by SMAC and INEA.

ECP has also implemented a construction management plan, education programs and procedures for monitoring the success of mitigation measures for all phases of the construction process, recording and disseminating environmental information and performance.

Following the appointment of Gil Hanse to carry out the design, Progolf Brazil was awarded the construction contract. Progolf Brazil, and the Course Superintendent - Neil Cleverly, were responsible for ensuring compliance with the Sustainability Blueprint and the construction management plan throughout the construction and grow-in phases, including the activities of appointed sub-contractors or visitors.

Progolf Brasil, a specialist golf course construction company, employed local workers for all the construction phases.

Since the beginning of the golf course construction (July 2013), the Course Superintendent, Neil Cleverly, an International BIGGA Member and International Superintendent Member of the GCSAA, supervises all the work performed by the greenkeeping team.

Neil has a sound water management program in place and is able to reduce potential for water contamination by managing the chemicals he uses. According to Neil, the course could not provide the quality of greens that the IGF demands without the use

of some pesticides (fungicides and insecticides) and fertilizers. However, it is worth mentioning that the use of herbicides is totally forbidden by the local authorities.

Green Grass Brazil also employed local staffers to install the grass on the golf course, along with expert help from David Doguet, the American turfgrass breeder from Bladerunner Farms in Poteet, Texas, who developed *Zeon Zoysia* for use on golf courses.

The planting of the golf course began in May 2014, using three different approaches; the majority of the *Zeon Zoysia* areas – tees and fairways – were planted using large rolls of turf, but some areas were planted using oblong shaped turf sods. The *SeaDwarf Seaside Paspalum* used on the greens were all planted as sprigs.

Maintenance Facility, pollution prevention and health and safety measures

Maintenance is performed in covered or indoor maintenance areas where potential pollutants cannot be introduced into stormwater drainage systems. All vehicles and equipment are cleaned in a designated area. The cleaning process includes blowing off the entire vehicle with high pressure air before placing it in the wash both. The wastewater drain is connected to an oil/water separator, preventing wash water from draining directly into soils, ground water or public sewer.

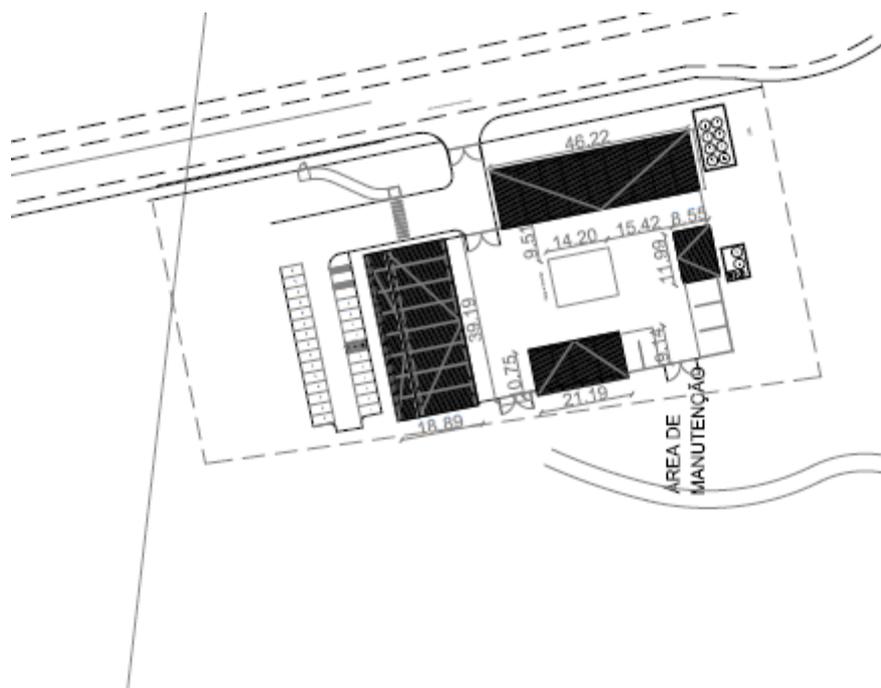


Fig. 9 Maintenance facility project, final layout (RUA/Cyrela, December 2015)

The fuel storage tank is sited on an impervious surface within an oil-tight bund wall. The containment bund has a roof to prevent rainwater entering the bund and the drainage is linked to the wastewater treatment system (oil/water separator).

The maintenance building is provided with a connection to the municipal water system for all human needs.

Equipment Storage and Mechanics Repair areas, Grinding room, Oil and lubrication storage rooms have a sealed concrete floor with chemically resistant paint. Storage vessels are labelled to show their contents and kept as close to the point of use and as far from surface water drains as possible. Liquid hazardous materials and hazardous waste containers are provided with secondary containment to prevent or minimize the possibility of accidental release.

Neil Cleverly ensures that ensures that chemicals, petroleum, and other controlled products are used, stored, and disposed of in accordance with BMPs and local regulations. The chemical storage area has a concrete floor, with natural ventilation and the pesticides are separated by group. The Superintendent informed that no herbicide is used to control weeds in the golf course. The weeds are removed manually as they do start to appear.

Jacobsen was confirmed as the preferred supplier of the mowing equipment in the spring of 2014. One of the deciding factors was that Jacobsen has a local distributor in Brazil - ProGolf Brazil has represented the Jacobsen brand in Brazil since 2012.

At the moment, the equipment consists of nine Eclipse2 hybrid powered walking greens mowers, four Eclipse 322 hybrid powered ride-on greens mowers, three SLF1880 super light fairway mower, four UK-built TR3 reel mowers for tees and surrounds, one trickster with spread, two trucker with sprayer and 12 golf carts (Cushman Hauler 1200) and three heavy duty Cushman 1600xd.

After the Games, the equipment will consist of six Eclipse2 hybrid powered walking greens mowers, two Eclipse 322 hybrid powered ride-on greens mowers, two SLF1880 super light fairway mower, two UK-built TR3 reel mowers for tees and surrounds, one trickster with spread, two trucker with sprayer and 12 golf carts (Cushman Hauler 1200) and two heavy duty Cushman 1600xd

All Jacobsen equipment uses GreensCare™, a 96% biodegradable hydraulic fluid made of renewable seed-oil based product. It was developed in 1997 and has been factory-filled in Jacobsen products since 2002.

The Olympic golf course has a maintenance crew of 40-45 people for the golf playing areas and surrounding grounds, all local workers.

5. Management hand-over

The Brazilian Golf Confederation will oversee ongoing maintenance before the Olympic Games and will manage the legacy, golf course included, after the Games. During the Olympic Games, the Olympic venue will be managed by the Brazilian Olympic Committee.

The Olympic Golf Course's post-games operational mode, entitled as "Olympic Games Legacy", was established in the Concession Usage Agreement signed by the City of Rio Janeiro Administration and the Brazilian Golf Confederation (CBG) on November 22, 2015, for 10 years period with possibility of renewal for another 10 years period.



Fig.10 the golf course and the Marapendi area (Photo: Rio 2016/Alex Ferro) via <http://www.rio2016.com/>

The Agreement establishes 4 main objectives and obligations to achieve a sustainable "Olympic Games Legacy". The next table presents an overview of these objectives and obligations.

