



***Hickam AFB Golf Courses  
Environmental Management (GEM) Plan  
Hickam AFB, Hawaii***



**October 2009**



**San Antonio, Texas**



## ***Hickam AFB Golf Courses Environmental Management Policy***

**In concert with the  
Hickam 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.**

# Table of Contents

**Table of Contents** ..... **ii**

**Executive Summary** ..... **3**

    U. S. Air Force GEM Program ..... 3

    GEM Program process ..... 3

    Environmental Compatibility Quotient (ECQ) scores ..... 3

    Environmental challenges..... 3

    Where do we go from here? ..... 4

    The GEM Initiative ..... 4

**GEM Process** ..... **5**

    GCEBA components ..... 6

    U.S. Air Force GEM Plan components ..... 7

**Course Specific Analysis** ..... **8**

    Mamala Bay Golf Course Description ..... 8

    Ke’aholi Golf Course Description ..... 10

    General Hickam AFB Golf Courses Details ..... 11

    Mamala Bay Golf Course Details ..... 11

    Ke’alohi Golf Course Details ..... 11

**Environmental Compatibility Quotient (ECQ) Checklists** ..... **12**

    Determining the Environmental Compatibility Quotient (ECQ) ..... 12

    Planning & Compliance ..... 13

    Operations & Maintenance ..... 15

    Water Resource Management ..... 17

    Conservation ..... 19

    Pesticides & Pollution Prevention ..... 21

    Environmental Compatibility Quotient Summary ..... 23

    Environmental Compatibility Quotient Scoring Scale ..... 23

**Environmental Challenges** ..... **24**

    Assessing environmental challenges ..... 26

        Coastal zone management ..... 27

        Bird/wildlife Aircraft Strike Hazard (BASH) ..... 29

        Potable water use ..... 31

        Airfield safety criteria ..... 33

        Invasive species ..... 35

        Explosive safety standards ..... 37

        Installation Restoration Program (IRP) sites ..... 38

        Military munitions restoration program (MMRP) sites ..... 42

        Underground Storage Tanks (UST) ..... 44

        Threatened or endangered species ..... 47

        Wetlands ..... 49

**Implementation** ..... **51**

    GEM Plan goals & objectives ..... 51

**Conclusion** ..... **51**

    The gallery ..... 51

**Bibliography** ..... **54**



## 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 Hickam 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 = 76, Showing progress (Yellow)**
- **Potential ECQ = 92, Advanced (Green)**

### Environmental challenges

The following environmental challenges were identified in compiling this Final GEM Plan:

- Coastal zone management
- Potable water use
- Airfield safety criteria
- Invasive species
- Explosive safety standards
- Installation Restoration Program (IRP) sites
- Military Munitions Restoration Program (MMRP) sites
- Underground Storage Tanks (USTs)
- Wetlands

## **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 Hickam 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/>).



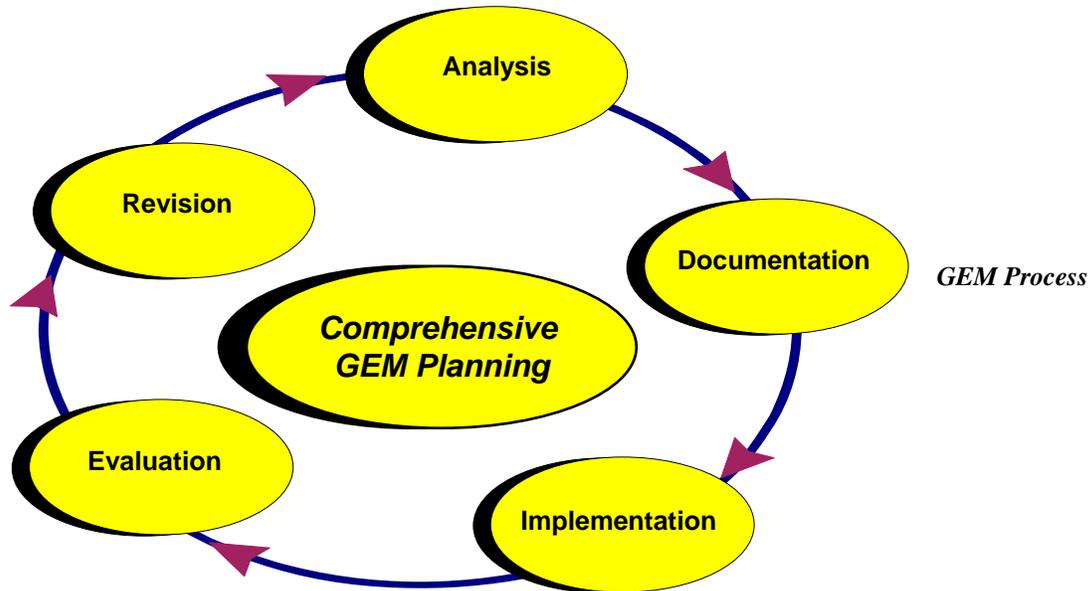
*Hickam AFB  
Golf Courses  
Hickam AFB, HI*

