Air Force Center for Engineering & the Environment

The Courses at Andrews
Environmental Management (GEM) Plan
Andrews AFB, MD

July 2008

San Antonio, Texas

The Golf Courses at Andrews Environmental Management Policy

**In concert with the
Andrews AFB mission,
we pledge to employ
only those management practices
that minimize or eliminate the potential
for negative impacts to the environment
and the surrounding community,
ensure compliance with all
appropriate regulations,
and to regularly reevaluate our processes
to achieve the highest standards
of environmental excellence.**

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Executive Summary

U. S. Air Force GEM Program

The U. S. Air Force Golf Course Environmental Management (GEM) program is a proactive Air Force Center for Engineering & the Environment (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 installation mission. Chapter 11 of AFI 32-7064 requires a GEM Plan as part of the Integrated Natural Resources Management Plan (INRMP).

GEM Program process

There are five steps in the GEM program process.

- Analysis
- Documentation
- Implementation
- Evaluation
- Revision

Environmental Compatibility Quotient (ECQ) scores

The following is the summary of the environmental compatibility quotient (ECQ) scores for the site visit conducted in Month Year:

- **Actual ECQ = 74, Showing progress**
- **Potential ECQ = 85, Showing progress**

Potential or Final environmental challenges

The following potential environmental challenges were identified in compiling this **Draft** or Final GEM Plan:

- Installation Restoration Program (IRP) Sites
- Bird/wildlife Aircraft Strike Hazard (BASH)
- Wetlands
- Invasive species
- Proposed project
- Air quality
- Threatened and endangered species

Where do we go from here?

The true measure of a successful GEM program is how well is it executed in the field each and every day. The installation golf and environmental staffs should continue to analyze, document, monitor, evaluate, revise, and implement changes based on lessons learned. The GEM Plan should be updated annually and revised during the next INRMP iteration update. The entire GEM process can be found on the regularly improved AFCEE GEM program website (http://www.afcee.brooks.af.mil/ec/golf/).

The 8th green on the West is typical of the high quality of The Courses at Andrews.

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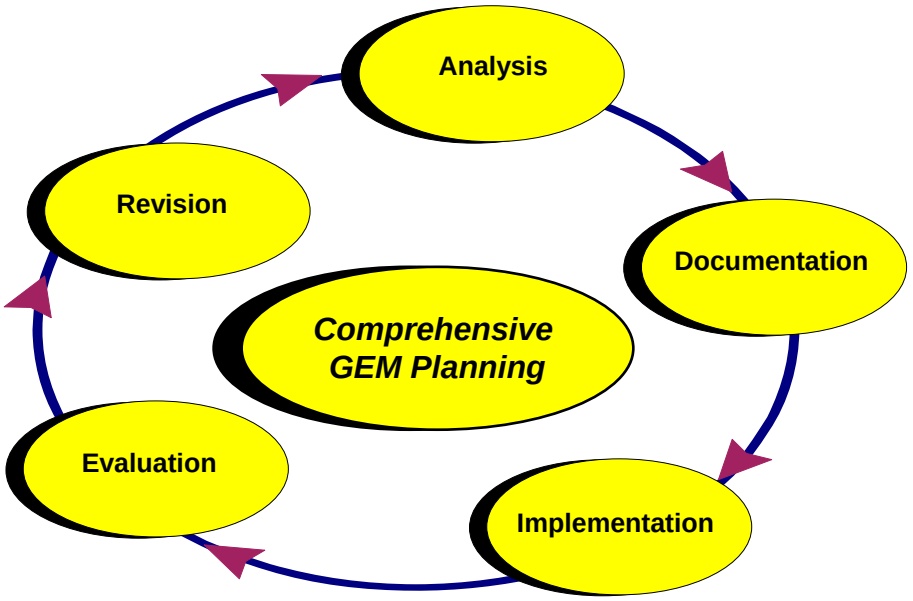
The golf course environmental baseline assessment (GCEBA), or the Draft Golf course Environmental Management (GEM) Plan is the initial step in creating a successful ecosystem-based comprehensive GEM Plan. The intent of the GEM Plan is to provide an efficient management tool that will enable course managers to devote more of their efforts to caring for their customers and the golf course. Properly designed and implemented, the GEM Plan will keep the entire golf facility in compliance with the constantly changing environmental requirements while contributing to the local community.

The GEM Initiative

The goal of the GEM initiative is to facilitate the creation of an environmentally friendly approach to golf course management while protecting and promoting the great game of golf. 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, golf courses are being managed compatibly with the environment. The comprehensive GEM planning process is the vehicle to document our successes while communicating directly with our customers, commanders, and local community.



GEM Process

The five steps of the GEM Process are based on continual improvement.

GEM Process

Efficient implementation is the most important aspect of any initiative where practices and procedures are examined and may undergo significant change. This is especially true of the comprehensive GEM planning process. The GEM Plan is derived from several diverse environmental regimes to include the National Environmental Policy Act and the ISO 14001 environmental management system.

There are five basic steps in the implementation of the GEM Planning process:

- Analysis
- Documentation
- Implementation
- Evaluation
- Revision

Analysis

Experienced environmental managers realize the importance of assembling all of the data relevant to a problem prior to determining its best solution. Comprehensive analysis is the most important task of the GEM process. Properly completing the analysis is paramount to the long-term compatibility of a golf course's management practices with the local community'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 potential environmental management challenges
- Summary report

Documentation

It is not enough just to know how to create a successful golf course environmental management program. There must be a written record documenting 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 assist in the daily management of the course while providing a convenient vehicle to communicate to the community and customers alike the environmental issues that challenge golf course managers as well as their plans to deal with them. In order to reach established environmental stewardship goals the golf course staff must consistently employ only those management practices that minimize or eliminate potential negative impacts to the environment.

The Courses at Andrews
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The West Course's 17th is a beautiful rolling 428 yard, par four.

U.S. AIR FORCE 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 depicted 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 initiative recommendations

Implementation

Positive and decisive action is the only true measure of the success of the GEM Plan. 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 installation golf staff should consider adopting the GEM Initiative process and establish an environmental policy that minimizes or eliminates any and all potential negative environmental impacts.

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 initiative. It is important for golf courses to show improvement over time. Improvements can be easily accomplished by regularly evaluating golf course maintenance methods, practices, and management approaches to day-to-day issues in concert with the desire and ability to change.

Revision

The very nature of a superior GEM Plan implies that all documents be regularly maintained to represent the most current conditions. 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 Plan. The GEM Plan should be kept as current as possible at all times. Ideally, it should be updated annually and completely rewritten on the same cycle as the Integrated Natural Resources Management Plan.

The Golf Courses at Andrews Aerial Photo

The Courses at Andrews Layout Map

Course Specific Analysis

One of the most pragmatic and enjoyable tasks in the baseline assessment portion of the GEM process is the course specific analysis. From a general description of the course to the details of the course's history and makeup to the various observations on course playability, aesthetics, and style of management, the course specific analysis sets the stage for the rest of the GEM Plan report.

The Courses at Andrews

"Andrews AFB (Base) is entirely within Prince Georges (PG) County, Maryland, approximately five miles south-southeast of Washington, D.C. The three 18-hole golf courses are irrigated with water provided through central pumping system along the western edge of Base Lake.