<p>Golf Course & Facilities Operation</p>	<p>The OGC and the Clubhouse facilities will be free-access to the public; For the golf course utilization a green-fee structure will be defined and released to the public from September 2016 on, with the objective of promoting and growing the sport golf in the City and Brazil. The practitioner's HCP Index Certificate will be required to play golf. Annually, CBG should promote and host 12 relevant golf tournaments in the OGC. CBG can hire a third party to manage the OGC and the Clubhouse facilities.</p>
<p>Environmental Protection</p>	<p>CBG can hire a national or international renowned and specialized consulting firm to manage the environment protection affairs. CBG must assure the compliance with the local and international environment protection regulation. CBG must create and maintain an environmental education centre at the OGC's facility to promote the environmental consciousness at the schools and local communities.</p>
<p>Technical School</p>	<p>CBG must create and maintain, in partnership with technical schools and universities, a knowledge centre to promote social inclusion through sport. The knowledge centre's content should capacity people as greenkeepers, environment protection and maintenance specialists, golf course machinery and equipment's operators and maintenance technicians.</p>
<p>Sport Legacy</p>	<p>CBG must create a high performance golf centre – Academy - at the OGC's facilities to improve the quantity and the quality of the Brazilian players (professionals, amateurs, juniors, male and female) at the world ranking. CBG must create a development golf centre to grow the quantity of new golf practitioners through programs like "<i>Golfe para a Vida</i>" (golf for life) in partnership with public and private schools and/or other communities. CBG must create a technical centre to capacity new golf coaches and golf referees to act in other golf clubs and golf tournament in Brazil and in the Region.</p>

An environmental management programme will be implemented during the operation phase. The Environmental Management Plan developed by ECP is a site-specific plan developed to ensure that all necessary measures are implemented during the operation phase in order to protect the environment and comply with the local legislation and GEO requirements.

The scope and objectives of the EMP are outlined in the document and the EMP provides information regarding the following issues:

- Local legal requirements and special conditions, such as the Legacy requirements.
- Environmental communication strategy and awareness plan (schools and other stakeholders).
- Environmental training (maintenance crew).
- Environmental management measures and plans (waste management, wildlife management plan, post transplanting/planting maintenance plan).
- Emergency plan.
- Monitoring and reporting (water, air, noise, fauna and flora).

ECP and the BGC are also considering the possibility of creating a biking & walking trail along the lagoon, connecting the golf facility with the Marapendi Park, and installing a bird watching tower near the pumping station, near the irrigation lake.

The Olympic golf event

The vast majority of the staging and infrastructure elements needed for the Olympic golf event will be located in non-sensitive areas.

Staging areas close to the golf course will be developed as part of the golf course construction works and afterwards will be allowed to re-naturalise until they are required just prior to the golf event.

Once the golf event has ended and all staging and infrastructure has been cleared from the site, all temporary and permanent surfacing not required to be retained as part of the golf course will be broken out and removed and all damaged areas of the site will be repaired.

All building materials removed will be reused or recycled. In addition, within the golf course, spectator pathways will be removed and spectator areas and other out of play areas around the golf course which have been damaged during the event will be repaired and allowed to regenerate with native vegetation.

6. KEY ACHIEVEMENTS

The Olympic golf course project and the Sustainability Blueprint are aligned with ECP/Fiori's policy on headline sustainability themes, including:

- **NATURE:** Protection and enhancement of Landscape & Ecosystems
- **WATER:** Efficient use of Water for irrigation
- **ENERGY:** Efficient use of clean Energy & Resources
- **POLLUTION CONTROL:** Environmental Quality improvements
- **SUPPLY CHAIN:** Wider environmental and social benefits through Products & Supply Chains
- **COMMUNITY:** Long term net gains to local People & Communities

The approach integrates social and environmental considerations and is intended to showcase an innovative approach to environmentally sound sustainable golf development in Brazil.

NATURE

GOAL: To regenerate and enhance the ecosystem and provide long term protection of the flora and fauna of the site and its immediate surroundings.

Key achievements

Landscape

- The course routing has been laid out to align with natural characteristics of the ground, to benefit from the stunning natural topography and landscape character, and to minimising the overall amount of intensively-maintained areas.
- The golf course (greens, tees, fairways, roughs and lakes) occupied the already cleared and degraded areas, adapting to the morphological and topographical characteristics of the ground and protecting, whenever possible, areas of higher density of vegetation and wetlands.

- The clubhouse and maintenance facility are single-storey buildings, to improve landscape integration.
- During the construction phase, the initial layout was reviewed and the area of transplanting native restinga vegetation (57,000 m²) was reduced to 14,200 m².
- The initial number of lakes was reviewed and reduced from 4 to 2 lakes, both located in artificially depressions created as a result of sand mining activity.
- The area of the irrigation lake was reviewed and reduced from 15,000 m² to 12,550 m² and the area of the retention lake from 40,000 m² to 30,517 m² to retain further natural habitat.
- The lakes' depth was reviewed and reduced from -12.00 m. to -4.00 m and the geomembrane liner system removed, promoting natural infiltration.
- The earth-movement was minimized in order to retain and enhance the authentic sense of place and natural beauty of the site.
- The position of the putting green/driving range area was reviewed and scaled-down by 27% to retain further natural habitat.
- The position of the maintenance building was reviewed, allowing for a better preservation of a native vegetation area that otherwise would need to be transplanted.
- The configuration of golf holes number #3, #5, #12, #13, #14 and #15 was reviewed, which allowed to preserve native vegetation areas that otherwise would need to be transplanted.

Ecosystems and Species

- The replantation process is considered the largest restinga vegetation recovery in Brazil. More than 15.000 individuals were transplanted and more than 33 ha

of resting habitat were re-naturalised/preserved. Up to now, the monitoring reports demonstrate the success of 95% of transplanted specimens.

- As a direct result of the forest management plan, the local nursery was scaled-up in to order fully restore and enhance degraded areas, enrich local biological diversity and improve the function of the Restinga ecosystem.
- The re-naturalised areas were restored as natural habitats, utilizing the dominant naturally occurring species on site. The area had its vegetal species from exotic origin removed, the totally of its native origin vegetation was preserved and there was an enriching process of its vegetation with seedling from native and autochthonous species produced at the local nursery. Part of the seedlings was also made available for planting in other areas of the Rio de Janeiro city.
- A non-chemical, non-toxic, method has been successfully used to remove and control exotic species.
- The golf course project involved the planting of more than 500,000 seedlings of 54 species and the habitat area has increased 159% (from 128 500 m² to 332 500 m²).
- The habitat diversity has also increased. Since the initial Fauna inventory (June 2013), the counting went from 118 species to 263 species (November 2015), including mammals (16), avifauna (143), reptiles (42), fish (8) and insects (54).
- An operational plan and a monitoring program for habitat dynamics and diversity was developed and implemented during the construction phase to ensure a sustainable management of the Restinga Habitat.
- Minimised amount of open water, restricted to two large and naturalised lakes.
- Retention of significant buffer from lagoon margin (30 metres).

WATER

GOAL: To minimize overall consumption, diversify sources and enhance quality

Key achievements

Demand and Sources

- The strategy for the management of the water consumption associated with the irrigation of the golf course provides for use of lower quality surface water as the only source of water supply.
- The use of the latest cultivar of *Seashore Paspalum* grass (greens) and *Zeon Zoysia* grass (fairways, roughs and tees, 80% of the grassed area) will reduce the use of water to minimum values.
- The design has continually evolved toward minimising the area of intensively-managed turf to 35 hectares, the absolute minimum required to create a playable golf course for all skill levels (36% of the total area).

Efficiency

- The irrigation system is controlled by the Toro Lynx NSN Mobile system. The golf course as installed design has 2000 DT series valve in head sprinklers including T7 and bunker spray heads. The design is a prescription irrigation system meaning that each individual head can be controlled as and where necessary saving valuable water volume with very little waste. The irrigation can be controlled directly from the computer by hard wire or by wifi/internet using an iPhone or Ipad through the mobile lynx app.
- The pump station was supplied by Watertronics incorporating the latest available technology including VFD (variable frequency drive) & EBV (electronic butterfly valves). The PLC contains a CPU and touch screen controls allowing infinite adjustment and control.

- The water management is a combination of state of the art technologies that apply the appropriate amount of supplemental water in an efficient manner (precision application of water and efficient pumping, based on detailed soil moisture and turfgrass analysis), proper plant selection (drought, disease and salt tolerant turfgrass varieties - *zoysiagrass* and *Seashore Paspalum*) and cultural maintenance practices that provide adequate turf quality while minimizing the use of water and pesticides.

