



Breckland Pines Golf Course
Environmental Baseline Assessment
RAF Lakenheath, England Jul 03



Executive Summary

U. S. AIR FORCE GEM PROGRAM GOALS

The U. S. Air Force Golf Course Environmental Management (GEM) program is a proactive Air Force Center for Environmental Excellence (AFCEE) initiative to foster a better understanding of the environmental challenges facing our golf courses worldwide. Armed with the support and approval of the Air Force Services Agency golf program, AFCEE's goal is to facilitate the creation of an environmentally friendly golf course facility while supporting the mission.

The primary tenets of the GEM Program are to minimize or eliminate potential negative environmental impacts, attain and maintain daily compliance with all appropriate regulations, and constantly examine our processes on all aspects of golf course management to achieve the highest standards of environmental excellence.

GEM PROGRAM PROCESS

There are five steps in the GEM program process.

- Analysis
- Documentation
- Implementation
- Evaluation
- Revision

This report is the result of the analysis step.

BRECKLAND PINES GOLF COURSE LAKENHEATH AB, ENGLAND ENVIRONMENTAL CHALLENGES

The following environmental challenges were identified during the GCEBA process:

- Bird/Wildlife Aircraft Strike Hazard (BASH)
- Aquifer protection
- Garden chafer beetle

Further information on the environmental challenges at Breckland Pines Golf Course can be found in the conclusion of this Golf Course Environmental Baseline Assessment.

WHERE DO WE GO FROM HERE?

The golf course staff should determine their preferred management approach for the challenges above in context with their ongoing goals of providing the best golfing experience for the money. They should then coordinate these practices with the installation environmental staff to ensure their compatibility with installation wide natural resources and environmental goals and objectives followed by implementation.

Table of Contents

Introduction	3
Program Process.....	4
Course Specific Analysis	7
Breckland Pines Golf Course.....	8
Miscellaneous Facility Review	9
Safety, Training, & Awareness	17
Compliance	19
Pesticide Use, Storage, & Handling.....	21
Pollution Prevention	23
Conservation Practices	25
Water Resources	27
Maintenance Practices.....	29
Customer Relations & Education.....	31
Miscellaneous Special Projects & Activities.....	33
ECQ Summary	35
GCEBA Results	35
Conclusion.....	36
Bibliography	40



Another great day begins on the links at RAF Lakenheath.

Introduction

The golf course environmental baseline assessment (GCEBA) is the initial step in the process of creating a successful ecosystem-based Golf Course Environmental Management (GEM) Plan.

The ultimate intent of the program is to provide a foolproof, customer-driven management tool that will free up course managers and superintendents to devote more of their efforts to caring for their customers and the course. Properly designed and implemented, the GEM Plan will keep the facility in compliance with the ever-changing environmental rules and regulations while providing a vital recreational opportunity for the installation.



The 1st tee at Breckland Pines Golf Course beckons from the patio.



Players can play the 9-hole course twice from slightly different tees.

Goal of the GEM Program

The goal of the U. S. Air Force GEM program is to facilitate the creation of an environmentally friendly golf course facility for its customers while supporting the installation mission. The Air Force Center for Environmental Excellence (AFCEE) is dedicated to helping to identify ways that more rounds can be played on better-conditioned courses while minimizing or eliminating negative impacts to the environment. In most cases, the U. S. Air Force's golf courses are being managed compatibly with the environment. The GEM program is the vehicle to document our successes while communicating directly with the golfers, our commanders, and the local community.

Program Process

Implementation is the most important phase of any initiative where practices and procedures are examined and may undergo significant change. This is especially true of the GEM Plan process. The specifics for the GEM Plan components and directions for their completion are delineated on AFCEE's Golf Course Environmental Management web site listed inside the back cover of this report.

The GEM Program is derived from many diverse environmental regimes such as the National Environmental Policy Act, the Environmental Compliance Assessment and Management Program, and the ISO 14000 environmental management system. The primary tenets of the GEM Program are to minimize or eliminate potential negative environmental impacts, attain and maintain daily compliance with all appropriate regulations, and constantly examine our processes on all aspects of golf course management to achieve the highest standards of environmental excellence. There are five basic steps in the implementation of the GEM Program process:

- Analysis
- Documentation
- Implementation
- Evaluation
- Revision



Winter storms can alter golfing plans with little or no notice.



Small, undulating greens add character to the Breckland Pines layout.



Stiff winds and narrow fairways offer the biggest challenges.

Analysis

Experienced environmental managers realize the importance of assembling all of the data relevant to a problem prior to determining its best solution. Analysis is the first and most important task of the golf course environmental baseline assessment (GCEBA) and the GCEBA is the initial step in the process of creating an ecosystem-based Golf Course Environmental Management (GEM) Plan. Properly completing the GCEBA is paramount to the long-term compatibility of an installation's golf course management practices with the GEM Program, and more importantly, the U. S. Air Force's natural resource and environmental management goals and objectives.