"Reflecting a military presence; the classic sense of style and gracious hospitality, The Courses at Andrews Air Force Base carries an air of true timeless elegance. High-end amenities, exceptional facilities and an unforgettable golf experience are the standard at this military resort. The envy of many golf courses, The Courses at Andrews Air Force Base boasts three 18-hole championship courses that are created from an extraordinary design and provides an enjoyable challenge for golfers at all skill levels. Our distinguishing attribute extends beyond just the three golf courses. It's reflected in everything we have to offer at The Courses at Andrews Air Force Base, including our professional tournament operations, food and beverage signature outlets, the only military resort resale golf shop, our complimentary practice facilities, and our state-of-the-art fitness center."

General Course Details

Climate	Temperate
Average annual precipitation	39.85 inches
Average growing season	230 days
Elevation	273 ft ASL
Prevailing wind direction	Variable
Total facility acreage	900 acres
Total actively maintained acreage	430 acres
Irrigation source	Groundwater (non-potable)

West Course Description

Heavily forested and gently rolling terrain describes the West Course at Andrews. Traditionally bunkered, medium-sized greens typify the layout where both length and accuracy are rewarded.

West Course Layout Map

West Course Details

Architect		Eddie Ault
Year constructed		1972
Par		34-36-70
Yardage/Rating/Slope		Blue- 6438/70.5/120
		White- 6038/68.2/113
		Gold- 5509/66.1/112
		Red- 5304/70.9/112
Turfgrass	Tees-	Bermudagrass/Ryegrass
	Fairways-	Bermudagrass/Ryegrass/Poa annua
	Greens	Penncross Bentgrass/Poa annua
	Roughs-	Bermudagrass/Bluegrass/Fescue

East Course Description

Similar to the West Course in the early and late parts of the round, the East Course contributed some of its holes in the addition of the South Course. The East shares restoration project concerns with its neighboring 18 to the south. A large pond originally designed to provide water to the new holes has developed into a relatively diverse and productive wetland. The East stays in character as far as playability and quality of the golfing experience proving once again that the Courses at Andrews are among the finest military recreation opportunities.

East Course Layout Map

East Course Details

Architect		Eddie Ault
Year constructed		1972
Par		36-36-72
Yardage/Rating/Slope		Blue- 6844/72.0/121
		White- 6420/70.3/118
		Gold- 5789/67.1/108
		Red- 5452/72.1/119
Turfgrass	Tees-	Bermudagrass/Ryegrass
	Fairways-	Bermudagrass/Ryegrass/Poa annua
	Greens	Penncross Bentgrass/Poa annua
	Roughs-	Bermudagrass/Bluegrass/Fescue

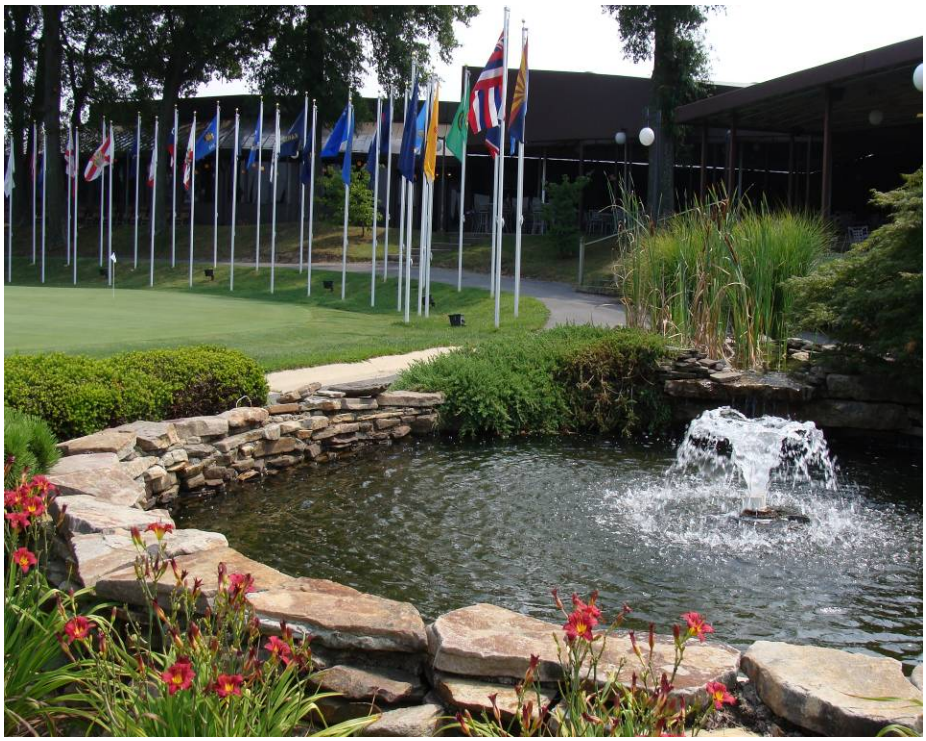
South Course Description

The last of the three courses to be constructed, the South Course just may be the best. Golf architecture firm Ault/Clark designed the course utilizing a couple holes from the original 36 to fashion an eclectic collection that features a links type and then moves through forested areas with plenty of water. The average player may be a somewhat challenged by the unforgiving quality of some of the South's golf holes as there is little room for error of the tee. Probably the most aesthetic, the South may also be host to the most environmental challenges. Water hazards, irrigation sources, endangered species habitat and two restoration project sites riddle the South's landscape.

South Course Layout Map

South Course Details

Architect		Ault/Clark Golf Architects
Year constructed		1996
Par		36-36-72
Yardage/Rating/Slope		Blue- 6759/72.1/128
		White- 6304/70.4/125
		Gold- 5798/68.5/118
		Red- 5296/71.1/115
Turfgrass	Tees-	Penncross Bentgrass
	Fairways-	Bermudagrass/Ryegrass
	Greens	Dominant Bentgrass
	Roughs-	Fescue



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Attention to detail is one of the precepts of Andrews' course management.

Environmental Compatibility Quotient (ECQ) Checklists

Many diverse and complex aspects of golf course management have been revealed through the literature search conducted to compile this study. In order to simplify the process, these aspects have been summarized into eight main topics and incorporated into five distinct environmental compatibility categories.

- Planning & Compliance
- Operations & Maintenance
- Water Resource Management
- Conservation
- Pesticides & Pollution Prevention

The environmental compatibility quotient (ECQ) checklist questions have been compiled using examples from several sources including Audubon International, Center for Resource Management, and Committed to Green. The ECQ checklists represent the best method currently available to determine the relative environmental compatibility of a golf course's management practices. The checklists can be used in many ways including:

- As a tool to establish a current snapshot or baseline of a golf course's relative environmental compatibility
- As a tool to identify areas for improvement or to demonstrate current successes
- As a self-assessment tool for the golf course manager and superintendent
- As documentation for an environmental award nomination
- As documentation for regulatory requirements or inquiries from customers, the media, or the general public

Determining the Environmental Compatibility Quotient (ECQ)

The ECQ compiled for an installation's course is a snapshot of the overall performance and compliance with the GEM Plan. There are two measures obtained as a result of using the ECQ checklists to determine the status or quality of the environmental management program: 1) determining the actual and; 2) potential environmental compatibility quotients.

- **Actual ECQ-** the total percentage of "Yes" responses for all ten checklists. This number represents the current level of the golf course management practice compatibility with the environment
- **Potential ECQ-** the total percentage of "Yes" responses plus the total percentage of "Partial" responses for all ten checklists. Maybe the most significant measure; the potential ECQ represents a level of compatibility that could be reached by finalizing or fully implementing a particular practice or procedure.