ENERGY

GOAL: To minimize overall consumption minimize fossil fuels, maximizing the use of renewables.

Key achievements

Designing out demand

- The main source of energy is the electric power (about three quarters of Brazil's power comes from hydro-electric dams) but the primary objective will be to continually reduce energy consumption from non-renewable resources, e.g. in the near future it is expected that the clubhouse will use renewable energy sources (solar) to heat water (baths and kitchens).
- The irrigation system is pressurized with the most up-to-date energy efficient pump system in order to adequate the pressure demand to a minimum, thus having the effect of reducing pressure loss by friction in pipework.
- The clubhouse design includes passive design features, e.g. good thermal insulation, correct choice of materials, correctly sized roof overhangs and other forms of shading to cut unwanted light and heat, use of thermal mass available in the building's structure to moderate temperatures and to provide heating and building shape (cross-flow passive ventilation) .

- The golf course construction utilised on-site materials – earth-shifting from within the site – minimising transportation.

Efficiency

- Use of most efficient turf maintenance machinery (hybrid mowers and equipment that use bio-degradable oils).

SUPPLY CHAIN

GOAL: To maximize the use of local, recycled materials and strive for long term zero waste operations.

Key achievements

Purchasing policy

- Strategic partnerships were established with local suppliers and distributors and the project promoted the use of natural materials existing on-site or produced in Brazil. More than 90% of all construction materials were sourced from within 400 km of the site.

Recycled and recyclable products and materials

- 100% recycled pathway material made from selected slate quarry waste, which was available locally.
- The clean waste wood from the implementation of the exotic vegetation control program were recycled and used as mulches for the planting and transplanting operations.
- The excavated soil was re-used on-site, during the construction of the golf course.

POLLUTION

GOAL: To minimize all pollution risks to air, water and soil.

Key achievements

- A specific environmental monitoring programme was implemented during the construction in order to guarantee an adequate control of environmental aspects.
- No herbicide is used to control weeds in the golf course. The weeds are removed manually when they do appear.
- All Jacobsen equipment uses GreensCare™, a 96% biodegradable hydraulic fluid made of renewable seed-oil based product.
- All vehicles and equipment are cleaned in a designated area. The cleaning process includes blowing off the entire vehicle with high pressure air before placing it in the wash both. The wastewater drain is connected to an oil/water separator, preventing wash water from draining directly into soils, ground water or public sewer.
- The fuel storage tank is sited on an impervious surface within an oil-tight bund wall. The containment bund has a roof to prevent rainwater entering the bund and the drainage is linked to the wastewater treatment system (oil/water separator).

COMMUNITY

GOAL: Consult with stakeholders to maximize the short and long-term socio-economic benefit of the golf facility.

Key achievements

Local jobs and other community benefits

- The majority of the construction workforce came from the local community. The operational workforce (maintenance crew) has also a large proportion of local hired workers.
- Programmes dealing with workforce upgrade as well as environmental and wildlife conservation and preservation are being developed – using the project as opportunity to educate and involve local schools and local environmental groups (e.g. birdwatching, bird observation stations and observation towers).
- The new Restinga nursery (6,300 m²), located near the Clubhouse, will continue to provide seedling from native and autochthonous species to ensure a sustainable management of the Restinga Habitat in the Rio de Janeiro region.
- ECP has started to implement the Management and Observation of the Capybara (*Hydrochoerus hydrochaeris*, Linnaeus 1766) Population Programme (ECP, August 2015). The programme conducted with free-living animals in their natural habitat, focus on observation and management of the local Capybara population, a wild herbivore, considered the largest rodent, with the aim of learning about the ecology of the population in the field.
- ECP and the BGC are studying the possibility of creating a biking & walking trail along the lagoon, connecting the golf facility with the Marapendi Park, and installing a bird watching tower near the irrigation lake.
- The actual Olympic golf course features an 18-hole championship golf course, practice area - driving range with four practice targets, putting green and a short game practice area with green and greenside bunker and four practice

holes, which is an ideal configuration to accommodate beginners, families and advanced golfers alike. The configuration of the nine target greens can be used in one of three ways: as a 4-hole short game practice course; as a 9-hole short course - ideal to give new golfers competition experience or as an entirely new 'game within the game' via target zones on the greens and a scoring system.

Leadership in the Community

- The City of Rio Janeiro Administration and the Brazilian Golf Confederation have agreed on an Olympic Golf Course's post-games operational programme to achieve a sustainable Legacy, established in the Concession Usage Agreement, signed for 10 years period with possibility of renewal for another 10 years period.

The agreement establishes that the golf facility will be free-access to the public and the development and implementation of four centres:

- An environmental education centre to increase awareness about the environment and sustainable golf development at the local schools and communities,
- A knowledge & technical centre for youth ages 14-18, to promote social inclusion through sport, in partnership with technical schools and universities, offering caddie, coach and referee development programs and specialised vocational training in greenkeeping and sports turf, Machine Operator and environmental management.
- A high performance golf centre – Academy - to improve the quantity and the quality of the Brazilian players at the world ranking,
- and a development golf centre to grow the quantity of new golf practitioners through programs like "Golfe para a Vida" (golf for life in English), in partnership with public and private schools and/or other communities.

7. ROADMAP

The Olympic Golf Course Sustainable Blueprint was developed and is being implemented since April 2013. The Sustainable Blueprint provides a comprehensive understanding of the sustainability vision and principles, and outlines a roadmap showing how these are translated into real world deliverables in all stages of the Olympic Golf Course project.

The table presents an overview of compliance with the intentions of the Sustainability Blueprint.

THEME	GOAL	TARGET AREAS	PROJECT TARGETS	% COMPLETE	VERIFIER REMARKS – Incl. Mitigation Measures
NATURE	To regenerate and enhance the ecosystem and provide long term protection of the flora and fauna of the site and its immediate surroundings	LANDSCAPE	Minimize change of elevations across the site	100	The golf course (greens, tees, fairways, roughs and lakes) occupied the already cleared and degraded areas, adapting to the morphological and topographical characteristics of the ground and protecting, whenever possible, areas of higher density of vegetation and wetlands.
			Retain maximum hectares of native grasslands of high nature conservation value.	100	<p>The project team has reduced project environmental impacts by:</p> <p>Reviewing the orientation of practice ground and academy to retain further natural habitat;</p> <p>The initial design of the golf course was also altered (holes #3, #5, #12, #13, #14 and #15) to retain further natural habitat;</p> <p>Transplanting of native restinga vegetation salvaged from where construction was planned - with the changes introduced to the design of the golf course, the initial area of transplanting of approx. 57,000 m² was reduce to 14.200 m².</p> <p>Reducing the number of lakes, from 4 to 2, the area and the depth of each lake, from 12m to 4m, promoting the natural infiltration (no liner), and retaining further natural habitat. The area of the irrigation lake was reviewed and reduced from 15,000 m² to 12,550 m² and the area of the retention lake from 40,000 m² to 30,517 m² to retain further natural habitat.</p>

THEME	GOAL	TARGET AREAS	PROJECT TARGETS	% COMPLETE	VERIFIER REMARKS – Incl. Mitigation Measures
			Transplant minimum hectares of native species to similar conditions on site	100	<p>A full time botanist (Mario Rotnitzky) has employed to identify all plants and develop native plant nursery on site.</p> <p>Transplanting of native restinga vegetation salvaged from where construction was planned - with the changes introduced to the design of the golf course, the initial area of transplanting of approx. 57,000 m² was reduce to 14.200 m².</p>
			Maintain a 'brown' golf course style	100	<p>The use of the latest cultivar of <i>Seashore Paspalum</i> grass (greens) and <i>Zeon Zoysia</i> grass (fairways, roughs and tees, 80% of the grassed area) will reduce the use of water to minimum values.</p> <p><i>Zeon Zoysia</i> grass uses between 30 and 40 percent less water and fertilizer, is drought tolerant and able to persevere through extreme conditions. With cold weather and long periods without water, <i>Zeon Zoysia</i> will "dim out" to a muted green and ultimately, light brown.</p>
			Single storey clubhouse and maintenance facility to improve landscape integration	100	The clubhouse and maintenance facility are single-storey buildings.
			Incorporate green roof design to clubhouse roof utilizing with 100% being sourced from on-site nursery stock.	0	The Clubhouse building does not feature a green roof yet
			Soft landscape approach to all car park areas and areas immediately adjacent to clubhouse and maintenance facility	100	Tree and shrubs planting and native planting screens were considered, providing quality and integrated green space. The Clubhouse has permeable parking areas (permeable pavers with gravel fill).