GCEBA COMPONENTS

The GCEBA is comprised of the following components:

- Site visit, interviews, and data collection
- Course specific analysis
- Miscellaneous facility review
- Environmental compatibility quotient checklists
- Identification of environmental management challenges
- Summary report

Documentation

It is not enough just to know how to create a successful golf course environmental management program. There has to be a written record of existing site data, maintenance practices, pesticide applications, and other historical golf course activities. By documenting what we know, we will be able to determine how to make better decisions in the future. The completed GEM Plan will be a comprehensive report with a map that will assist in the daily management of the course while providing a convenient vehicle to communicate to our customers the environmental issues that challenge us on our golf course and our plans to deal with them. In order to reach the environmental stewardship goals set by the U. S. Air Force, we must consistently employ only those management practices that minimize or eliminate potential negative impacts to the environment.

GEM PLAN COMPONENTS

The GEM Plan will be comprised of the following components:

- GCEBA report
- Map of the entire golf course facility grounds depicting locations of the significant environmental management challenges and the golf course facilities
- Booklet that describes the environmental management challenges on the GEM Plan map
- Specific practices that will be employed by the golf course staff to deal with each environmental management challenge after coordination with and approval by the installation environmental staff
- Compilation of best management practices employed at the golf course in their implementation of the GEM program recommendations

Implementation

Positive and decisive action is the only true measure of the success of a GEM Program. By implementing new practices, whether to knowingly improve the course's role in the environmental stewardship of the installation or to just try new ideas to determine their value, will the golf staff and golfers benefit. The Breckland Pines staff should adopt the GEM Program Environmental Policy and immediately begin finding ways to minimize or eliminate any and all negative impacts to the environment.

Evaluation

In order to ensure the highest quality of customer service and environmental stewardship, there must be continual self-evaluation and improvement. There also should be consistent, on-going measurement of the reduction or elimination of environmental impacts the newly implemented practices have on the course. For example, documenting the reduced use of inputs such as fertilizers, pesticides, and irrigation can be used to demonstrate the increased environmental stewardship of the golf course management practices as well as the overall value of the GEM Program. It is important for U. S. Air Force golf courses to show improvement over time. This can be easily accomplished by regularly evaluating golf course maintenance methods, practices, and management approaches to day-to-day issues and changing when appropriate.

Revision

The very nature of a superior GEM program implies that all documents be regularly maintained to represent the most current conditions. U. S. Air Force golf course managers and superintendents should be constantly looking for ways to improve their environmental stewardship. Acting on lessons learned is right behind initial implementation as the most important aspect of a successful GEM Program. The GEM Plan should be kept as current as possible at all times. Ideally, it should be completely updated at least every three years.

Course Specific Analysis

One of the most pragmatic and enjoyable tasks in the GCEBA process is the course specific analysis. From a general overall description of the course to the details of the course’s history and makeup to the various observations on the way the course plays, looks, and is managed, the course specific analysis sets the stage for the rest of the GCEBA report. It is comprised of the following tasks:

- Course description
- Course details
- Miscellaneous facilities review



Natural patches of heather complicate less than accurate shots.

Course description

Considering its limited budget and available amenities, the Breckland Pines Golf Course at RAF Lakenheath provides an enjoyable recreation opportunity quite admirably. The 9-hole course occupies only 45 acres of the southeastern edge of the installation. Generally, rolling, but limited topographic relief greets the player while the smallish greens challenge golfers of all levels. The course reflects its British heritage with intermittent patches of native heather and wild grasses. Breckland’s Director of Golf, makes the most of his facility by catering to the youth at RAF Lakenheath as well as making on of the best steaks in the area.

Course details

Architect	Civil Engineering
Year constructed	1952
Climate	Semi-continental
Average annual rainfall	762 mm
Winds/Prevailing Direction	S. SW / N. NE
Total Facility Acreage	45
Par	36 (9-hole facility)
Yardage/Rating/Slope	Yellow- 3305/68.8/104 White- 3130/67.8/103 Red- 2820/66.8/102
Turfgrass	Tees Poa annua/ Fescue mix
	Fairways Poa annua/Fescue mix
	Greens Browntop bent/Poa annua
	Roughs Mixed



Breckland Pines Golf Course
RAF Lakenheath, England

Miscellaneous Facility Review

Although the course is primary to the enjoyment and eventual return of most of Breckland Pines' customers, the support facilities play a huge role in the overall success of the operation. This section of the GCEBA will examine the following facilities for their aesthetic, functional, and environmental values:

- Clubhouse/pro shop/snack bar
- Practice areas
- Maintenance complex
- Pesticide mixing and storage
- Cart barn
- Infrastructure



Manager Derek Turner makes the most of limited space in his shop.



Breckland Pines' clubhouse is compatible with architectural standards.

Clubhouse

The clubhouse at Breckland Pines is comprised of two buildings joined by a breezeway. The brick construction buildings are small, yet adequate for the 9-hole facility. The snack bar occupies one building while the pro shop and administrative offices occupy the other. Storage space is minimal and the facility suffers somewhat because of it. There is a small bar within the dining area to further satisfy the needs of the customers.



A small short game practice green is available for customer use.