*The clubhouse at Mamala Bay was set to be replaced prior to joint basing decision.*

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.



*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.



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Hickam AFB, HI*

*If you are lucky enough to see this sight, you are indeed fortunate. This is the view of the sunrise behind the 3<sup>rd</sup> tee and you must have had an early tee time or are a Mamala Bay employee.*

## **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 Hickam 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 Hickam or to just try new ideas to determine their value, will the golf staff and golfers benefit. The Hickam 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**

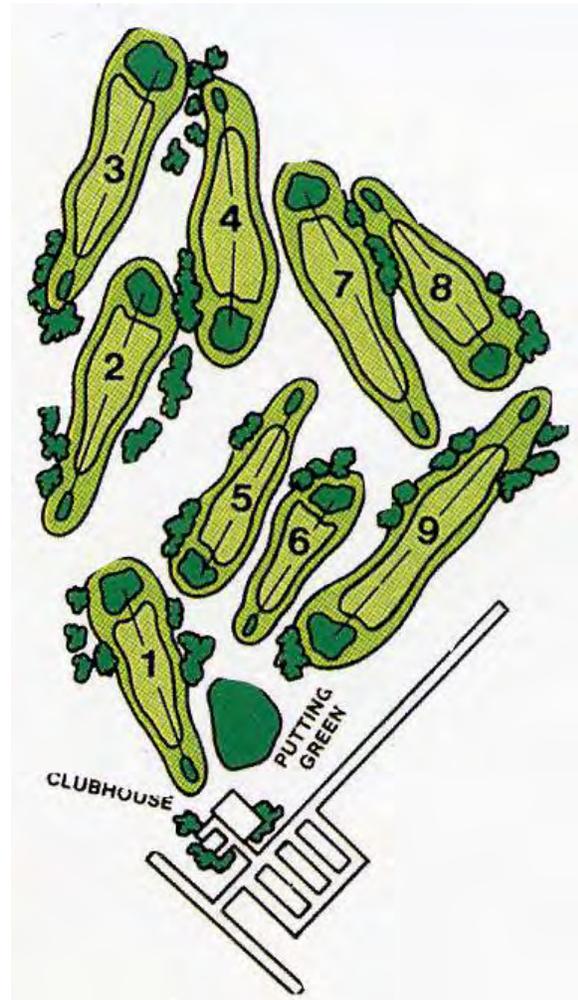
The very nature of a superior GEM Plan implies that all documents be regularly maintained to represent the most current conditions. Golf course managers and superintendents should be constantly looking for ways to improve their environmental stewardship. Acting on lessons learned is right behind initial 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.