THEME	GOAL	TARGET AREAS	PROJECT TARGETS	% COMPLETE	VERIFIER REMARKS – Incl. Mitigation Measures
		ECOSYSTEMS	Regenerate maximum hectares of naturalized vegetation between holes, around tees and greens.	90	<p>The re-naturalised areas were restored as natural habitats, utilizing the dominant naturally occurring species on site.</p> <p>The area had its vegetal species from exotic origin removed, the totally of its native origin vegetation was preserved and there was an enriching process of its vegetation with seedling from native and autochthonous species produced at the local nursery.</p> <p>More than 15.000 individuals were transplanted.</p> <p>The golf course project involved the planting of more than 500,000 seedlings of 54 species and the habitat area has increased 159% (from 128 500 m² to 332 500 m²).</p> <p>After the Olympic Games, the BGC will consider modest amendments to the golf course to reduce maintenance costs.</p>
			Create more than 10 hectares habitat that mimics and connects with the existing ecosystems and contributes to the green infrastructure of Rio City Hall	100	<p>Re-naturalized areas = approx.. 33 ha, with 100% locally site-sourced native plants. Due to exotic plant removal and re-naturalization efforts, the project created more than 33 hectares of natural habitat – Restinga habitat.</p> <p>The main existing ecological corridor - the Marginal Strip Protected area (approx.. 9 ha) facing the Marapendi Lagoon, was not affected by the golf course construction and remained intact during the implementation of the project.</p> <p>The other existing ecological corridors in the area are the patches of native vegetation (fragments of the restinga habitat) were maintained or recovered, connecting on-site</p>

THEME	GOAL	TARGET AREAS	PROJECT TARGETS	% COMPLETE	VERIFIER REMARKS – Incl. Mitigation Measures
					habitats into the wider network - the Parque Natural Municipal de Marapendi, the Nelson Mandela Parke and the network of urban parks and green corridors in the city of Rio de Janeiro.
			Monitor sensitive areas and ecological corridors within the venue that require continued attention	100	<p>Monitoring and reporting schedule based on permit requirements. Monitoring results were reported to and verified by the Local Authority (SMAC and INEA).</p> <p>Monitoring is an integral part of the restoration process. Implementation of the monitoring plan:</p> <ul style="list-style-type: none"> • Pre-construction monitoring and monitoring during construction - from April 2013 to December 2015 • Post-construction monitoring – Since January 2016
		SPECIES	Monitor protected species on-site and implement conservation plan	100	<p>A pre-construction survey was conducted prior to the start of construction. An operational plan and a monitoring program for habitat dynamics and diversity was developed and implemented during the construction phase to ensure a sustainable management of the Restinga Habitat.</p> <p>Monitoring results are reported to and verified by the Local Authority ((SMAC and INEA).</p> <p>The Capivara protection and management plan will be implemented during the project life cycle.</p> <p>Monitoring and reporting (water, air, noise, fauna and flora) will continue during the operational phase.</p>

THEME	GOAL	TARGET AREAS	PROJECT TARGETS	% COMPLETE	VERIFIER REMARKS – Incl. Mitigation Measures
			Increase the number of native species	100	<p>The habitat diversity has also increased. 2014-2015 monitoring reports indicate the overall number of mammals, birds, reptiles, and amphibians (targeted animal species) has significantly increased over the year.</p> <p>Since the initial Fauna inventory (June 2013), the counting went from 118 species to 263 species (November 2015), including mammals (16), avifauna (143), reptiles (42), fish (8) and insects (54).</p>
			Zero net loss of protected fauna and associated habitat and feeding grounds	100	<p>The replantation process is considered the largest restinga vegetation recovery in Brazil. More than 15.000 individuals were transplanted and more than 33 ha of resting habitat were re-naturalised/preserved.</p> <p>The golf course project involved the planting of more than 500,000 seedlings of 54 species and the habitat area has increased 159% (from 128 500 m² to 332 500 m²).</p> <p>Monitoring results show Zero net loss of protected fauna.</p>
			Zero net loss of protected flora	100	<p>Up to now, the monitoring reports demonstrate the success of 95% of transplanted specimens.</p>
			All existing mature trees retained	100	<p>Tree survey. Transplants - Up to now, the monitoring reports demonstrate the success of 95% of transplanted specimens.</p> <p>Monitoring results are reported to and verified by the Local Authority (SMAC and INEA).</p>
			Remove existing exotic species using non-chemical means	100	<p>A non-chemical, non-toxic, method has been successfully used to remove and control exotic species.</p>

THEME	GOAL	TARGET AREAS	PROJECT TARGETS	% COMPLETE	VERIFIER REMARKS – Incl. Mitigation Measures
					<p>Site Clearance Plan – only individuals from exotic species and invasive exotic species were removed, and those of native origin were totally preserved and transplanted, not occurring the suppression of Mata Atlântica vegetation and protected species.</p> <p>A control plan is being implemented to ensure the restinga is maintained (versus recolonised with invasive species).</p> <p>Monitoring results are reported to and verified by the Local Authority (SMAC and INEA).</p>
			Minimize impact on local fauna during construction	100	<p>The wildlife management plan has been proven effective by rigorous evaluation of key species (fauna monitoring reports verified by the Local Authority).</p> <p>During the construction period, all the rescued individuals in the project area were marked and transferred to be release at the Municipal Natural Park of Marapendi, following the procedures presented in the monitoring reports and approved by SMAC and INEA.</p>

THEME	GOAL	TARGET AREAS	PROJECT TARGETS	% COMPLETE	VERIFIER REMARKS – Incl. Mitigation Measures
ENERGY	To minimize overall consumption of fossil fuels, maximizing the use of renewables	DEMAND	<u>GOLF COURSE</u>		
			Golf course irrigated area limited to 40 hectares	100	The design has continually evolved toward minimising the area of intensively-managed turf to 35 hectares, the absolute minimum required to create a playable golf course for all skill levels (36% of the total area).
			Additional non-irrigated maintained areas within the development site limited to 10 hectares	100	Bunkers – 4,4 ha Other areas – 8 ha - During the construction phase, the detailed design has continually evolved toward minimizing the area of intensively-managed turf to the absolute minimum required to create a playable golf course for all skill levels, taking into consideration the source of water supply and the optimization of the golf course irrigation. These areas were complemented, where necessary, with the use of indigenous local grass species.
			Best available technologies to be used for irrigation system spec.	100	The irrigation system is controlled by the Toro Lynx NSN Mobile system. The golf course as installed design has 2000 DT series valve in head sprinklers including T7 and bunker spray heads. The design is a prescription irrigation system meaning that each individual head can be controlled as and where necessary saving valuable water volume with very little waste. The irrigation can be controlled directly from the computer by hard wire or by wifi/internet using an iPhone or Ipad through the mobile lynx app.