Practice areas

Breckland Pines Golf Course has an all-weather driving range and a small practice putting green. The practice green is not located nearby the clubhouse and first tee reducing its utility for customers. The new practice green in the early stages of grow-in during the site visit should improve the situation.



Metal shelves, dry above liquid, and palletized bags fit the bill.

Pesticide mixing and storage

Despite severe budget constraints and one of the least attractive maintenance complexes in the U. S. Air Force inventory, the pesticide storage facility maintained by the Breckland Pines superintendent and his staff is neat, safe, and fully compliant. This is certainly a testament to Al's dedication to his trade as well as adequate justification for a pay raise.

Although caution should be taken whenever chemicals are being used, special measures should be taken so that pesticides can never impact the drinking water aquifer directly below the course.



“Cart barn” is hardly the correct term for this structure.

Cart barn

The cart barn really isn't.... Minimal carts are available for use and the storage facility provides limited protection for the few in Breckland Pines' inventory. Improvements should be in the planning stages.



Breckland Pines, like most British courses, does not have cart paths.

Infrastructure

This section examines important elements of a quality golf course that are difficult to group into another category. There are no cart paths. The parking lot is in fair to condition and is not large enough to satisfy the regular demands of Breckland Pines' customers. Landscape development attempts have been minimally successful and should be discontinued unless a professional landscape architect is employed with specific direction on desired goals and objectives. There is a site amenity group near most teeing areas and the course signage could be improved.

Maintenance complex

The existing maintenance complex is greatly wanting for just about everything from space, heat, running water, and organization. Superintendent Al Collier makes the most of his limited resources focusing on the care of the course rather than the relatively dismal conditions of his “office”. To no surprise of anyone, construction of the new maintenance complex is underway and should provide a cure for all of the maladies associated with the current situation.



It is definitely waaaaaaay past time for a new maintenance complex.



Preliminary site work is underway for the new maintenance complex.



Artist's rendition of the superintendent's new facility.

Environmental Compatibility Quotient Checklists

The following is a brief compilation of some of the observations in each of the ten Environmental Compatibility Quotient (ECQ) categories during the site visit.

ECQ Categories

- Overall Management Philosophy & Documentation
- Safety, Training, And Awareness
- Compliance
- Pesticide Use, Storage, & Handling
- Pollution Prevention
- Conservation Practices
- Water Resources
- Maintenance Practices
- Customer Relations & Education
- Miscellaneous Special Projects & Activities

ECQ Checklists

The Environmental Compatibility Quotient (ECQ) checklists are a convenient method of assessing the overall performance, implementation, and completeness of an installation's Golf Course Environmental Management Plan. The checklists can be used in many ways including:

- As an analytical tool while compiling a Golf Course Environmental Baseline Assessment like this one.
- As a self-assessment tool for the golf course manager or superintendent.
- As an award nomination evaluation by a Golf Course Assessment Team (GCAT).



All-weather driving range facility is located on “borrowed” ground.

Key to checklist responses

- **Yes** = Practice is complete or ongoing and can be verified.
- **Partial** = Practice has been initiated but needs further attention and improvement.
- **No** = Practice is not in place.

Determining the Environmental Compatibility Quotient

The ECQ compiled for an installation's course is a snapshot of the overall performance and compliance with the GEM Plan. There are two ways to use the ECQ checklists to determine the status or quality of the environmental management program: determining the actual and potential environmental compatibility quotients.

- **Actual ECQ-** the total percentage of "Yes" responses for all ten checklists.
- **Potential ECQ-** the total percentage of "Yes" responses plus the total percentage of "Partial" responses for all ten checklists.

ECQ Scoring Scale

Percent Responses Yes or Partial per Category	Level
93-100%	Advanced
83-92%	Getting there
73-82%	Showing progress
63-72%	Early stages
Less than 62%	Just started



Lack of storage space is endemic at Breckland Pines as well as many U. S. Air Force golf clubhouses.

Overall Management Philosophy & Documentation

U.S. Air Force GEM program goals

- Enhance the installation ecologically and economically
- Demonstrate that the golf course is managed with consideration for the unique conditions of the ecosystem of which it is a part
- Document management practices to promote more widespread understanding and appreciation for environmentally sound golf course facilities
- Share information on the environmental challenges of your golf facility with your customers, the golfers

Observations

- Initiate and complete the GEM Plan with assistance from installation environmental staff
- Utilize installation environmental management geographic information system and civil engineering digital aerial photographs for mapping requirements
- Finish the collection of all pertinent data to assist in creating a comprehensive management approach to the entire facility



The mission at RAF Lakenheath takes precedence at Breckland Pines.



There are many possible locations to share information with customers.