## 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.



*Mamala Bay Golf Course*



*Ke'alohe Golf Course*

### **Mamala Bay Golf Course Description**

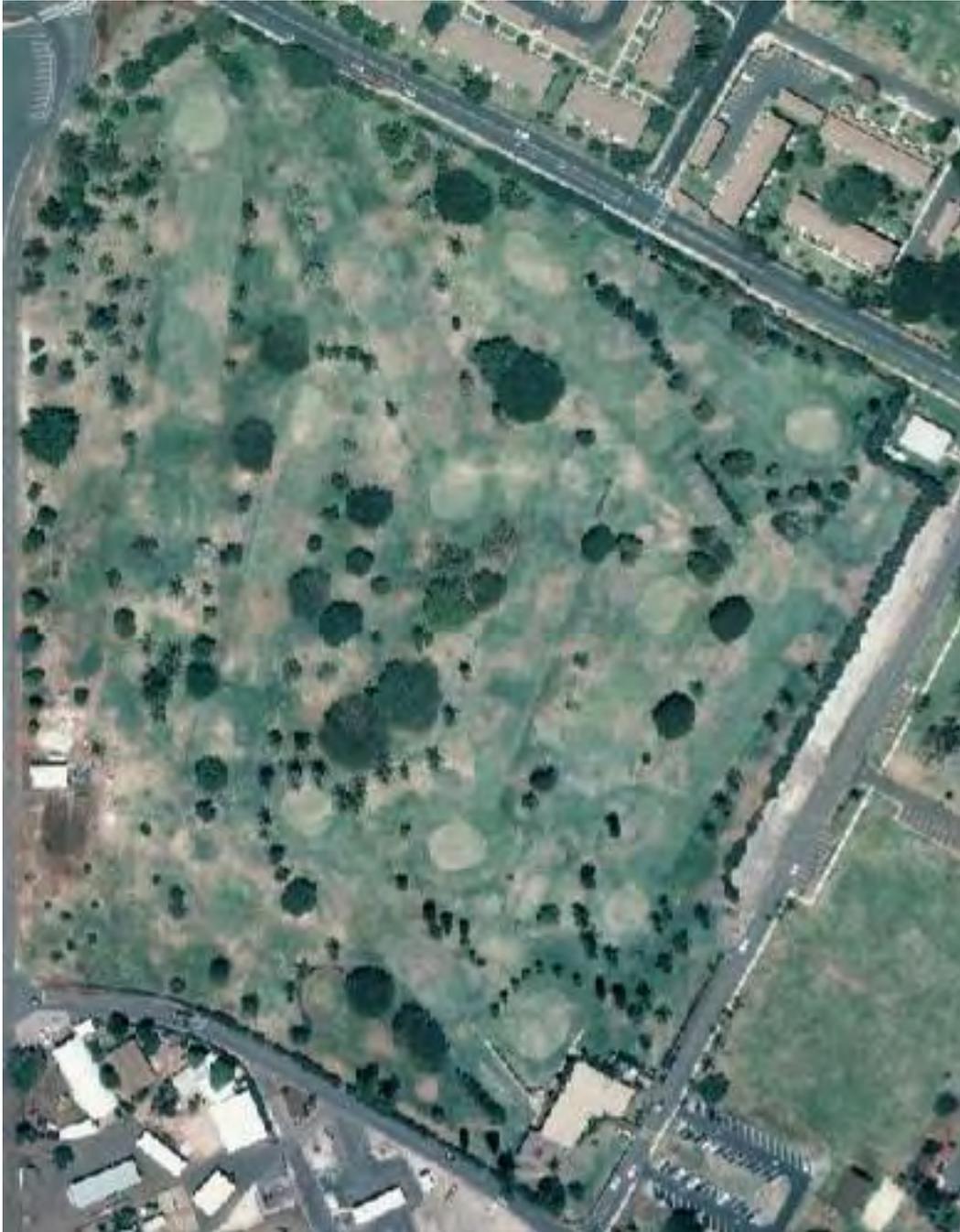
One of the finest military golfing facilities, Mamala Bay is also home to a management staff without peer. Experience in customer satisfaction is their claim to fame. The course rarely is out of perfect condition and players flock to the facility as evidenced by its annual position at the top of the "rounds played" list. The clubhouse is functional yet is due for replacement. It was on the Air Force project list until the joint basing decision changed everything. Despite this setback, the future is still bright for the Mamala Bay staff and its happy customers. The course is relatively flat but its routing plan offers plenty of challenges while its location hard against the coastline and the bay (Ahua Lagoon) delights the eye.



**Mamala Bay Golf Course**

## **Ke'aholi Golf Course Description**

At 22 acres, the Ke'aholi Golf Course is perfectly located near the center of Hickam's residential community. The short course is only nine holes but has the opportunity to provide a quality golfing experience while satisfying one's hunger and thirst with the accompanying restaurant and bar. A great place to work on the all-important short game, the facility needs, or better yet, deserves to be upgraded to realize its full potential. Current management is a step in a positive direction.