THEME	GOAL	TARGET AREAS	PROJECT TARGETS	% COMPLETE	VERIFIER REMARKS – Incl. Mitigation Measures
			Create 'brown' golf course with less water and chemical inputs than a 'standard' golf course	100	<p>The use of the latest cultivar of <i>Seashore Paspalum</i> grass (greens) and <i>Zeon Zoysia</i> grass (fairways, roughs and tees, 80% of the grassed area) will reduce the use of water to minimum values.</p> <p><i>Zeon Zoysia</i> grass uses between 30 and 40 percent less water and fertilizer, is drought tolerant and able to persevere through extreme conditions. With cold weather and long periods without water, <i>Zeon Zoysia</i> will "dim out" to a muted green and ultimately, light brown.</p> <p>No herbicide is used to control weeds in the golf course. The weeds are removed manually when they do appear.</p>
			<u>CLUBHOUSE FACILITY</u>		
			Maximizing use of passive building design principles	100	The clubhouse design includes passive design features, e.g. good thermal insulation, correct choice of materials, correctly sized roof overhangs and other forms of shading to cut unwanted light and heat, use of thermal mass available in the building's structure to moderate temperatures and to provide heating and building shape (cross-flow passive ventilation).
			Scalable "modular" pavilion style for clubhouse extension ensures not "over constructed" at start	100	
			Use of sustainable refrigeration technology and use of individual air conditioner units per room to improve flexibility and accuracy control	50	Individual air conditioner units per room to improve flexibility and accuracy control

THEME	GOAL	TARGET AREAS	PROJECT TARGETS	% COMPLETE	VERIFIER REMARKS – Incl. Mitigation Measures
		SOURCES	100% of clubhouse cooking to use LPG	TBC	ECP was able to provide the relevant evidence. Documentary evidence be provided by RJZ Cyrela (Brazilian building construction company and real estate developer).
			Efficient Vehicles to be used – Incl. solar powered buggies, bio-diesel machinery	75	Golf buggies – There are no golf carts, the golf course was specifically designed for walking golfers. Machinery – some mowers are hybrid powered. All Jacobsen equipment uses GreensCare™, a 96% biodegradable hydraulic fluid made of renewable seed-oil based product. It was developed in 1997 and has been factory-filled in Jacobsen products since 2002.
			Irrigation pump system to be high efficiency model	100	The pump station was supplied by Watertronics incorporating the latest available technology including VFD (variable frequency drive) & EBV (electronic butterfly valves). The PLC contains a CPU and touch screen controls allowing infinite adjustment and control.
			Best available technologies to be used for lighting fixtures and appliances in Clubhouse and Maintenance facilities	0	At the moment, all lighting fixtures are conventional - LED lighting products – ECP/BGC are currently analysing the feasibility of purchasing LED spotlights.

THEME	GOAL	TARGET AREAS	PROJECT TARGETS	% COMPLETE	VERIFIER REMARKS – Incl. Mitigation Measures
SUPPLY CHAIN	Maximize the use of local, recycled materials and strive for long term zero waste	PURCHASING POLICY	An environmental and ethical procurement policy will adopted	100	
			100% of sand quarried on-site to be utilized for greens construction root zone material	100	<p>The golf course construction utilised on-site materials – earth-shifting from within the site – minimising transportation.</p> <p>The excavated soil was re-used on-site, during the construction of the golf course.</p> <p>100% recycled pathway material made from selected slate quarry waste, which was available locally.</p>
		Maximum of materials to comply with 'Harmful Substances and Materials Guide – Rio 2016'	TBC	ECP was able to provide the relevant evidence. Documentary evidence be provided by RJZ Cyrela (Brazilian building construction company and real estate developer).	

THEME	GOAL	TARGET AREAS	PROJECT TARGETS	% COMPLETE	VERIFIER REMARKS – Incl. Mitigation Measures
		SUPPLIERS	90% of all construction materials to be sourced from within 400 km of site.	100	<p>Strategic partnerships were established with local suppliers and distributors and the project promoted the use of natural materials existing on-site or produced in Brazil.</p> <p>More than 90% of all construction materials were sourced from within 400 km of the site.</p> <p>Bladerunner Farms, in Texas, shipped <i>Zeon Zoysia</i> to a grower in Brazil - Green Grass Brazil, a local licensed sod producer of both grass varieties used on the course — <i>Zeon Zoysia</i> and <i>SeaDwarf Seashore Paspalum</i>. Green Grass Brazil has grown the grass on its Brazilian sod farms for planting directly onto the Olympic Golf Course.</p> <p>Jacobsen was confirmed as the preferred supplier of the mowing equipment in the spring of 2014. One of the deciding factors was that Jacobsen has a local distributor in Brazil - ProGolf Brazil has represented the Jacobsen brand in Brazil since 2012.</p>
			100% of timber, glues, seed and turf to be supplied by Brazilian companies and timber to be FSC cert.	50	<p>Timber, Chemical, Fertilizers, Seed and Turf supplied by Brazilian Companies</p> <p>FSC certified Wood - ECP was able to provide the relevant evidence. Documentary evidence be provided by RJZ Cyrela (Brazilian building construction company and real estate developer</p>
			Commission local building architect to design low impact passive clubhouse	100	RUA Arquitetos, local building architects, designed the Clubhouse as a high performance green building.

THEME	GOAL	TARGET AREAS	PROJECT TARGETS	% COMPLETE	VERIFIER REMARKS – Incl. Mitigation Measures
			Create on-site turf nursery and tree nursery	100	<p>As a direct result of the forest management plan, the existing local nursery was scaled-up (5,200 m²), in to order fully restore and enhance degraded areas, enrich local biological diversity and improve the function of the Restinga ecosystem.</p> <p>During the construction phase, the local nursery produced more than 500,000 seedlings of 54 species.</p> <p>Due to its location (located in the future Clubhouse/Academy area), the Nursery was “deactivated”.</p> <p>A new nursery was built on site, near the Clubhouse and the buildable land.</p> <p>The new nursery (6,300 m²) will be dedicated to supplying exclusively local native species for revegetation and landscaping projects.</p> <p>The new nursey will also continue to provide seedling to ensure a sustainable management of the Restinga Habitat in the Rio de Janeiro region.</p>
			100% of hard landscape path materials to be locally produced	100	100% recycled pathway material made from selected slate quarry waste, which is available locally.
			Environmental awareness training for all sub-contractors	100	Environmental Education and Training Workforce Plan implemented during the construction phase.

THEME	GOAL	TARGET AREAS	PROJECT TARGETS	% COMPLETE	VERIFIER REMARKS – Incl. Mitigation Measures
WATER	e.g. To minimize overall consumption, diversify sources and enhance quality	DEMAND	Golf course irrigated area limited to less than 50% of the site	100	Irrigated area = 35 ha (36% of the site).
			Grass species selection to be Zeon Zoysia for fairways and rough and Seashore Paspalum for greens and surrounds equal to one third of 'standard' grass species requirements	100	<p>The use of the latest cultivar of <i>Seashore Paspalum</i> grass (greens) and <i>Zeon Zoysia</i> grass (fairways, roughs and tees, 80% of the grassed area) will reduce the use of water to minimum values.</p> <p><i>Zeon Zoysia</i> grass uses between 30 and 40 percent less water and fertilizer, is drought tolerant and able to persevere through extreme conditions.</p> <p>The architect's vision and the sustainability blueprint were focused on water conservation. The water management is a combination of state of the art technologies that apply the appropriate amount of supplemental water in an efficient manner (precision application of water and efficient pumping, based on detailed soil moisture and turfgrass analysis), proper plant selection (drought, disease and salt tolerant turfgrass varieties - zoysiagrass and Seashore Paspalum) and cultural maintenance practices that provide adequate turf quality while minimizing the use of water and pesticides.</p>

THEME	GOAL	TARGET AREAS	PROJECT TARGETS	% COMPLETE	VERIFIER REMARKS – Incl. Mitigation Measures
		SOURCES	Existing on-site water sources to be used. Lower quality surface water to be extracted, deeper aquifer water only to be used to replenish.	100	<p>Irrigation water source – The strategy for the management of the water consumption associated with the irrigation of the golf course provides for use of lower quality surface water as the only source of water supply.</p> <p>The water use to irrigate the golf course comes from the irrigation lake. Both lakes were built in artificially depressions, created as a result of sand mining activity, and are formed by the outcropping of the groundwater table and their recharging capacity has been sufficient to serve the irrigation needs.</p>
			Rainwater from clubhouse and maintenance facility to be harvested and recycled	0	
			Less than 5 hectares of open water is being created, lakes to have littoral shelves and shallow margins	100	2 lakes = 4,6 ha
		EFFICIENCY	Best available Toro sensors, mapping and irrigation technology to be used	100	The irrigation system is controlled by the Toro Lynx NSN Mobile system. The golf course as installed design has 2000 DT series valve in head sprinklers including T7 and bunker spray heads. The design is a prescription irrigation system meaning that each individual head can be controlled as and where necessary saving valuable water volume with very little waste. The irrigation can be controlled directly from the computer by hard wire or by wifi/internet using an iPhone or Ipad through the mobile lynx app.