Overall Management Philosophy & Documentation				
#	Environmental Compatibility Indicator	Yes	Partial	No
1	Has management demonstrated that the environment is an important part of their responsibilities by initiating the GEM Planning process?	✓		
2	Has the golf course adopted and posted an Environmental Policy?			✓
3	Is the GEM Plan underway or completed, available, and updated regularly?		✓	
4	Is a map of the property highlighting environmental opportunities or constraints such as wildlife habitat, water resources, sensitive landscapes, special management zones, etc. posted for customers?			✓
5	Environmental goals, objectives, issues, projects, and progress are evaluated at least annually and are regularly communicated to employees, customers, management, and the local community?			✓
6	Are written records of water quality monitoring activities, results, and control measures readily available?	✓		
7	Is there an inventory of bird and mammal species documented, maintained, and readily available?		✓	
8	Is there a general understanding of how course management practices may positively enhance or adversely impact wildlife species and their habitats?	✓		
9	Are the environmental impacts of pest control measures such as leaching and runoff potential, toxicity to non-target organisms, soil absorption capacity, pesticide persistence, water solubility, and effects on soil microorganisms and non-target species considered as part of the course management planning process?	✓		
10	Are records of pest treatments employed and their effectiveness maintained and used to guide future pest control decisions?	✓		
	Point totals for each column	5	2	3

Safety, Training, & Awareness

U.S. Air Force GEM program goals

- Educate all employees on the benefits of an ecosystem based golf course environmental management program
- Store and handle all potentially harmful products to minimize employee exposure
- Regularly train employees on the potential health hazards associated with their duties
- Involve entire staff in ensuring a safe golfing opportunity for their customers



Proper hearing protection, but no helmet...?



All chemicals are locked in labeled and approved storage devices.

Observations

- Enroll all pesticide applicators in respiratory and pulmonary monitoring programs
- Ensure all pesticide applicators are aware of precious drinking water aquifer directly underneath the golf course property
- Enlist base bioenvironmental engineer's assistance in examining management procedures to ensure safety of all customers and employees
- Inquire of the possibility of installation environmental staff conducting training for Advisory Council and employees

Safety, Training, & Awareness				
#	Environmental Compatibility Indicator	Yes	Partial	No
1	All employees are familiar with the GEM Plan and are trained regularly on the importance of environmental performance and compliance with the goals and objectives of the program?			✓
2	All appropriate employees are trained to be familiar with USAF, federal, state, and OSHA regulations that apply to storage and handling of chemicals used on the property?	✓		
3	Key employees are aware that chemical manufacturing, use, storage, and disposal may pose risks to human health and the environment?	✓		
4	All employees are trained to understand that poor management practices may adversely impact worker health, on- and off-site water quality, local soil health, and wildlife species and their habitats?		✓	
5	A current copy of all Material Safety Data Sheets (MSDS) for all chemicals used anywhere on the golf course property is maintained and readily available for use by employees?	✓		
6	Chemical applicators are encouraged to apply for continuing education programs and receive regular training to maintain currency?	✓		
7	Are all golf course pesticide applicators active participants in the local respiratory and pulmonary function testing program?			✓
8	Pesticides, fertilizers, and other chemicals are stored on plastic or metal shelving?	✓		
9	Are golfers notified in the pro shop and on the first and tenth tees about the day's planned or recently completed spraying of any chemical or fertilizer that may be hazardous to human health and safety?	✓		
10	Are key staff members trained regarding water quality and conservation issues?	✓		
	Point totals for each column - Response percentage	7	1	2

Compliance

U.S. Air Force GEM program goals

- Integrate management practices with appropriate regulatory requirements and procedures
- Guarantee safe, healthy, and enjoyable experience for golfers while ensuring long-term operation of the facility
- Utilize installation expertise regularly on all matters dealing with bird aircraft strike hazards, regulators, impact analysis, and cleanup



Compliance can be a tricky and complex task in a foreign country.



Compliance issues can arise from a simple attempt to correct a problem like bird damage seeking garden chafer grubs.

Observations

- Attend all ECAMP in-briefs & out-briefs
- Do more than what is required
- Provide input into all installation management plans that affect the golf facility
- Ensure ECAMP results are outstanding
- Continue building quality relationships with installation environmental and engineering staff by creating GEM committee that meets at least biannually

Compliance				
#	Environmental Compatibility Indicator	Yes	Partial	No
1	Is fuel storage/delivery managed in accordance with federal, state, and local regulations?	✓		
2	Are installation environmental staff members included in on-going course management discussions and plans at regularly scheduled meetings?			✓
3	Are there regularly scheduled staff meetings to discuss environmental management issues?			✓
4	Does the director of golf and the superintendent attend ECAMP in-briefings and out-briefings?			✓
5	Does the director of golf and/or the superintendent coordinate with installation environmental staff on the various management plans that affect or include the golf course?			✓
6	Have all necessary permits been updated and their requirements satisfied in a timely manner?	✓		
7	Has appropriate impact analysis (NEPA) been performed on all proposed actions on or affecting the golf course property?	✓		
8	Are containers used to store used oil in good condition, not leaking, and clearly labeled?		✓	
9	Are oil/water separators operating properly and correctly maintained?	✓		
10	Are projects planned and funded for the next year that would increase the compatibility of the course's management methods with the environment?	✓		
Point totals for each column - Response percentage		5	1	4

Pesticide Use, Storage, & Handling

U.S. Air Force GEM program goals

- Ensure that all chemicals will be used, stored, and handled in appropriate manner at all times
- Compile and utilize an Integrated Pest Management approach to caring for the entire golf facility
- Licensed pest applicators are strongly encouraged to attend personal safety training and health monitoring programs



Appropriate, safe, and compliant.