ECQ Scoring Scale

Percent Responses Yes or Partial per Category Level	
90-100%	Advanced (Green)
70-89%	Showing progress (Yellow)
69% or less	Getting started (Red)

The newest course, the South, is loaded with natural ornamental grasses.

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The following ECQ checklists are a record of the interview conducted with The Courses at Andrews superintendent during the visit to Andrews AFB.

Planning & Compliance				
#	Environmental Compatibility Indicator	Yes	Partial	No
1	Has management demonstrated that environmental stewardship is an important part of their responsibilities by initiating the Comprehensive Golf course Environmental Management (GEM) Planning process?	✓		
2	Is the GEM Plan complete, updated regularly, and readily available to employees and customers?		✓	
3	Has the golf course adopted and posted an environmental policy?			✓
4	Is a map of the property highlighting environmental challenges posted for employees and customers?			✓
5	Are environmental challenges and their approved and implemented management practices, objectives, and targets evaluated at least annually, and are they regularly communicated to employees, customers, management, and the local community?			✓
6	Are there signs appropriately located to warn golfers of hazards of drinking reclaimed or otherwise non-potable water?			✓
7	Are there signs posted that highlight key habitats or have appropriate areas been designated “Environmentally Sensitive Zones” per The Rules of Golf?	✓		
8	Is there a general understanding by the entire course management staff of how their practices may potentially adversely impact the environment?	✓		
9	Are the environmental impacts of pest control measures considered as part of the comprehensive GEM planning process?	✓		
10	Is there at least one project planned and funded for the next year that would increase the compatibility of the course’s management program with comprehensive GEM planning goals and objectives?	✓		

Planning & Compliance Checklist (continued).

#	Environmental Compatibility Indicator	Yes	Partial	No
11	Have all employees been familiarized with the GEM Plan and are they trained regularly on the importance of environmental performance and compliance with its goals and objectives?		✓	
12	Are environmental management issues regularly discussed during staff meetings?	✓		
13	Does the superintendent document the actual amount of each pesticide or fertilizer annually used on each major golf course feature (greens, tees, fairways, roughs, water features, and natural areas)?	✓		
14	Has the course attained full certification in the Audubon Cooperative Sanctuary Program or similarly recognized environmental management program?			✓
15	Are all employees trained in their native language on the benefits of minimizing potential negative impacts?	✓		
16	Are comprehensive written records maintained to measure and document the environmental compatibility of the entire facility's management practices?	✓		
17	Are there documented aesthetic or functional thresholds integrated into the pest control decisions?		✓	
18	Is there a written and regularly updated Integrated Pest Management Plan for the entire golf course property?	✓		
19	Are employees trained on what to do in case of a spill and have spill containment kits been provided at all appropriate locations?	✓		
20	Has course management comprehensively examined the course to determine the activities that have a potential to negatively impact an identified environmental challenge?		✓	
	Totals	**11**	**4**	**5**

Operations & Maintenance				
#	Environmental Compatibility Indicator	Yes	Partial	No
1	Is contour mowing used to conserve fuel and/or to 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 levels that do not excessively stress important playing surfaces?	✓		
4	Are aeration, topdressing, and drainage improvements regularly implemented to improve soil health and minimize or eliminate use of pesticides or fertilizers?	✓		
5	Have all playing surfaces been inventoried and mapped for soil types including soil structure, nutrient levels, organic content, compaction, and water infiltration?		✓	
6	Are soil tests or plant tissue analysis used to determine turfgrass nutritional requirements?	✓		
7	Are there projects planned and funded for the next year that would increase the compatibility of the course's management methods with protection of the environment?	✓		
8	Are all appropriate employees trained to be familiar with (national, federal, state, and OSHA) regulations that apply to storage and handling of potentially hazardous materials used on the property?	✓		
9	Has there been a complete examination of all aspects of the operation other than the golf course (snack bar/restaurant, clubhouse, pro shop, pesticide mixing and storage facilities, fuel storage and delivery areas, and maintenance complex) for potential negative environmental impacts?	✓		
10	Are all employees encouraged to apply for education and training opportunities that may increase their awareness of the GEM Plan goals?	✓		

Operations & Maintenance Checklist (continued).

#	Environmental Compatibility Indicator	Yes	Partial	No
11	Are containers used to store used oil for equipment maintenance in good condition, not leaking, and clearly labeled?	✓		
12	Are oil/water separators and/or golf course wash racks operating properly and correctly maintained?	✓		
13	Are all golf course vehicles and equipment maintained and cleaned in a manner that eliminates the potential for spreading of contamination?	✓		
14	Are recycling containers located throughout the facility for use by customers and employees?		✓	
15	Are grass clippings left in place (other than greens) collected, composted, and/or recycled?	✓		
16	Are products that minimize unnecessary packaging considered prior to purchasing for use throughout the facility?			✓
17	Are energy efficiency ratings factored into equipment purchases for use throughout the facility?	✓		
18	Has the entire facility been studied to quantify solid waste streams to identify functions that produce the greatest quantities and have steps been taken to reduce these quantities?		✓	
19	Does the restaurant/snack bar facility utilize at least 90% plates, cups, and utensils that are reusable rather than disposable?	✓		
20	Is the food storage and prep area regularly cleaned to reduce the likelihood of pest infestations and required pesticide applications?	✓		
	Totals	**16**	**3**	**1**

Water Resource Management				
#	Environmental Compatibility Indicator	Yes	Partial	No
1	Are written records of water quality monitoring activities, results, and pollution control measures readily available?	✓		
2	Where appropriate, are slow-release fertilizers and/or spoon-feeding techniques used to reduce the potential for runoff impacts and nutrient loading to water quality?	✓		
3	Is the irrigation system utilized solely based on the specifically calculated local daily evapotranspiration rate?			✓
4	Are outdoor irrigation of non-golf course areas and indoor plumbing regularly monitored and maintained for leaks?	✓		
5	Have low-flow water saving devices been installed wherever possible?	✓		
6	Are recycled or other non-potable water supplies being used to irrigate at least 65% of the golf course property?	✓		
7	Is there at least one project planned that should eliminate or minimize a potential water quality or erosion problem?	✓		
8	Are water features regularly monitored for algae, erosion, excessive aquatic plant growth, eutrophication, and sedimentation?	✓		
9	Is runoff from parking lots cleansed by control measures such as vegetative or drainage filters prior to leaving the golf course property?			✓
10	Are there procedures for reporting water quality problems to supervisors (as required) for appropriate action?	✓		

Water Resource Management Checklist (continued).