THEME	GOAL	TARGET AREAS	PROJECT TARGETS	% COMPLETE	VERIFIER REMARKS – Incl. Mitigation Measures
			Piped drainage outlets from clubhouse to be routed through sustainable drainage features before leaving the site	25	The Maintenance Facility - the water collected from the washpad is treated (oil/water separator) before discharge into the sanitary sewer system. The Clubhouse and the maintenance building are provided with a connection to the municipal sanitary sewer system and water system for all human needs.
			Best available technologies to be used for water fixtures in Clubhouse and Maintenance facilities	TBC	ECP was able to provide the relevant evidence. Documentary evidence be provided by RJZ Cyrela (Brazilian building construction company and real estate developer).
POLLUTION	e.g. To minimize all pollution risks to air, water and soil	SOIL	Disturbed area / extent of earthworks limited	100	The earth-movement was minimized in order to retain and enhance the authentic sense of place and natural beauty of the site. The golf course (greens, tees, fairways, and semi-roughs/roughs and lakes) occupied the already cleared and degraded areas, adapting to the morphological and topographical characteristics of the ground and protecting, whenever possible, areas of higher density of vegetation and wetlands

THEME	GOAL	TARGET AREAS	PROJECT TARGETS	% COMPLETE	VERIFIER REMARKS – Incl. Mitigation Measures
			Erosion control measures implemented on all exposed soil areas and steep slopes	0	
		WATER	Water outlets from Clubhouse to be filtered through Sustainable Drainage features prior to leaving site	50	<p>The property is connected to the City's wastewater system.</p> <p>Sustainable drainage systems (Suds) - The Clubhouse project incorporates a green roof design (not built yet), and more natural features such as a small pond. A translucent roof captures rain water and the main purpose of the sustainable drainage system is to mimic the natural drainage of the site before development. This is achieved by capturing rainfall and allowing as much as possible to evaporate or soak into the ground close to where it fell.</p> <p>The Maintenance facility - Maintenance is performed in covered or indoor maintenance areas where potential pollutants cannot be introduced into stormwater drainage systems. All vehicles and equipment are cleaned in designated area. The wastewater drain is connected to an oil/water separator, preventing wash water from draining directly into soils, ground water or public sewer</p> <p>The fuel storage tank is sited on an impervious surface within an oil-tight bund wall. The containment bund has a roof to prevent rainwater entering the bund and the drainage is linked to the wastewater treatment system (oil/water separator).</p>

THEME	GOAL	TARGET AREAS	PROJECT TARGETS	% COMPLETE	VERIFIER REMARKS – Incl. Mitigation Measures
			Create 'brown' golf course with 25% less water and chemical inputs than a 'standard' golf course	100	<p>The use of the latest cultivar of <i>Seashore Paspalum</i> grass (greens) and <i>Zeon Zoysia</i> grass (fairways, roughs and tees, 80% of the grassed area) will reduce the use of water to minimum values.</p> <p><i>Zeon Zoysia</i> grass uses between 30 and 40 percent less water and fertilizer, is drought tolerant and able to persevere through extreme conditions. With cold weather and long periods without water, <i>Zeon Zoysia</i> will "dim out" to a muted green and ultimately, light brown.</p>
			30m minimum depth of buffer zone adjacent to existing wetland area	100	The main existing ecological corridor - the Marginal Strip Protected area (a 30m minimum depth of buffer zone) facing the Marapendi Lagoon, was not affected by the golf course construction and remained intact during the implementation of the project.
			All water inlets and outflows to be monitored	75	<p>Artificial Lakes (2) - Quarterly Water Quality Monitoring Report.</p> <p>Monitoring results are reported to and verified by the Local Authority (SMAC and INEA).</p>
		EMISSIONS	Disturbed area / extent of earthworks limited	100	<p>Air quality - Quarterly Water Quality Monitoring Report. Monitoring results are reported to and verified by the Local Authority (SMAC and INEA).</p> <p>Trucks were washed off before they leave the site and water was applied to exposed soil surfaces at the construction site as frequently as necessary to control fugitive dust emissions.</p>

THEME	GOAL	TARGET AREAS	PROJECT TARGETS	% COMPLETE	VERIFIER REMARKS – Incl. Mitigation Measures
			Efficient Vehicles to be used – Incl. solar powered buggies, bio-diesel machinery	75	Golf buggies – There are no golf carts, the golf course was specifically designed for walking golfers. Machinery – some mowers are hybrid powered.
			90% of all construction materials to be sourced from within 400km of site	100	Strategic partnerships were established with local suppliers and distributors and the project promoted the use of natural materials existing on-site or produced in Brazil. More than 90% of all construction materials were sourced from within 400 km of the site. The golf course construction utilised on-site materials – earth-shifting from within the site – minimising transportation. Lakes - The excavated soil was re-used on-site, during the construction of the golf course. Exotic vegetation control program - The clean waste wood from the implementation of the program were recycled and used as mulches for the planting and transplanting operations.
			Efficient logistics plan to minimize quantity of deliveries to site	100	

THEME	GOAL	TARGET AREAS	PROJECT TARGETS	% COMPLETE	VERIFIER REMARKS – Incl. Mitigation Measures
			<p>Maintenance facility to use best available technology and methods in pollution prevention controls</p>	<p>50</p>	<p>The Maintenance facility was planned and designed to be state-of-the-art maintenance facility.</p> <p>All equipment and vehicles are properly tuned and maintained.</p> <p>All vehicles and equipment are cleaned in a designated area. The cleaning process includes blowing off the entire vehicle with high pressure air before placing it in the wash both. The wastewater drain is connected to an oil/water separator, preventing wash water from draining directly into soils, ground water or public sewer</p> <p>The fuel storage tank is sited on an impervious surface within an oil-tight bund wall. The containment bund has a roof to prevent rainwater entering the bund and the drainage is linked to the wastewater treatment system (oil/water separator).</p> <p>Equipment Storage and Mechanics Repair areas, Grinding room, Oil and lubrication storage rooms have a sealed concrete floor with chemically resistant pain. Storage vessels are labelled to show their contents and kept as close to the point of use and as far from surface water drains as possible. Liquid hazardous materials and hazardous waste containers are provided with secondary containment to prevent or minimize the possibility of accidental release.</p> <p>The Course Superintendent ensures that ensures that chemicals, petroleum, and other controlled products are used, stored, and disposed of in accordance with BMPs and local regulations.</p>

THEME	GOAL	TARGET AREAS	PROJECT TARGETS	% COMPLETE	VERIFIER REMARKS – Incl. Mitigation Measures
			Low or zero solvent products for clubhouse - e.g. ochre paints, no epoxy resins, avoiding glass fibre insulation materials	TBC	ECP was able to provide the relevant evidence. Documentary evidence be provided by RJZ Cyrela (Brazilian building construction company and real estate developer).
			Implement waste recycling program	75	<p>During construction, it was possible to valorise an important proportion of wood wastes for the making of substrates.</p> <p>The clean waste wood from the implementation of the exotic vegetation control program were recycled and used as mulches for the planting and transplanting operations.</p> <p>The excavated soil was re-used on-site, during the construction of the golf course.</p> <p>100% recycled pathway material made from selected slate quarry waste, which was available locally.</p>
COMMUNITY	e.g. To help build an enhanced sense of identity, self-sufficiency, and quality of life for the local	ACCESSIBILITY	Local membership incentive	TBD	Olympic Golf Course's post-games operational programme - The agreement between the City of Rio Janeiro Administration and the Brazilian Golf Confederation establishes that the golf facility will be free-access to the public.
			Tee time pricing structure	TBD	Olympic Golf Course's post-games operational programme - a green-fee structure will be defined and released to the public from September 2016 on, with the objective of promoting and growing the sport golf in the City and Brazil.
			Clubhouse programme to adapt post games to improve accessibility for local community	TBD	Olympic Golf Course's post-games operational programme - The agreement establishes that the golf facility will be free-access to the public.