New maintenance complex will improve pesticide-related situations.

Observations

- Document, document, document...write down everything you know and track anything that might assist in better decisions in the future
- Most difficult pests include garden chafer beetle, blackbirds/crows, hedgehogs, and fusarium
- Need to complete the Integrated Pest Management Plan
- Ensure that all pesticide use patterns do not contaminate the unconfined aquifer directly underneath the course property

Pesticide Use, Storage, & Handling				
#	Environmental Compatibility Indicator	Yes	Partial	No
1	Are there trained scouts on staff other than the superintendent to monitor turf and plant health and pest populations using scouting forms to record the type, severity, location, and treatment of pest problems and organized into a report or guide so that they can be used for future pest control solutions?		✓	
2	Are there written pest profiles of common pest species with a variety of potential control measures pre-evaluated including alterations in cultural management, biological, physical, and mechanical controls prior to treating the problem on the course?		✓	
3	Are there established and documented aesthetic and functional thresholds for all managed areas to effectively manage pest populations and reduce chemical use?			✓
4	Is there a specially and appropriately designed pesticide mixing area where all mixing occurs by only trained personnel?	✓		
5	Has a list of pesticides and other chemicals stored or used at the golf facility been provided to the appropriate Fire Department(s)?	✓		
6	Is there a written Integrated Pest Management Plan readily available and updated regularly in use at the facility?			✓
7	Are food storage and prep areas properly cleaned to reduce the likelihood of pest infestations and required pesticide applications?	✓		
8	Are scouting forms collected, indexed, and mapped to aid decisions for positive pest control planning?			✓
9	Are written and readily available records maintained of all applications of pesticides made by certified applicators, including the following? <ul style="list-style-type: none"> - the quantity of each pesticide used - the chemical or common name of the active pesticide ingredient(s) (not the product name) - the pest or purpose for which the pesticide was applied --the date and place of application.	✓		
10	Is the chemical storage structure/area locked, well ventilated, fire proof, and access is limited to select personnel?	✓		
Point totals for each column - Response percentage		5	2	3

Pollution Prevention

U.S. Air Force GEM program goals

- Employ practices that eliminate or avoid the potential for polluting the environment
- Guarantee that the golf course facility will not allow chemicals, fertilizers, detergents, or petroleum products they use to migrate outside their property boundaries
- Create and utilize a comprehensive pollution prevention plan for all aspects of the golf course and its facilities



Course maintenance is not the only aspect concerned with P2.



Sandy soils allow more percolation to groundwater increasing the chance of polluting an outstanding and valuable natural resource.

Observations

- Further reduce solid waste streams from clubhouse operations
- Decrease the use of slow release fertilizers to further protect aquifer below course
- Consult with installation environmental staff prior to any major changes in pesticide or fertilizer applications
- Regularly provide training for all employees on the specifics of pollution prevention and how they can help
- New maintenance complex will include a wash water recycling system

Pollution Prevention				
#	Environmental Compatibility Indicator	Yes	Partial	No
1	Are there designated "no-mow" areas and established "no spray zones" and buffer areas around pond, river, stream, or lake edges and have they been communicated to mower operators and technicians?	✓		
2	A spill containment kit is readily available and spill containment procedures are in place?	✓		
3	Does the chemical storage area have a sealed metal or concrete floor and are all pesticides handled over an impermeable surface?	✓		
4	Does the chemical storage area have a lip along the edges to contain spills?	✓		
5	Are liquid products stored below dry products and are dry materials stored on pallets or shelves to keep them off the floor?	✓		
6	Has the Installation Spill Plan been amended to include the golf course facility?	✓		
7	Are grass clippings blown off equipment with compressed air instead of or prior to washing?			✓
8	Are gasoline, motor oil, brake and transmission fluid, solvents, and other chemicals used to operate or maintain equipment and vehicles prevented from directly or indirectly entering water bodies?	✓		
9	Does the fuel storage and delivery area comply with local, state, and federal regulations?	✓		
10	Are slow-release fertilizers used to reduce the negative potential for runoff?	✓		
Point totals for each column - Response percentage		9	0	1

Conservation Practices

U.S. Air Force GEM program goals

- Use natural resources efficiently while respecting their long term value to the local community and the mission of the USAF
- Provide important greenspace benefits
- Closely monitor and manage water use to prevent unnecessary depletion of installation or local water resources



Heather is mowed at least once every three years.



Arizona cypress trees provide roosts for undesirable flocking bird species. Some may not survive severe pruning.