#	Environmental Compatibility Indicator	Yes	Partial	No
11	Is the irrigation pumping station and associated equipment regularly checked for proper operation and leaks?	✓		
12	Has the irrigation system or its components recently been upgraded to reduce inefficiency, malfunction, and overall water use and are flow meters used to monitor water use and detect potential waste?	✓		
13	Is there a map of the watershed in which the golf course property resides and location(s) of floodplains and stormwater drainage exist on the property?	✓		
14	Is the quality of the water entering and leaving the property tested regularly for contaminants, pH, dissolved oxygen, and nutrients?		✓	
15	Is water quality data collected to establish baseline conditions for all water features on the property?			✓
16	Are settling ponds and/or detention ponds used to effectively remove sediments and pollutants from water features?	✓		
17	Are biological processes such as the addition of grass carp or white amur used to control unwanted aquatic vegetation in water features?			✓
18	Is there a written Water Resource Management Plan that delineates the care of the course's water features to include creeks, streams, ponds, irrigation system components, conservation efforts and water supply concerns?			✓
19	Has the property been examined for potentially significant wetlands or associated sensitive water-based habitats?	✓		
20	Has the property's water features been studied to determine the aquatic and amphibious species population?	✓		
	Totals	**14**	**1**	**5**

Conservation				
#	Environmental Compatibility Indicator	Yes	Partial	No
1	Is all motorized golf course equipment checked regularly for excessive air polluting emissions?	✓		
2	Has the entire golf course property been examined for critical habitats, state species of concern, and threatened or endangered species?	✓		
3	Have all potentially significant wildlife habitats and their maintenance practices been coordinated with local natural resource manager, the Fish & Wildlife Service, or other appropriate local or regional regulatory agency?	✓		
4	Are employees encouraged to minimize their trips around the course to conserve on the use of fossil fuels?	✓		
5	Have efforts been made to connect natural areas to facilitate wildlife movement through the course property?	✓		
6	If applicable, have all necessary permits been updated and their requirements satisfied in a timely manner?	✓		
7	Are recycling containers conveniently provided for customer and employee use throughout the golf course facility?		✓	
8	Has there been a study to determine the presence of invasive or exotic species on or near the course?	✓		
9	Is there a readily available Drought Management Plan for the entire golf course facility?		✓	
10	Is there at least one project planned and funded that is expected to minimize or eliminate the course's potentially existing negative environmental impacts?			✓

Conservation Checklist (continued).

#	Environmental Compatibility Indicator	Yes	Partial	No
11	Is stormwater collected for supplementing irrigation water supplies for use anywhere on the golf course facility grounds?	✓		
12	Are a majority of plants used in landscaped areas drought-tolerant native trees, shrubs, groundcovers, or their cultivars?	✓		
13	Have local wildlife species and their habitats been documented and mapped?	✓		
14	Does the course have a Tree Management Plan complete with planting plan and maintenance schedule?			✓
15	Are all employees trained to understand that poor management practices may adversely impact worker and environmental health and welfare?	✓		
16	Is there an inventory of bird and mammal species documented, maintained, and readily available?	✓		
17	Are food, shelter, and nesting attributes of plant species for landscape development considered during the design/selection process?	✓		
18	Have all degraded habitats due to construction or maintenance of the course been fully restored or improved?	✓		
19	Has the entire property been examined for archaeological, cultural, or historical resources?	✓		
20	Are customers and employees regularly informed/trained on the golf course's conservation practices?	✓		
	Totals	**16**	**2**	**2**

Pesticides & Pollution Prevention				
#	Environmental Compatibility Indicator	Yes	Partial	No
1	Are there minimally maintained, natural areas, no spray zones, and buffer areas around water features or sensitive landscapes and have they been communicated to equipment operators and pesticide applicators?	✓		
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	Are equipment or vehicle wash and wastewater kept from making direct contact with surface water?	✓		
7	Is equipment cleaned with compressed air or with blowers on part of the course instead of or prior to washing at a designated wash rack where pollution prevention measures are employed?			✓
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/delivery area comply with local, state, federal, or other applicable regulations?	✓		
10	Are written records maintained of all applications of pesticides to include: - the pest and treatment type (preventative/curative); - the location (specific playing area) of each pesticide used; - the area (SF/SM) and quantity of each pesticide used; - the chemical or common name of the active ingredient(s); - the date, location, or purpose?	✓		

Pesticides & Pollution Prevention Checklist (continued).

#	Environmental Compatibility Indicator	Yes	Partial	No
11	Is there a map of the course's "hot spots" that may require special care or attention?			✓
12	Are there trained scouts on staff other than the superintendent to monitor turf and plant health and pest problems?	✓		
13	Are there scouting forms utilized and are they collected and organized into a report or guide for use in future pest control decisions?	✓		
14	Is there an established aesthetic or functional threshold for insects, fungal diseases, and weeds for all managed areas that may possibly reduce pesticide and fertilizer inputs?		✓	
15	Are current copies of all Material Safety Data Sheets (MSDS) for all chemicals used anywhere on the golf course property maintained and readily available?	✓		
16	Are chemical applicator(s) encouraged to apply for regular training to maintain currency?	✓		
17	Is the chemical storage structure/area locked, well-ventilated, fire resistant and is access limited to appropriate personnel?	✓		
18	Are records of pest treatments and their effectiveness maintained and used to guide future pest control decisions?	✓		
19	Are golfers adequately 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?		✓	
20	Are there written pest profiles for common regional pests along with alternative potential control measures readily available?	✓		
	Totals	**17**	**1**	**2**

The Courses at Andrews
Andrews AFB, MD

The par 3, 4th hole on the South Course may be the most attractive of the 54.

Environmental Compatibility Quotient Summary			
Environmental Compatibility Category	**Yes**	**Partial**	**No**
Planning & Compliance	**11**	**4**	**5**
Operations & Maintenance	**16**	**3**	**1**
Water Resource Management	**14**	**1**	**5**
Conservation	**16**	**2**	**2**
Pesticides & Pollution Prevention	**17**	**1**	**2**
Totals	**74**	**11**	**15**

Key to checklist responses

- **Yes** = Practice is complete or ongoing and can be verified
- **Partial** = Practice has been initiated yet is not completed
- **No** = Practice is not in place

Month Year - The Courses at Andrews ECQ:

- **Actual ECQ = 74, Showing progress (Yellow)**
- **Potential ECQ = 85, Showing progress (Yellow)**

Environmental Compatibility Quotient Scoring Scale	
Total Yes or Partial Responses	**Environmental Compatibility Level**
90-100%	**Advanced (Green)**
70-89%	**Showing progress (Yellow)**
69% or less	**Just started (Red)**

Image has been removed due to the perceived potential threat to security.

Environmental Challenges Map

Environmental Challenges

One of the important results of the GCEBA process is the identification of significant environmental challenges to be addressed in the GEM Plan. Ideally, the golf staff will address their management approach to each challenge to accomplish course and local community environmental management objectives while still attaining acceptable levels of course playability and customer satisfaction.

The following environmental challenges were identified during the GEM process:

- Installation Restoration Program (IRP) Sites
- Bird/wildlife Aircraft Strike Hazard (BASH)
- Wetlands
- Invasive species
- Proposed project
- Air quality
- Threatened and endangered species

Assessing environmental challenges

The assessment of the environmental challenges is probably the most crucial as it provides a prioritized list of coordinated actions significant to the long-term success of the golf facility. The finalized GEM Plan will include the description, driver or requirement, management practice, objective, and target:

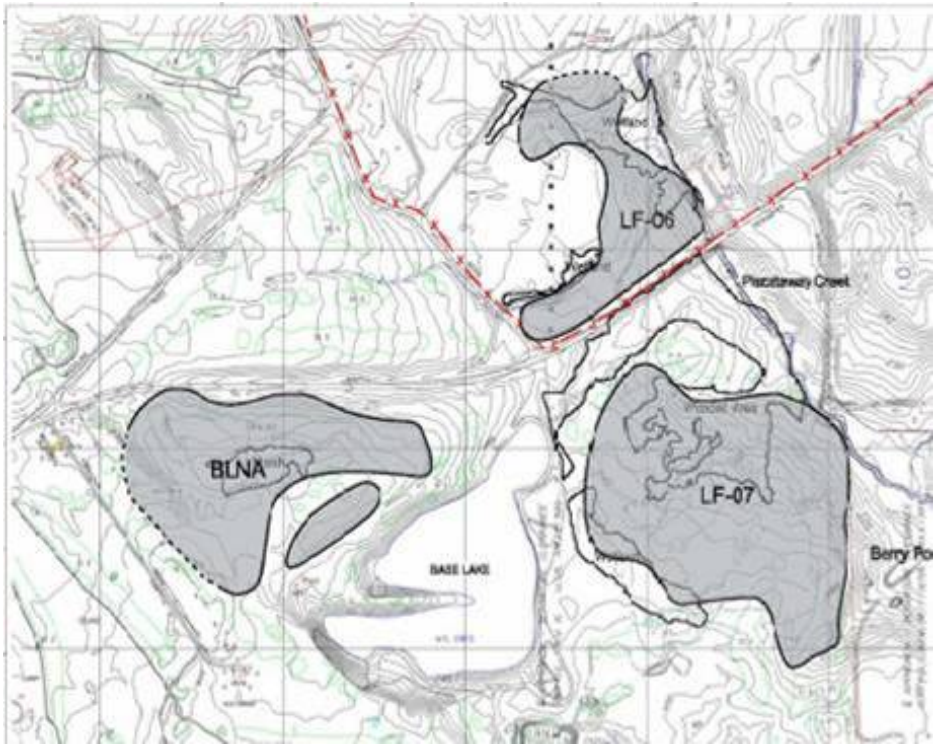
DESCRIPTION
Once the challenge has been identified, a short description and a few historical or statistical details assist greatly in understanding the key factors in devising management practices.

DRIVER/REQUIREMENT
Challenges are defined as “things that are bigger than the course”. Some of the reasons behind why a particular issue becomes a challenge are important to recognize and understand. A driver or requirement may be a local, regional, or national law, regulation, or initiative that creates the requirement to protect species, habitat, or preserve a resource such as open space or unique ecosystems.

MANAGEMENT APPROACH
A course’s approach to managing environmental challenges in accordance with the driver or requirement, environmental policy (see page 2), and established objectives and targets is the heart of the GEM Plan.

OBJECTIVE
Objectives are the overall goals for environmental performance focusing specifically on management activities associated with each challenge and the potential for impacts. The objective should directly relate to the environmental policy.

TARGET
The target is the time frame and/or quantifiable unit of measure to achieve the established objectives.



The Courses at Andrews
Andrews AFB, MD

Three IRP sites will be addressed in the recently awarded restoration project.

Installation Restoration Program (IRP) Sites

According to the INRMP, "Andrews AFB is currently conducting RI/FSs at three historical landfills located on Main Base: ERP sites Landfill (LF) 5, LF6, and LF7. The purpose of an RI is to determine the nature and extend of the contamination. Information from the RI is then used to perform a FS to evaluate possible remedies and mitigation measures. LF5 (Leroy's Lane) is located east of the runway and East Perimeter Road between Building 2495 and the installation's perimeter fence. LF5 is situated at the headwaters of a tributary that drains to Piscataway Creek. LF6 and LF7 are located south of the runway and east of Freedom Lake. LF6 is sited north of the South Perimeter Road and west of the Small Arms Range. LF7 is positioned south of the South Perimeter Road and is beneath the eastern most section of the installation ' s golf course. There is a major section of wetlands and other water resources (Streams and Springs) located within LF6 and LF7. All three landfills are located in the same watershed that drains to Piscataway Creek. Due to the co-location of landfills and various types of water resources there is a potential impact to on and off base natural resources."

The document continues with "Once the RIs [remedial investigation]are completed and approved by the appropriate regulators, FSs [feasibility study] will be completed to determine suitable remedies and mitigation measures. During the FS, the Environmental Flight will work closely with ERP program to determine mitigation measures for landfill caps. The use of traditional caps for the three landfills may not yield the best benefit to natural resources. It is this last sentence that may be the most important for golf course managers. There is at least some hope that the golf course could be spared major invasive actions.

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Further complicating the restoration process is the presence of threatened and endangered species habitat. This photo was taken near the South Course's 13th teeing area.

Site LF-06

According to the Draft FS, "LF-06 was an old gravel pit approximately 10 to 15 feet (ft) deep in the 1950s. The area was used for disposal of construction rubble from the late 1950s through the late 1960s. Minor quantities of garbage, old paints, and equipment from the Reutilization and Marketing (R&M) Annex (Building 2326) were also reported to be buried at this location. In addition, unknown quantities of liquid waste (waste oils, paint thinners, and cleaning solvents) from industrial shops were indiscriminately dumped at LF-06 (Engineering Science 1985).

Based on field activities conducted during the RI, inert fill is present in varying thickness in the southern, eastern, and northern parts of LF-06, and a source area is present in the northern part of LF-06. Inert fill thickness ranges from 2 to 12 feet. Fill material generally consists of varying amounts of construction rubble, cement, brick glass, ash, metal, asphalt, tile, and rubber. The area of landfill activity has been defined as investigations around the perimeter of the landfill show no evidence of fill and define the limits of LF-06. Inclusive of the potential source area in the northern part of the site, LF-06 covers approximately 11 acres."

The FS continues by recommending alternative 4, "Selective Soil Excavation with Off-site Disposal, Alternative Closure Cover with Drainage Control and ICs/LTM" since "it manages site contamination risk, protects against future groundwater degradation, and protects future residents (an unlikely scenario) from using groundwater as a drinking water source."

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The 12th hole on the South Course is within the LF-07 boundary.

Site LF-07

"The FS states "LF-07 was an old gravel pit area used for disposal of construction rubble from the 1960s through the 1980s. Some shop wastes also may have been indiscriminately dumped at LF-07. As recently as 1984, the following items were found at this landfill: old furniture, washing machines, metal lockers, sheet and scrap metal, household garbage, plastics, empty 55-gallon drums, waste lumber, tires, pipes, and hospital wastes including unused needles, and chemical reagents (Engineering Science 1985).

Based on field activities conducted during this RI, fill or pockets of fill were detected across the site. Fill material generally consisted of varying amounts of wood, concrete, brick, ash, metal, rubber mixed with a soil matrix. Four potential source areas have been identified within the overall area of inert fill material. The investigation locations around the perimeter of LF-07 show no evidence of fill, and define the limits of LF-07. The landfill area, inclusive of the potential source areas, covers approximately 28 acres."

The Draft FS recommends Alternative 4 as "the most appropriate alternative since it manages site contamination risk, protects against future groundwater degradation, and protects future residents (an unlikely scenario) from using groundwater as a drinking water source. This alternative is anticipated to be just as protective as the other alternatives without the expense of a closure cap and active groundwater treatment. The effort for the implementation of Alternative 4 is proportional to the risk associated with the contamination at the site.

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This pond and the surrounding area on the East Course's 9th is part of the Base Lake North Area (BLNA) installation restoration program site.

Base Lake North Area (BLNA)

"Base Lake North Area (BLNA) was active during the initial construction of Andrews AFB from 1942 to 1955. This area was used for the disposal of general refuse and construction rubble. No liquid or hazardous wastes are known to have been buried at this location. Trenches were reported to have been excavated 10 to 12 ft deep and 15 ft wide within the area. Construction rubble and general refuse were buried in these trenches and covered daily with local soil (Engineering Science 1985).

Based on field activities conducted during this RI, fill or pockets of fill were detected across central and western BLNA. As currently mapped, the fill area covers approximately 20 acres. No distinct trenches were detected in the geophysical survey, and fill material generally consisted of varying amounts of brick, asphalt, wood, concrete, glass, and rubber. One hot spot area, documented by DPS-44, contained black granular fill material with a strong tar-like odor. Another hot spot area (documented by TP-17), contained household trash consisting of newspaper, bottles, cans, wire, glass, and rubber. This area was named BLNA during the RI. Subsequent to the RI naming scheme, Base Lake was renamed Freedom Lake."