**Ke'aholi Golf Course**



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*The 1<sup>st</sup> at Mamala Bay can be one of the toughest on the course.*

**General Hickam AFB Golf Courses Details**

Average annual precipitation	~ 22 inches
Average growing season	Year round
Elevation	Just above sea level (~0-20' ASL)
Prevailing wind direction	Northeast tradewinds
Climate	Tropical

**Mamala Bay Golf Course Details**

Architect / Year constructed	Robert Baldock / 1965-1966
Total acreage / actively maintained	178 / 140 acres
Par	36-36-72
Yardage/Rating/Slope	Back- 6868/72.7/133 Middle- 6412/70.7/124 Forward- 5675/72.9/120
Turfgrass	328 Hybrid Bermuda grass
Tees-	328 Hybrid Bermuda grass
Fairways-	328 Hybrid Bermuda grass
Greens	Common Bermuda grass
Roughs-	Potable (Red)
Irrigation source	

**Ke'alohe Golf Course Details**

Year constructed	1961
Total acreage / actively maintained	22 / 22 acres
Par	27 (9 holes only)
Yardage/Rating/Slope	1406
Turfgrass	Greens 328 / Rest Common Bermuda
Irrigation source	Potable (Red)

## 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 Hickam'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 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 following ECQ checklists are a record of the interview conducted with Hickam AFB Golf Courses superintendent during the installation site visit.

<b><u>Planning &amp; Compliance</u></b>				
<b>#</b>	<b>Environmental Compatibility Indicator</b>	<b>Yes</b>	<b>Partial</b>	<b>No</b>
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	Does management conduct a comprehensive annual evaluation for each identified environmental challenge and its management approach, objective, and target?	✓		
6	Does the course have a Tree Management Plan complete with planting plan and maintenance schedule?		✓	
7	Is there a readily-available and regularly updated Integrated Pest Management Plan specifically written for the entire golf course property?	✓		
8	Is there a map of the course's "hot spots" or specific areas that may require regular special care or attention?		✓	
9	Is there an up-to-date comprehensive golf course development plan or master plan that details the desired short- and long-term improvements to the facility?		✓	
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	Are the actual amounts of each pesticide or fertilizer on the facility available in writing for every application over the last year?	✓		
14	Has the facility attained full certification in the Audubon Cooperative Sanctuary Program or similar industry-recognized environmental management program?			✓
15	Are employees trained in their native language on the benefits of minimizing potential negative impacts?	✓		
16	Are environmental targets being met based on an annual review or as needed basis?	✓		
17	Are there documented functional or aesthetic thresholds integrated into pest control decisions?	✓		
18	Is there a written comprehensive Golf Course Water Resources Management Plan that delineates the care of each of the course's water features?		✓	
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	Have all maintenance procedures been examined to determine their potential to negatively impact an identified environmental challenge?	✓		
	<b>Totals</b>	<b>11</b>	<b>8</b>	<b>1</b>

<b><u>Operations &amp; Maintenance</u></b>				
<b>#</b>	<b>Environmental Compatibility Indicator</b>	<b>Yes</b>	<b>Partial</b>	<b>No</b>
1	Is there a written, regularly updated and comprehensive Turfgrass Management Plan for each type of turf and playing area?	✓		
2	Are there designated natural or minimally-maintained buffers around sensitive landforms and/or 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 other drainage improvements regularly implemented to improve soil health and minimize or eliminate inputs of pesticides or fertilizers?	✓		
5	Are soil tests or plant tissue analysis regularly used to determine turfgrass nutritional requirements?	✓		
6	Is the information collected in soil tests and plant tissue analysis integrated into a regularly updated Nutrient Requirement Plan and map?		✓	
7	Is there at least one project planned and funded for the next year that would improve the course's protection of the environment?	✓		
8	Are all appropriate employees trained to be familiar with (national, federal, HI, and OSHA) regulations that apply to storage and handling of potentially hazardous materials used on the property?	✓		
9	Has all aspects of the golf course property other than the course for potential negative environmental impacts?	✓		
10	Have all employees received documented training that would increase their awareness of the GEM program environmental stewardship goals and objectives?		✓	

**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 helps to eliminate the potential for spreading of disease or other contamination?	✓		
14	Are electric motor-powered equipment or vehicles being utilized where appropriate?	✓		
15	Are waste products such as oil, grease, tires, and batteries stored in a covered container and disposed of properly off site?	✓		
16	Does the superintendent use hand held GPS units to assist in GIS mapping of the golf course areas?			✓
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?	✓		
19	Are at least 90% plates, cups, and utensils in use by the restaurant/snack bar facility reusable rather than disposable?		✓	
20	Does course management utilize a web-based golf course planning tool for every day decision-making and recordkeeping?			✓
<b>Totals</b>		<b>15</b>	<b>3</b>	<b>2</b>