Observations

- Increase communication with customer on conservation practices that are already in place
- Continue building relationships with installation natural resources manager and other environmental professionals
- Provide detailed input to the scheduled update of installation integrated natural resources management plan (INRMP)
- Insist on regular, comprehensive training on environmental challenges from installation environmental staff

Conservation Practices				
#	Environmental Compatibility Indicator	Yes	Partial	No
1	Are all motorized golf course equipment checked regularly for excessive air polluting emissions?	✓		
2	Are there designated non-maintained or minimally maintained buffers around core wildlife habitats?	✓		
3	Has the irrigation system or its components recently been upgraded to reduce inefficiency, malfunction, and overall water use?	✓		
4	Has all “non-target” irrigation (ponds, out of play areas, etc.) been eliminated or minimized?	✓		
5	Have flow meters been installed to monitor water use and detect potential waste?	✓		
6	Has the property been examined for critical habitats, threatened or endangered species, wetlands, and floodplains?	✓		
7	Are employees encouraged to minimize their trips around the course to conserve on the use of fossil fuels?	✓		
8	Does the snack bar utilize reusable plates and silverware for use by customers throughout the facility’s operating hours?		✓	
9	Have all potential wildlife habitats and their maintenance practices been coordinated with the installation BASH officer and environmental management personnel?	✓		
10	Are recycling containers conveniently provided for customer and employee use throughout the golf course facility?		✓	
Point totals for each column - Response percentage		8	2	0

Water Resources

U.S. Air Force GEM program goals

- Minimize or eliminate potentially negative environmental impacts to all on- or off-site water resources
- Preserve water resources by using only those quantities required to maintain quality playing surfaces
- Ensure that any maintenance practices on or near water features are coordinated with appropriate personnel prior to taking action



This unique bunker used to be the only water hazard on the course.



Sandy soils require that supplemental water be applied nearly daily.

Observations

- Ensure quick responses to any spills to protect surface and groundwater resources
- Determine most efficient irrigation schedule and document needs in an official Drought Management Plan
- Eliminate any possibility of polluting groundwater resources by comprehensively examining all golf course maintenance practices and procedures

Water Resources				
#	Environmental Compatibility Indicator	Yes	Partial	No
1	Are water features regularly monitored for algae, erosion, excessive aquatic plant growth, fish kills, and sedimentation?	✓		
2	Wash and wastewater is kept from making direct contact with surface water and is recycled or allowed to filter through a vegetative area when cleaning and maintaining equipment?	✓		
3	Outdoor irrigation of non-golf course areas and indoor plumbing are regularly monitored and maintained for leaks?	✓		
4	Has the golf course staff been provided with stormwater management planning requirements from the installation's environmental staff?			✓
5	Have part circle irrigation heads been installed where possible to preserve water resources and reduce maintenance while minimizing potential negative impacts to surrounding natural areas?	✓		
6	Are all water feature maintenance tasks coordinated with the installation natural resource manager and bird/wildlife aircraft strike hazard officer?	✓		
7	Has the irrigation system been completely checked for proper water distribution in all irrigated areas and are water leaks fixed in a timely manner?	✓		
8	Are the parking lots for customers and employees at least partially constructed with permeable surfaces and are they drained through an area of turfgrass or vegetation prior to discharge into a water feature?			✓
9	Does the facility have a Drought Management Plan written, ready, and available when, or if, irrigation restrictions may be instituted?			✓
10	Are water quality problems immediately reported to supervisors or regulatory agencies (if required) for appropriate action?	✓		
Point totals for each column - Response percentage		7	0	3

Maintenance Practices

U.S. Air Force GEM program goals

- Integrate the concept of ecosystem management into all course management decisions and practices
- Employ the principles of integrated pest management
- Document all activities for future reference
- Constantly examine management practices to look for improvements
- Insist on a well-trained staff



Continue the current maintenance approach on "natural" areas.



Al Collier does an excellent job creating quality playing conditions

Observations

- Increase training and involvement of staff on integrated pest management procedures
- Compile written pest profiles of common pest species
- Document all attempts to solve garden chafer beetle problem

Maintenance Practices				
#	Environmental Compatibility Indicator	Yes	Partial	No
1	Is contour mowing used to conserve fuel and increase playability and aesthetics?	✓		
2	Are there designated non-maintained or minimally maintained buffers around core wildlife habitats?	✓		
3	Are green, tee, and fairway mowing heights maintained at reasonable levels without continually stressing turf or maximizing chemical inputs?	✓		
4	Are there regular procedures in place to continually improve soil health such as organic amendments, aeration, and drainage?	✓		
5	Is there a map of the course's "hot spots" requiring special care or regular attention?			✓
6	Is all maintenance equipment maintained and cleaned in a manner that eliminates the potential for spreading of contamination?	✓		
7	Has there been a complete examination for potential negative environmental impacts of all aspects of the operation including snack bar/grill, clubhouse, pro shop, and maintenance complex?	✓		
8	Are trees and other vegetation on the course maintained to encourage positive airflow and sunlight penetration to improve cultural conditions for the turfgrass as well as to minimize pesticide inputs?	✓		
9	Have all playing surfaces been inventoried and mapped for soil types including soil structure, nutrient levels, organic content, compaction, and water infiltration?	✓		
10	Are soil tests and plant tissue analysis used to determine nutritional requirements?	✓		
Point totals for each column - Response percentage		9	0	1

Customer Relations & Education

U.S. Air Force GEM program goals

- Ensure that the customer knows that their opinions count and will be acknowledged, assessed, and acted upon
- Educate the customers about the benefits of environmentally responsible golf course management and the future of the game and the environment
- Enlist customer support and assistance on caring for the course and its facilities as well as GEM Plan goals



The Director of Golf has built an admirable youth program.