The Draft FS recommends "Alternative 4 is the most appropriate alternative since it manages site contamination risk, protects against future groundwater degradation, and protects future residents (an unlikely scenario) from using groundwater as a drinking water source. This alternative is anticipated to be just as protective as the other alternatives without the expense of a closure cap and active groundwater treatment. The effort for the implementation of Alternative 4 is proportional to the risk associated with the contamination at the site.

Driver/requirement

- AFI 32-7020, The Environmental Restoration Program
- Comprehensive Environmental Response, Compensation, and Liability Act, (CERCLA)
- Superfund Amendments and Reauthorization Act (SARA)

Objective

Ensure daily compliance with restoration program site requirements.

Management approach

- Abide with all existing land use controls (LUCs)
- Work closely with installation restoration program manager to ensure compliance
- Review and comment on new Draft Feasibility Study
- Attend as many project management meetings as feasible throughout restoration process
- Coordinate all excavation or drilling procedures with contractors
- Accompany all contractors as required to protect golf course and amenities
- Review and comment as necessary on all proposed actions that may impact the golf course

Target

Immediately integrate any specified or directed land use controls into regular maintenance practices.

Construction debris like this is the evidence indicating a potential environmental concern buried below.

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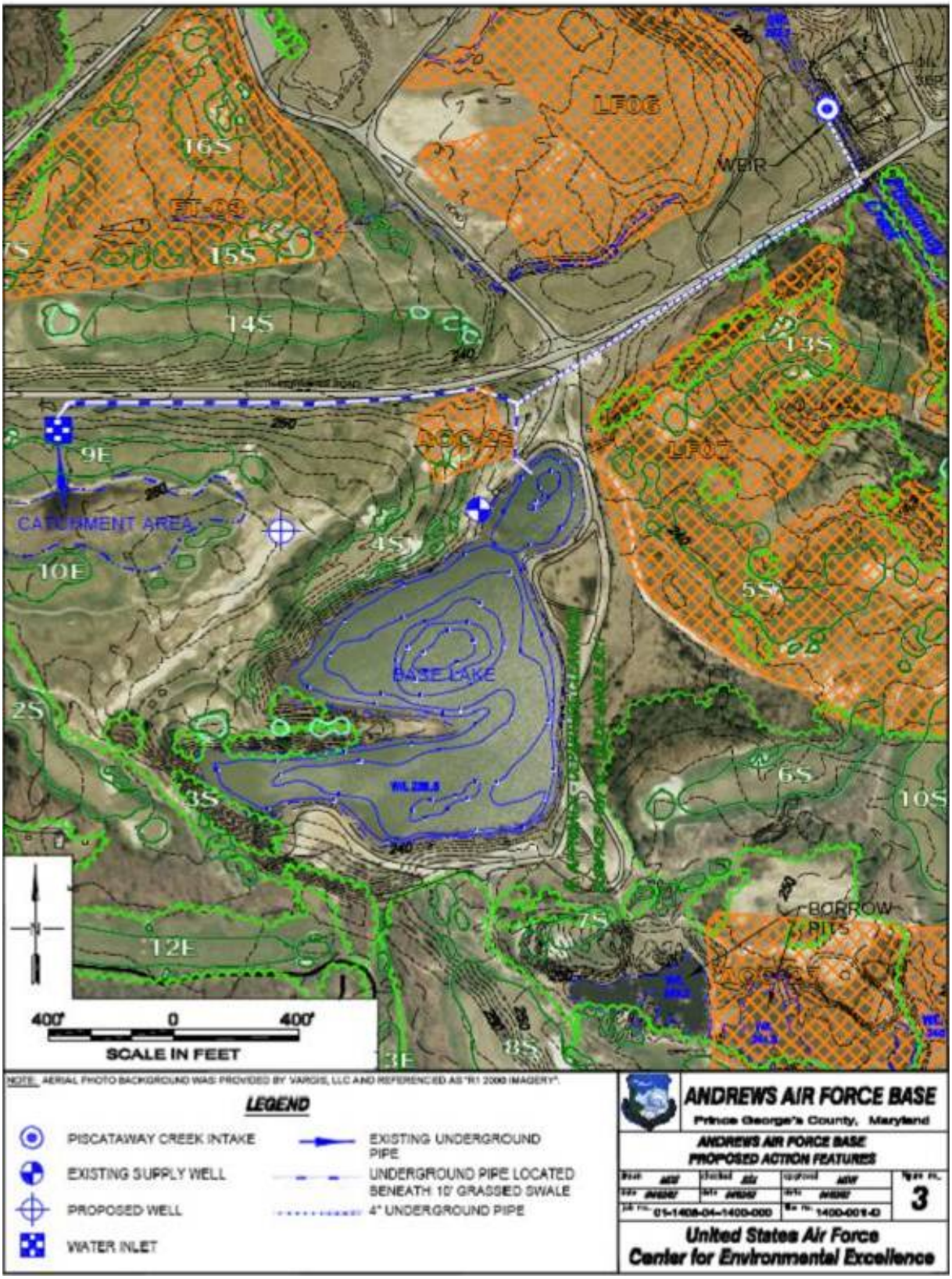

An excerpt from the "Increasing the Water Supply" Environmental Assessment, this map demonstrates the complexity of dealing with the IRP sites while preserving the water quality in Base Lake and preserving the existing land use as a golf course.

The Courses at Andrews
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The Andrews airfield is one of the most important in the world.

Bird/wildlife Aircraft Strike Hazard (BASH)

The BASH Plan states "Landscaping and natural vegetation associated with the Andrews AFB Golf Course provide resources for a variety of birds and other wildlife. Canada Geese were observed departing the golf course and transiting the approach ends of Runways 01L and 01R during the visit. Dense stands of trees such as at the southeast edge of the airfield attract roosting birds, deer and other wildlife."

The BASH Plan continues "Waterfowl such as resident Canada Geese are increasingly abundant in the region and in the parks, golf courses, wetlands, and residential areas surrounding the base. Forested areas on and near the AFB attracted significant roosting populations of blackbirds, starlings, and grackles as well as Turkey Vultures, Black Vultures, Red-tailed Hawks, and other raptors."

Again, the BASH Plan states, "Other wetland areas outside the security fence such as along the golf course and base lake are also of concern. Areas around all these features supported aquatic vegetation such as cattails, sedges, rushes, willows, other brushy vegetation, and small trees."

Presumably approved by the installation airfield manager, the INRMP states that "Over 120 bluebird boxes have been installed at the Main Base, with a high percentage of them occupied during the nesting season. A number of group commanders at the base support the Operation Bluebird program, which is administered by the Environmental Flight. Several military retirees and other personnel have volunteered their time for construction, installation, and maintenance of the boxes. A number of other birdhouses have also been installed at the golf course and at Brandywine."

The proximity of the Courses at Andrews and the installation's airfield should continue to be of primary concern to both the golf and airfield managers.

Driver/requirement

- Bird/Wildlife Aircraft Strike Hazard (BASH) Plan, 91-212
- AFI 13-213, Airfield Management
- AFI 32-1053, Pest Management Program
- FAA Advisory Circular 150/5200-33A, Hazardous Wildlife Attractants On Or Near Airports
- AFI 91-202, The U. S. Air Force Mishap Prevention Program
- AFPAM 91-212, Bird/Wildlife Aircraft Strike Hazard (BASH) Management Techniques
- UFC 3-260-01, Airfield and Heliport Planning and Design
- AFPD 91-2, Safety Programs

Objective

Ensure that golf course management practices contribute to the overall elimination of potential BASH concerns.