THEME	GOAL	TARGET AREAS	PROJECT TARGETS	% COMPLETE	VERIFIER REMARKS – Incl. Mitigation Measures
		LOCAL COMMUNITY	Programs dealing with local employment opportunities. jobs are intended to be created	TBD	<p>The majority of the construction workforce came from the local community. The operational workforce (maintenance crew) has also a large proportion of local hired workers.</p> <p>Programmes dealing with workforce upgrade as well as environmental and wildlife conservation and preservation are being developed – using the project as opportunity to educate and involve local schools and local environmental groups.</p> <p>Olympic Golf Course’s post-games operational programme - The agreement establishes the development and implementation of four centres: An environmental education centre, a knowledge & technical centre, a high performance golf centre and a development golf centre.</p>
			Golf academy – using driving range area post games to provide academy space / short course / Brazilian golf camps with access for local groups, juniors, PGA teacher, Confederation of Golf Brazil initiatives.	100	<p>The actual Olympic golf course features an 18-hole championship golf course, practice area - driving range with four practice targets, putting green and a short game practice area with green and greenside bunker and four practice holes, which is an ideal configuration to accommodate beginners, families and advanced golfers alike.</p> <p>The configuration of the nine target greens can be used in one of three ways: as a 4-hole short game practice course; as a 9-hole short course - ideal to give new golfers competition experience or as an entirely new ‘game within the game’ via target zones on the greens and a scoring system.</p>

THEME	GOAL	TARGET AREAS	PROJECT TARGETS	% COMPLETE	VERIFIER REMARKS – Incl. Mitigation Measures
			Environmental and wildlife conservation and preservation initiatives --- using the initiatives as opportunities to educate and involve local school groups	TBD	Olympic Golf Course’s post-games operational programme - The agreement establishes the development and implementation an environmental education centre, to increase awareness about the environment and sustainable golf development at the local schools and communities.
			Local environmental groups provided with opportunities to access the site - funding initiatives to create bird hides and increase habitat opportunity.	TBD	ECP and the BGC are studying the possibility of creating a biking & walking trail along the lagoon, connecting the golf facility with the Marapendi Park, and installing a bird watching tower near the irrigation lake.

THEME	GOAL	TARGET AREAS	PROJECT TARGETS	% COMPLETE	VERIFIER REMARKS – Incl. Mitigation Measures
		LOCAL LEADERSHIP	Education and training centre of excellence for Brazil and South American golf, and post-Olympic sport surface management to be installed with active outreach to schools and colleges	TBD	<p>Olympic Golf Course’s post-games operational programme - The agreement establishes the development and implementation of a knowledge & technical centre, a high performance golf centre and a development golf centre:</p> <ul style="list-style-type: none"> • A knowledge & technical centre for youth ages 14-18, to promote social inclusion through sport, in partnership with technical schools and universities, offering caddie, coach and referee development programs and specialised vocational training in greenkeeping and sports turf, Machine Operator and environmental management. • A high performance golf centre – Academy - to improve the quantity and the quality of the Brazilian players at the world ranking, • A development golf centre to grow the quantity of new golf practitioners through programs like “Golfe para a Vida” (golf for life in English), in partnership with public and private schools and/or other communities.

THEME	GOAL	TARGET AREAS	PROJECT TARGETS	% COMPLETE	VERIFIER REMARKS – Incl. Mitigation Measures
			<p>Use Olympics 2016 momentum to promote and develop other stakeholder commitments e.g. a local parks initiative, raising awareness of mangrove and lagoon ecology, cycle tracks</p>	<p>50</p>	<p>The new Restinga nursery (6,300 m²), located near the Clubhouse, will continue to provide seedling from native and autochthonous species to ensure a sustainable management of the Restinga Habitat in the Rio de Janeiro region.</p> <p>ECP has started to implement the Management and Observation of the Capybara (<i>Hydrochoerus hydrochaeris</i>, Linnaeus 1766) Population Programme. The programme conducted with free-living animals in their natural habitat, focus on observation and management of the local Capybara population, a wild herbivore, considered the largest rodent, with the aim of learning about the ecology of the population in the field.</p> <p>ECP and the BGC are studying the possibility of creating a biking & walking trail along the lagoon, connecting the golf facility with the Marapendi Park, and installing a bird watching tower near the irrigation lake.</p>

8. CONTINUED DEVELOPMENT POINTS

As part of the BGC's continuing efforts at the Olympic golf course to promote sustainable development, listed below is a set of key points to be used as a guide for those next steps. These working points show the strength of vision of the development and demonstrate a commitment to the long-term legacy of the project:

- Artificial lakes - establish and maintain riparian buffers along shoreline. Maintenance and restoration of shoreline vegetation allows native plants to fill in the shoreland zone and increase biodiversity, wildlife habitat and protect water quality. Buffers help purify water by filtering toxic substances and some pollutants (fertilizers, pesticides) out of runoff from the golf course area, before these substances reach waterbodies. If properly established and maintained, a full riparian buffer can remove at least 50 percent of chemical fertilizers and pesticides. Buffers also help prevent erosion by protecting shoreline from slumping or being washed away and provide food, nesting cover, and shelter for wildlife, including species at risk, providing connecting corridors, enabling wildlife to move safely from one area to another.

- The maintenance facility should be organized for efficient and proper storage of equipment and supplies - remove and replace the two piece overhead doors throughout facility to single roll up doors.

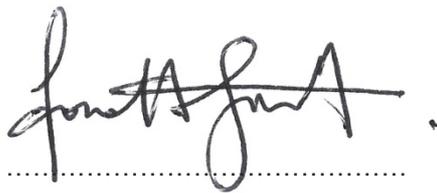
- Complete of wash-down areas - although the wash bay area is linked to an oil/water separator, the whole area should be better isolated from the surrounding area by a raised curb or roll-over bund, with the effluent directed to the oil separator. Moreover, install a recycled closed loop system which also allow chemical mixing and refuelling activities to take place on the same washpad. An average 18-hole club washes an estimated 1100 machinery washes per year. If each wash lasts about 10 minutes and the wash hoses have a flow rate of 30litres / minute, each wash uses approximately 300 litres of water. Over a year this could equate to 330 m³.