Use opportunities to spread the word on golf & the environment.

Observations

- Create a location to communicate environmental management goals and maintenance plan in the new clubhouse
- Continue to involve installation youth through rules and instruction clinics
- Survey customers to determine where business practices can be improved

Customer Relations & Education				
#	Environmental Compatibility Indicator	Yes	Partial	No
1	Are the course manager and superintendent involved in a long-term customer educational program that is regularly updated and documented?	✓		
2	Is there a conveniently located and highly visible place at the course or clubhouse where golf course environmental management notices and informational messages are regularly posted?		✓	
3	Do the course manager and superintendent actively communicate with customers to determine and document their points of view?		✓	
4	Is there active and regular communication with the Golf Council, Civil Engineering, Environmental Management, the Services manager, and commanders by course management?		✓	
5	Has the environmental management staff been asked to lead regularly scheduled educational seminars on the course's environmental challenges for golfers, commanders, and the golf staff?			✓
6	Is there consistent and attractive signage around the course and grounds that would increase the awareness of the average golfer to the environmental management practices employed?			✓
7	Are there signs appropriately located to warn golfers of hazards when drinking reclaimed or otherwise non-potable water?	✓		
8	Are there interpretive signs posted to highlight key habitats or have appropriate areas been designated "Environmentally Sensitive Zones" per R & A rules?	✓		
9	Are course staff members trained regularly on how to improve their dealings with customers?	✓		
10	Are there clinics provided to teach beginning golfers the basics of the game and to teach all levels of golfers the rules of the game?	✓		
	Point totals for each column	5	3	2

Miscellaneous Special Projects & Activities

U.S. Air Force GEM program goals

- Educate the local community about the benefits of an environmentally responsible golf course management approach is for the future of the game and the environment
- Reach out to school children to raise their awareness and appreciation for the game of golf and the GEM Plan principles
- Further the great game of golf at all times in as many ways as possible



Initiate tree planting program to replace aging or undesirable species.



Educate on playing, etiquette, rules, and the environment.

Observations

- Conduct field trips at the course for local school children
- Enlist the assistance of local city and county officials on golf course environmental planning initiatives
- Initiate Earth Day environmental awareness golf tournament
- Educate customers about the benefits of an environmentally friendly golf course

Miscellaneous Special Projects & Activities				
#	Environmental Compatibility Indicator	Yes	Partial	No
1	Are there projects planned and funded for the next year that would communicate the compatibility of the course's management methods with protection of the environment?	✓		
2	Are there projects planned and funded to reduce the course's potential negative environmental impacts?	✓		
3	?	✓		
4	Are there regular field trips for local students or other local community groups hosted at the course?	✓		
5	Are there projects planned to eliminate or minimize a potential erosion problem?			✓
6	Does the course have a native tree installation program complete with planting plan and maintenance schedule?			✓
7	Are any of the local schools or universities involved in educational or research activities at your course?			✓
8	Are there special facility-wide recycling programs underway?	✓		
9	Is your course an active participant in the USAF Golf Environmental Management Program?	✓		
10	Has your facility been nominated by your MAJCOM for the golf course environmental management award in the last 3 years?			✓
Point totals for each column		6	0	4

ECQ Summary

#	Environmental Compatibility Quotient Category	Yes	Partial	No
1	Overall Management Philosophy & Documentation	5	2	3
2	Safety, Training, & Awareness	7	1	2
3	Compliance	5	1	4
4	Pesticide Use, Storage, & Handling	5	2	3
5	Pollution Prevention	9	0	1
6	Conservation Practices	8	2	0
7	Water Resources	7	0	3
8	Maintenance Practices	9	0	1
9	Customer Relations and Education	5	3	2
10	Miscellaneous Special Projects & Activities	6	0	4
	Composite points & response percentage	66	11	23

GCEBA Results

Σ Breckland Pines Golf Course, Lakenheath AB, England

- Actual ECQ = 66 or “Early stages”

- Potential ECQ = 77 or “Showing progress”

Conclusion

Despite its diminutive size, Breckland Pines Golf Course fulfills its desired objectives by providing quality outdoor recreational opportunities for RAF Lakenheath's airmen and their families. The manager and his staff definitely extract as much potential as the facility affords in satisfying his customers as well as bosses. The significant environmental challenge of protecting the unconfined drinking water aquifer below the course while attempting to keep the garden chafer grubs at bay will always be the key limiting factor. Through continued coordination and team building with installation environmental staff, there is light at the end of the tunnel.



Potential road improvement project could impact 3rd green & 4th tee.



Turfgrass damage due to garden chafer beetle only gets worse.