Management approach

- Coordinate pond and stream maintenance procedures with installation environmental management staff
- Install only BASH-approved plant material
- Secure membership on BASH Working Group and attend all meetings
- Mow all non-play areas in accordance with AFPAM 91-212
- Continue to assist installation airfield and environmental managers with BASH concerns on the golf course
- Consider removal of highly attractive trees and shrubs

Target

After securing membership on the BASH Working Group, assess, identify and eliminate 25% of the BASH conditions on the course prior to the next iteration of the natural resources management plan. Initiate consultation immediately and regularly thereafter to ensure compliance with airfield management and BASH criteria.

The Courses at Andrews
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Ponds can be an attractant to water fowl seeking food and shelter.

The Courses at Andrews
Andrews AFB, MD

Installation mission requirements are the number one priority for The Courses at Andrews.

The Courses at Andrews
Andrews AFB, MD

Andrews AFB's wetlands occur mostly downstream of the golf courses.

Wetlands

The emergent wetland community that is found at Andrews AFB is the palustrine persistent emergent subclass. These wetlands are found in areas on the golf course near the Base Lake (Freedom Lake) and at the southern end of the airfield. Plants found at these wetlands include of broadleaf cattail (Typha latifolia), common rush (Juncus effusus), jewelweed (Impatiens capensis), buttonbush (Cephalanthus occidentalis), giant cane (Arundinaria gigantea), shallow sedge (Carex lurida), and seedbox (Ludwigia spp.). Black willows (Salix nigra) are found on the outskirts of emergent wetlands.

Driver/requirement

- Clean Water Act, Section 404
- National Pollutant Discharge Elimination System (NPDES)
- Executive Order 11990, Protection of Wetlands
- Installation storm water pollution prevention plan (SWPPP)

Objective

Ensure that all water bodies continue to be free of pollutants potentially attributable to a golf course management practice.

Management approach

- Establish, document and communicate fertilizer and pesticide application buffers to all appropriate employees or service providers
- Consult with environmental staff prior to any changes in creek bed or pond bank maintenance
- Comply with all requirements included in the approved installation SWPPP
- Ensure all spill prevention procedures and spill kits are in place and all

pertinent employees are adequately trained to correctly and promptly perform required actions in an emergency situation
- Consult with installation environmental staff to ensure that golf course maintenance practices are fully compliant with complex water-related regulations
- Compile a comprehensive Water Resource Management (WRM) Plan for the entire golf course facility

Target
Immediately consult with environmental staff to assist in the completion of the buffer establishment process and continue to comply with SWPPP. Complete WRM Plan prior to end of CY09.

Areas like this wet, slow-moving swale can rapidly become a maintenance headache and are potential candidates for delineated wetlands.

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The Courses at Andrews
Andrews AFB, MD

Phragmites, or common reed, is one of Andrews' worst invasive species.

Invasive species

One of the goals of the INRMP is to control invasive species especially common reed and honeysuckle. The golf courses are rife with areas conducive to these species Phragmites is found in wetlands worldwide. It grows in wet areas including fresh or brackish marshes, creeks, edges of ponds and lakes, ditches, and the dune systems of barrier coastal islands. Dense stands of phragmites usually are associated with areas where soil has been exposed or disturbed. The plants are less competitive when water levels vary by seasons and years. The exact abundance and current rate of spread of phragmites in Maryland is unknown. However, it is increasing in abundance and distribution. Phragmites has a thick stalk that can reach 13 feet in height. It has a large plume-like flower that persists throughout the winter. Phragmites most often spreads by creeping rhizomes (roots). All stands have vertical and horizontal rhizomes, and young stands have long surface runners that help in rapid expansion of the colony.

Japanese honeysuckle is a perennial vine that was introduced from eastern Asia during the 1800's as an ornamental, for erosion control and for wildlife cover and food. Japanese honeysuckle is extremely widespread, occurring in at least 38 states from California across southern and midwestern states to New England and the Great Lakes region. It escaped cultivation to invade cultivated and natural areas where it grows vigorously, smothering most vegetation in its path, and girdles shrubs and young trees as it twines up to reach greater light. Its evergreen nature gives it an additional advantage, allowing it to grow when most other plants are dormant. Japanese honeysuckle is a vigorous bloomer and produces abundant seed dispersed by birds.

Driver/requirement

- Executive Order 13112, Invasive Species
- National Invasive Species Act (1996)
- Plant Protection Act (2000)
- Federal Noxious Weed Act of 1976 (7 U.S.C. 2801)
- Executive Order 13112, Invasive Species, February 3, 1999

Objective

Prevent introduction and establishment of invasive species to reduce their impact on the environment, economy and health of the United States.

Management approach

- Never knowingly install a listed or potentially invasive species
- Regularly inspect likely areas for invasives to establish themselves
- Work with installation environmental staff to contain or reduce invasives
- When possible, restore native species and habitat conditions
- Train all pertinent employees on the latest invasive species identification and control measures
- Restore disturbed areas dominated by invasive species to natural vegetation where practical and consistent with mission requirements
- Utilize native or indigenous plant materials whenever possible

Target

Conduct invasive species survey and complete an approved plan to contain or reduce invasives prior to the end of FY10.

Low lying, poorly drained areas are ideal for the establishment of invasive species.

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The Courses at Andrews
Andrews AFB, MD

Some of the 5th on the East Course is within the potential proposed project site.

Proposed project

North of the East Course on or near the 3rd, 5th and 6th holes is the site of a proposed project. The NASAM pad is related to the defense of the airfield by the Army. No other information was provided on this project.

Potential impacts to the golf course may be mitigated by active communication between all parties.

Driver/requirement

- Mission support and installation defense

Objective

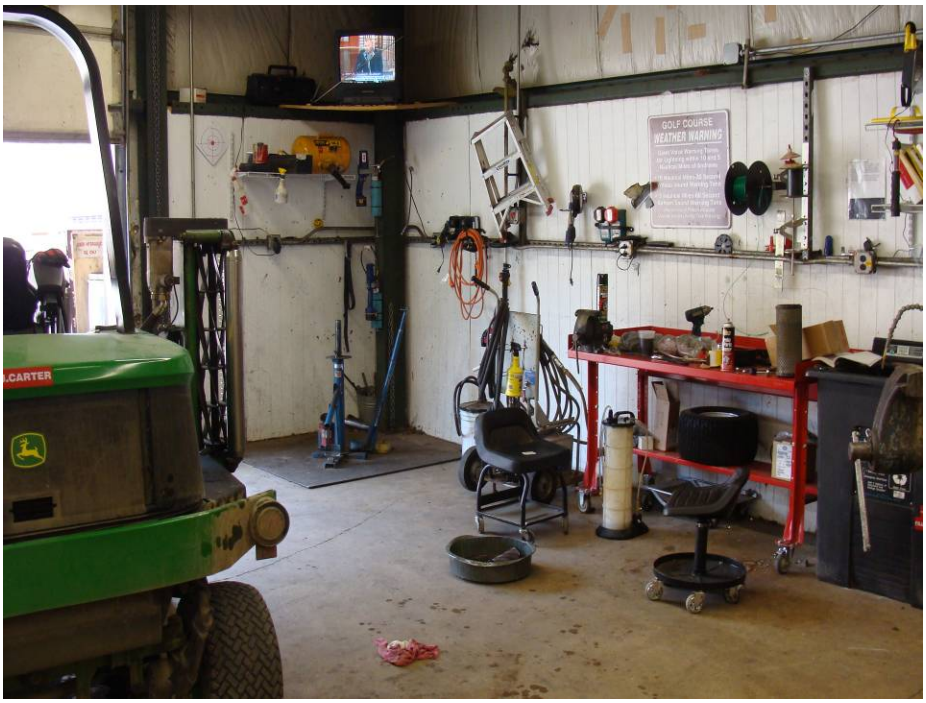
Continually support the mission at all times.