- Complete the fertilizer storage area - fertilizers should be stored in a closed, secure storage place to protect the product from the weather (sun, rain etc.). The room should have adequate provisions for ventilation to help dissipate heat. Pallets should be stored in racking or shelving bays. A fork-lift truck or pallet truck should be use when unloading the fertilizer.
- Complete the Irrigation Equipment storage area – irrigation equipment should be stored in a closed, secure storage place. Valuable equipment should be stored in a locked facility that also provides protection from the weather.
- Complete the chemical storage area - the chemical storage area should be well ventilated to the outside. Pesticides should be stored in manner that will prevent direct contact of the material with the floor. All storage racks or shelves should be constructed of non-combustible materials which is easily cleaned. Explosion-proof lights should be used and all light switches should be located on the outside of the building and control the ventilation system so all systems are activated prior to entry. Sufficient absorbent material such as activated charcoal or other chemical absorbents should be available on the premises. Placards should be posted at the entrance of the pesticide storage facility warning of contents within and contact phone number in case of emergency.
- Repair pavement to withstand operational stresses - in some areas the sealed concrete floor with chemically resistant pain is already showing strong signs of degradation.
- A pollution incident response plan should be drawn up and implemented. Staff should be informed of pollution risks and trained in how to deal with spillages on site. Suitable materials and equipment should be held to deal with spillages such as drain covers, absorbent booms, rags, or sandbags.
- Areas where maintenance or dismantling activities are carried out should have a raised edge with drainage to a sealed sump or via an oil separator.
- Liaise with Rio 2016™ Organizing Committee to ensure consistent and coordinated planning for Games time operations.

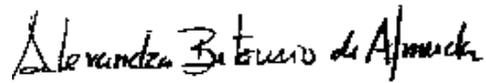
- Improve golf course facility-community interaction. Example: Walking / cycling opportunities - connection with Rio green parks network.

9. RECOMMENDATION

Based on the scope and findings of the verification assessment, the site visited and the available information provided by Fiori/ECP Environmental Solutions, The Recommendation of the Verifier further to the certification review process is that the Olympic Golf Course project should be formally awarded GEO Certified® - Development status for excellence in sustainable golf development.



Jonathan Smith
Chief Executive of GEO



Alexandra Betâmio de Almeida
Verifier for Olympic Golf Course – Rio2016

APPENDIX

LIST OF DOCUMENTS SUBMITTED

Legal requirements:

- Environmental Permit LMI n° 000956/2013, 14/04/2013 (Perfeitura da cidade do Rio de Janeiro, Secretaria Municipal de Meio Ambiente SMAC)
- Permits/licenses/authorizations (Phase I, II and III)
 - Order issued by GLA, 16 de Julho 2013
 - Order issued by SMAC 841/2013, 22 de Julho de 2013
 - Protocol SMAC/CGCA, 6/08/2013
 - Protocol SMAC/CGCA, 18/08/2013
 - Protocolo SMAC/CGCA, 21/08/2013
 - AA N° IN026180 – Environmental authorization to capture, collection, monitoring and transport of wildlife, 11/02/2014 (Instituto Estadual do Ambiente)
- Relatório - Ação Civil Pública n° 0273069-88.2014.8.19.0001 (Basílio Advogados) (report from Fiori's attorneys), 26.10.2015
- Laudo pericial (expert report) Processo 0273069-88.2014.8.19.001, 10/12/2015
- Sistema de Armazenamento e abastecimento de combustíveis líquidos para a área de manutenção e operação do campo de golfe olímpico, Autorização Ambiental Municipal AAM N.º 3/2015, 8.10.2015 (fuel storage permit)

Surveys, plans and Monitoring reports:

Fauna:

- Preliminary inventory of Wildlife – Phase I (April 2013, ECP)
- Wildlife inventory and management plan – Phase I (June and July 2013, ECP)
- Fauna monitoring reports – Phase II (2013: July/August, August/September, September/October, October/November, November December and 2014: December/January, January/February, February/March, ECP)
- Fauna monitoring plan – Phase III (October 2013, ECP)
- Fauna Translocation Plan (December 2013, ECP)
- Fauna monitoring reports – Phase III (March/May 2014, ECP)
- Quarterly Fauna Monitoring Report (March, April and May/June to August/September to November 2014, ECP)

Flora and Lakes:

- Forest management plan - Phase I (April 2013, ECP)
- Native Flora, inventory rev 1, Phase I (April 2013, ECP)
- Native Flora, transplanting plan (April 2013, ECP)
- Native Flora, transplanting and management plan (June 2013, ECP)
- Native Flora, transplanting operations – Drawings Phase II (July 2013, ECP)
- Native Flora - Transplanting and management operations - detailed project , Phase I (July 2013, ECP)
- Native Flora, inventory rev 2, Phase I (August 2013, ECP)
- Flora monitoring reports – Native Flora, transplanting operations – Phase II (2013: July/August, August/September, September/October, October/November, November/December and 2014: December/January, January/February, February/March, ECP)
- Vegetation and exotic control - plan for removal of significant populations of invasive plants in the FMP area - Phase III (October 2013, ECP)
- Lakes permanent monitoring, planting and transplanting operations plan -Phase III (October 2013, ECP)
- Native Flora, transplant operations plan - Final Report (June 2014, ECP)
- Lakes permanent monitoring, planting and transplanting operations - monitoring reports – Phase III (March/May 2014, ECP)
- Quarterly Monitoring Report - artificial lakes and native plant species (post transplanting/planting maintenance) (March to May/June to August/September to November 2014, ECP)
- Artificial Lakes, Water Quality Monitoring Report (March 2015, ECP)

Environmental Management Plan:

- Site waste management plan rev3 (April 2013, ECP)
- Environmental Management Plan (March 2015, ECP)
- Golf Course Composting Management Plan (August 2015, ECP)
- Habitat Management Plan (July 2015, March 2016 ECP)
- Brazilian Golf Confederation - EMP, Monthly Monitoring Report (January 2016, ECP)
- Environmental Signage (January 2016, ECP)

BIDDING DOCUMENTS – reports and drawings:

- “Native / Push-Up” Greens, Construction Process and Technique Specification_1_21_2013
- Olympic Golf Course, Project Information, History, and Participants_1_31_2013

- TECHNICAL BRIEF – VERSION 1, DECEMBER, 2011 (Topographic and soil surveys , Hydrogeological and Geotechnical studies of the area, groundwater quality characterization surveys, geological-geotechnical studies)
- Architect REQUEST FOR PROPOSAL (RFP)

BIDDING DOCUMENTS – Conceptual Design:

- Routing Plan_9_23_12
- Grassing Plan_9_23_12
- Earthwork Plan_9_23_12
- Conceptual Drainage Plan_9_23_12
- Clearing Plan_9_23_12
- Circulation Plan_9_23_12

Golf Course and Building design – reports and drawings:

- Golf Course Drawings – Phase I (cut and fill, grading, grassing, hard landscape, irrigation, masterplan, routing, site clearance, site restoration – November 2012)
- Irrigation design, Larry Rogers Design Group 19 June 2013
- Irrigation design – drawings Toro, Larry Rogers Design Group 18 June 2013
- Buildings design (building permit drawings) – Clubhouse and Maintenance facility (25_July_2013, RUA and October 2013)
- Native Planting Status and golf course punch list (3.10.2015, PGA)
- Review of OGC Construction related Items, Issues/Concerns and Actions Required (08.03.2015, PGA)
- Progress Checklist and Greens, Tees & Approaches and Fairways Agronomy Plan (test event) (08.03.2015, PGA)
- Buildings design (building detail drawings) – Clubhouse (out/2014, Tanedo)
- Buildings design (building detail drawings) – Maintenance Facility (out/2014, Tanedo)
- Buildings design (building detail drawings) – Pumping station (out/2014, Tanedo)

Additional Documents

- GEO LEGACY Manual, 2012
- Technical Guide - Golf facility buildings, 2013
- Evaluation Criteria - Planning, Design and Construction Stage (November, 2013)
- Evidence Documents – Planning, Design and Construction Stage (1st edition, October, 2013)
- Rio 2016™ OLYMPIC GOLF COURSE TECHNICAL BRIEF – VERSION 1, DECEMBER, 2011.

- ESTRATÉGIA DE SUSTENTABILIDADE PARA O PROJETO GOLF RESERVA MARAPENDI (Sustainability strategy for Olympic Golf Project) Julho 2013
- ESTRATÉGIA DE SUSTENTABILIDADE PARA O PROJETO GOLF RESERVA MARAPENDI (Sustainability strategy for Olympic Golf Project), V.2 – October 2013