<b><u>Water Resource Management</u></b>				
<b>#</b>	<b>Environmental Compatibility Indicator</b>	<b>Yes</b>	<b>Partial</b>	<b>No</b>
1	Are written records of water quality monitoring activities, results, and pollution control measures readily available and used to establish appropriate maintenance practices?	✓		
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	Does the irrigation system operate using computerized controllers based on real-time evapotranspiration rates?		✓	
4	Are the golf course sprinklers and outdoor irrigation of non-golf course areas and indoor plumbing regularly monitored and maintained for proper distribution and leaks?	✓		
5	Have low-flow water saving devices been installed wherever possible?	✓		
6	Are triploid, non-reproducing grass carp or similar fish species used to control unwanted aquatic vegetation in major water features?	✓		
7	Is there at least one project planned and funded that would minimize or eliminate a potential water quality or erosion problem?	✓		
8	Are water features regularly monitored for algae, erosion, excessive aquatic plant growth, etc.?	✓		
9	Are low impact design (LID) principles such as using vegetative or drainage filters to cleanse parking lot runoff prior to leaving the property?	✓		
10	Are there signs appropriately located to warn golfers of the potential hazard of drinking recycled or otherwise non-potable water?	✓		

**Water Resource Management Checklist (continued).**

#	Environmental Compatibility Indicator	Yes	Partial	No
11	Are properly functioning flow meters employed to monitor total potable and non-potable water use?	✓		
12	Has the irrigation system or its components recently been upgraded to reduce or eliminate inefficiency and overall water use?	✓		
13	Is there a map of the watershed in which the golf course property resides and location(s) of floodplains and storm water drainage that exists on the property?	✓		
14	Is the quality of the irrigation water regularly checked to determine overall quality or nutrient, salt or total suspended solid parameters?	✓		
15	Is water quality data regularly collected to establish baseline conditions and maintenance procedures for all water features on the property?	✓		
16	Is at least 75% of the water used for irrigating the golf course property from recycled or other non-potable sources?			✓
17	Is there at least one project planned and funded that increase the course's water use efficiency?			✓
18	Have the property's Water Quality Management Zones been identified and mapped based on industry-standard risk factors?		✓	
19	Has the property's water features been studied to determine the aquatic and amphibious species population?	✓		
20	Has the property been examined for potentially significant wetlands or associated sensitive water-based habitats?	✓		
<b>Totals</b>		<b>16</b>	<b>2</b>	<b>2</b>

<b><u>Conservation</u></b>				
<b>#</b>	<b>Environmental Compatibility Indicator</b>	<b>Yes</b>	<b>Partial</b>	<b>No</b>
1	Is all motorized equipment maintained for efficient operation that would minimize the potential of creating excessive air polluting emissions?	✓		
2	Has the entire golf course property been examined for critical habitats, species of concern and threatened or endangered species?	✓		
3	Are all manmade ponds or other large water features adequately lined to minimize or eliminate losses?		✓	
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 physically connect natural areas to facilitate wildlife movement through the course property?	✓		
6	Have all necessary permits been secured and are they 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 species on or near the course?	✓		
9	Is there a comprehensive and readily available Drought Management Plan for the entire golf course facility?		✓	
10	Has there been a demonstrated 2% annual reduction in potable water use since FY07?		✓	