Management approach

- Actively participate in all project siting discussions to ensure mitigation of impacts to golf course

Target

Immediately engage with project proponent and installation civil engineering and environmental staffs.



The Courses at Andrews
Andrews AFB, MD

The office of the Courses at Andrews air quality manager.

Air quality

The Clean Air Act establishes the national ambient air quality standards for the United States. Unfortunately, the greater Washington D.C. area, of which Andrews AFB is part of, is currently in non-attainment for both ozone and PM2.5. Every effort should be taken by the golf staff to assist in the regional effort to minimize excess air emissions from equipment or as a result of maintenance operations.

Driver/requirement

- Clean Air Act

Objective

Minimize or eliminate excessive emissions from golf course equipment, vehicles and equipment care.

Management approach

- Replace older equipment as funding allows
- Encourage employees to minimize their trips on and around the course
- Ensure equipment cleaning solution containers are closed at all times
- Eliminate all aerosols from maintenance and clubhouse inventories
- Replace 2-cycle powered equipment as funding and technology allow

Target

Perform scheduled annual engine overhauls and regular equipment maintenance as necessary to minimize or eliminate excessive exhaust emissions.

The Courses at Andrews
Andrews AFB, MD

Sandplain gerardia, an endangered species, thrives in this area near the 12th tee on the South Course.

Threatened and endangered species

The Threatened and Endangered Species Survey tells us that the "Sandplain gerardia is a Federally-listed endangered and Maryland-listed endangered plant. The plant is typically found in dry, sandy, short grass plains, roadsides, and openings in oak scrub. A plant resembling sandplain gerardia was fist observed at Andrews AFB in 1993 prior to golf course construction. The plant was identified south of the flightline near the current 13th tee of the South Course.

In 1994, a second survey was conducted at this same site, but no specimens were observed. Despite this, however, the golf course habitat was fenced to avoid possible impacts from the planned golf course construction. The fenced site, adjacent to the golf course, was surveyed where a sandplain gerardia population has been previously known to exist. This species was not observed at the time of the survey. Since this species flowers from early August to early September, it was not expected that it would be identified during the survey. However, based on discussions with base personnel, the species is regularly observed at this location during its flowering period in August. While this species was not identified during the survey, an assessment of habitat conditions at the enclosure was performed.

Few areas were noted within the enclosure that provide the disturbed habitat with limited competition that is required by sandplain gerardia. A well developed herbaceous community dominated by bluestem (*Andropogon* spp.), tickseed sunflower (*Bidens aristosa*), dogbane (*Apocynum* spp.), and goldenrod (*Solidago* spp.) was noted. In addition, shrubs and sapling of multiple species were noted within the enclosure. The population of sandplain gerardia is not expected to persist at this location without the introduction of disturbance and the removal of competitive

species."

According to the Installation Pest Management [IPM] Plan, "The protection of endangered and protected species is covered in the installation Natural Resources Plan, maintained and administered by the Environmental Flight. There are currently no protected endangered animal species on AAFB, but there are several protected plant species. The Pest Management Coordinator periodically evaluates on-going pest control operations and evaluates all new pest control operations to ensure compliance with the Endangered Species Act. No pest management operations are conducted that are likely to have a negative impact on endangered or protected species or their habitats without prior approval from the Environmental Flight."

Driver/requirement

- Endangered Species Act of 1973, as amended (16 U.S.C. 1531-1543)

Objective

Never allow a management practice to negatively impact a known threatened or endangered species on or near the golf course.

Management approach

- Ensure that the maintenance practices for all identified potential threatened or endangered species habitats are regularly coordinated with environmental
- Continue to provide a quality golf course-specific IPM Plan to pest manager

Target

Request a site assessment and review of current management practices immediately from the appropriate installation environmental manager.

The Courses at Andrews
Andrews AFB, MD

Large rodents can sometimes be a pest from the golf course manager's perspective.

Implementation

Setting goals and objectives is an important step in the implementation of an installation's GEM Plan. Implementation is the single best evidence that the installation GEM team is working well together in their task of supporting the mission.

GEM Plan goals & objectives

Goals are defined as actions or results that should be accomplished in the next year.

- Adopt and post an environmental policy and a map of the property highlighting environmental challenges for both employees and customers
- Install warnings signs at all appropriate water bodies
- Familiarize all employees with the GEM Plan
- Document and integrate aesthetic and functional thresholds into pest management practices
- Ensure all customers are adequately warned of planned or recently completed chemical or fertilizer applications

Objectives are defined as actions or results that are desired to be accomplished prior to the next INRMP update in 2011.

- Evaluate and communicate identified environmental challenges and their management approaches, objectives and targets at least annually
- Regularly test the water quality of streams both as they enter and leave the golf course property and collect the data to establish baseline conditions
- Compile and implement a Water Resource Management Plan for the entire golf course facility

GEM Plan best practices

Best practices are defined as any action, method, practice, or result that has proven its value and worth over time. The GEM program has been designed to create a body of scientific data to share with all U.S. Air Force installation golf and environmental staff members.

- Conducted plant growth regulator tests on fairway turfgrasses to help eliminate or minimize regular maintenance
- Regularly utilize course drainage system covers during fertilizer applications to preserve water quality downstream

The Courses at Andrews
Andrews AFB, MD

Quality playing conditions is a regular occurrence.

Conclusion

The Courses at Andrews provide the most comprehensive golf recreational experience available in the U.S. Air Force. With three of the finest courses anywhere and a fitness center all run by a highly trained and motivated staff rife with genuine customer-oriented hospitality, Andrews AFB has raised the bar to new heights. The high quality golfing experience is a testament to the course management's customer-driven long-term vision and guidance.

This is evident by the statement on their trend-setting web site: "Moreover, we are committed to making The Courses at Andrews Air Force Base a place of warmth, hospitality, and operational efficiency. To us, that means prompt, courteous service, and genuine responsiveness to your needs. We hope you enjoy your experience at The Courses at Andrews Air Force Base and will use the facilities often.

Remember, The Courses at Andrews Air Force Base...."*where we have accomplished something very special*"."

The gallery

On the following pages are some of the more revealing photographs of challenges, maintenance practices, and other areas of the golf course facility.

The courses contain numerous natural.

The number of small creeks is astounding.

Compliance and safety are at the heart of the operation .

Minimally-maintained areas dominate the South Course.

There are a number of water quality monitoring wells.

Ornamentals offer an occasional spot of color.

Stumps left from storms are unsightly and unsafe.

Many areas are vegetated with native grasses.

Bird houses are located throughout the property.

Poorly drained areas can turn into wetlands.

The federally threatened Sandplain gerardia grows here.

Restoration team investigates one of the sites.

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Air Force Center for Engineering & the Environment
Technical Directorate
Natural Infrastructure Division

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Please visit our Golf Course Environmental Management Program website:
http://www.afcee.brooks.af.mil/ec/golf/