Areas needing improvement

The ECQ Summary on the previous page highlights the following areas for relative improvement at RAF Lakenheath:

- Overall Management Philosophy & Documentation
- Compliance
- Pesticide Use, Storage, & Handling
- Customer Relations & Education

The gallery

This section of the report will be where some of the more revealing photographs (of the literally hundreds taken during the site visit) of pests, maintenance practices, and other areas where improvements may be made to create the best possible golf facility.



Driving range may be absconded by the installation for another use.



Tiny, yet appealing greens typify the Breckland Pines golf experience.



Inadequate parking hampers customer satisfaction.



Landscape design and maintenance found wanting near clubhouse.

Environmental challenges

One of the important results of the GCEBA process is the identification of significant issues or challenges that should be addressed in the long term GEM Planning process. Ideally, the golf staff will address each issue from the best way to satisfy the goals of the golf facility and acceptable levels of course playability and customer satisfaction. The golf staff's preferred management approach for these issues should then be coordinated with the installation's environmental staff for refinement, coordination, and approval.

The GEM Plan would then consist of the environmental challenges, the approach to their management, a map showing where these challenges occur on the golf course, a booklet that describes the mapped challenges, goals and objectives for future years, and a set of best management practices.

The following environmental challenges were identified during the GCEBA process at Breckland Pines Golf Course, Lakenheath AB, England:

- Bird/Wildlife Aircraft Strike Hazard (BASH)
- Aquifer protection
- Garden chafer beetle

BIRD/WILDLIFE AIRCRAFT STRIKE HAZARD (BASH)

According to the BASH Plan, "the golf course is near the runway environment" at RAF Lakenheath. The installation has adopted a "short grass policy" since the airfield's soil is largely sand and "cannot support grass height greater than 3 to 5 inches" says the BASH Plan. Many expensive solutions have been suggested with little to no support. The mission of the installation must be protected through complete coordination from all facilities within the region of influence near the airfield. The golf course situation is made somewhat more difficult in that the largest bird attractants are the garden chafer grubs for which there is no approved chemical control. Large numbers of crows congregate on the course searching for a quick meal.



Crows begin their destructive ways....

AQUIFER PROTECTION

The INRMP states “chalk found in the south and east of England is part of a major aquifer. The aquifer is largely unconfined and recharged directly from rainfall. Since there is no confining layer above, the aquifer is highly vulnerable to contamination from anthropogenic [man-made] sources, especially fertilizers and pesticides...”. Since the installation, to include the golf course, is located directly over this important source of regional drinking water. One of the planning tools used to assist in the protection of groundwater is Source Protection Zones (SPZs), which support England’s groundwater protection policy by designating areas that may be at risk to potential degradation. The INRMP lists “principal contaminants detected in the aquifer include PCE, TCA, TCE, PAHs, simazine, atrazine, diuron, monuron, and high levels of nitrate”.

Parts of the installation have been designated as in Protection Zone 1. The maintenance staff may consider eliminating slow release fertilizers as they may pass through the sandy soils to the groundwater below. In addition, any and all chemical use must consider the aquifer below first.

GARDEN CHAFER BEETLE

The garden chafer beetle emerges in May/June. They lay their eggs that hatch into grubs that feed on turfgrass roots and then lie dormant deep in the soil before beginning the process all over again. Currently, there is no approved chemical control for chafer grubs and with the right weather they can become a monumental problem for superintendents.

Ironically, even though infestations can cause problems such as desiccation and other turf diseases, it is not the grubs that are the real problem. Predators such as badgers, hedgehogs, crows, and even foxes seek out the grubs by peeling back the turfgrass reeking havoc with playing conditions. If greens and tees become infested, severe economic impacts occur.

Breckland Pines’ staff members are working closely with installation environmental staffers to find a solution to this annually recurring problem. Of course, any treatments or remedies such as the Bayer product Merit or special products containing nematodes must consider potential impacts to the environment in general as well as the potential impacts to the unconfined aquifer.



Crow damage to turf in their search for garden chafer grubs.

Bibliography

Audubon International, Environmental Performance Audit, *Integrated Environmental Management*, Golf Course Superintendents Association of America, February 2000, New Orleans, LA.

The Center for Resource Management, *Golf & the Environment: Charting a sustainable future*. Environmental Principles for Golf Courses in the United States, 1996, Salt Lake City, UT.

Air Force Center for Environmental Excellence, *Final Integrated Natural Resources Management Plan for HQ USAFE*, May 2003, Lakenheath AB, England.

Greenkeeper International magazine, "New Products" column, *Chafer Grub Control* article, no date.

RGF Products flier, *Frequently Asked Questions About Wash Water Recycling Systems*, no date.

No Chafer Grub and Leather Jackets on Our Golf Course, article accessed at website:
<http://www.nemasysinfo.com/html/news/news.html#SEAFORD>.

Mann, Dr. Ruth, "Chafers: Have they met their match?" article in Greenkeeper International, Sept 2001.

48th Fighter Wing, *RAF Lakenheath Bird Aircraft Strike Hazard (BASH) Plan*, 01 Aug 01





For additional assistance or more information, please contact:

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Or visit our Golf Course Environmental Management Program webpage:
<http://www.afcee.brooks.af.mil/ec/golf/>