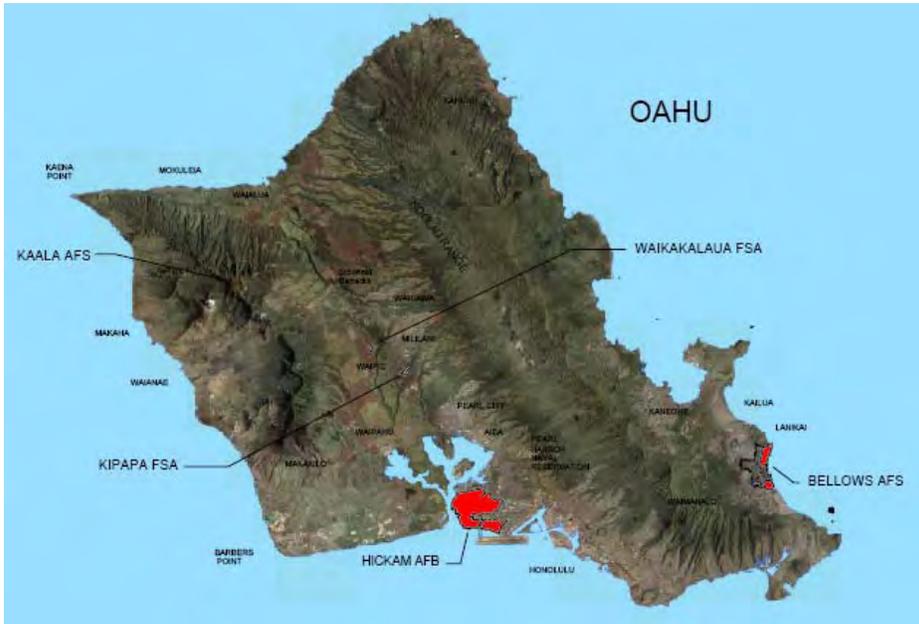
**Conservation Checklist (continued).**

#	Environmental Compatibility Indicator	Yes	Partial	No
11	Has there been a demonstrated 2% annual reduction in irrigation water use starting in FY10?	✓		
12	Are at least 85% of plants used in landscaped areas drought-tolerant native trees, shrubs, groundcovers, or their cultivars?	✓		
13	Are there signs posted to highlight key habitats or have appropriate areas been designated "Environmentally Sensitive Zones" per The Rules of Golf?	✓		
14	Has a comprehensive energy audit been conducted for the entire golf course facility?	✓		
15	Has the use of petroleum products been tracked and has there been a demonstrated 2% reduction each year since FY05?		✓	
16	Is there an inventory of bird and mammal species documented, maintained and readily available?	✓		
17	Is there a comprehensive Energy Management Plan compiled for the entire golf course facility demonstrating a 3% annual reduction since FY03?			✓
18	Have all damaged or 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	Is the irrigation pump station an energy efficient, variable frequency drive?	✓		
	<b>Totals</b>	<b>15</b>	<b>4</b>	<b>1</b>

<b><u>Pesticides &amp; Pollution Prevention</u></b>				
<b>#</b>	<b>Environmental Compatibility Indicator</b>	<b>Yes</b>	<b>Partial</b>	<b>No</b>
1	Are there established, documented and communicated minimally-maintained and fertilizer and pesticide application buffer areas around water features or sensitive landscapes?		✓	
2	Is the equipment wash rack adequately covered to minimize or eliminate collection of precipitation?	✓		
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 and does it have at least 150% of total storage volume secondary containment?	✓		
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 least toxic pest control strategy been identified for each of the most common pests and is it always used first when an action threshold is reached?	✓		
7	Is equipment cleaned with compressed air or blowers on part of the course instead of, or prior to washing at a designated wash rack?	✓		
8	Are leachate potentials of pesticides considered in the integrated pest management process?	✓		
9	Does the fuel storage/delivery area comply with local, HI, 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 area) of each pesticide used; - the area (SF/SM) & quantity of each pesticide used; - the chemical & common name of active ingredient(s); - the date, location, or purpose of the application?	✓		

**Pesticides & Pollution Prevention Checklist (continued).**

#	Environmental Compatibility Indicator	Yes	Partial	No
11	Are all pesticide applications recorded and mapped to guide future pest control decisions?	✓		
12	Other than the superintendent, are there trained scouts on staff 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 each of the course's most common pests that may help 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 fertilizers and pesticides stored in separate facilities?	✓		
17	Is the chemical storage structure/area locked, well-ventilated and fire-resistant and is access limited to appropriate personnel?	✓		
18	Are all fertilizer applications made by a certified fertilizer applicator and are they recorded and mapped to guide future actions?			✓
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?	✓		
<b>Totals</b>		<b>17</b>	<b>1</b>	<b>2</b>



*Hickam AFB  
Golf Courses  
Hickam AFB, HI*

*Hickam is located on the south shore of the island of Oahu.*

<b><u>Environmental Compatibility Quotient Summary</u></b>			
<b>Environmental Compatibility Category</b>	<b>Yes</b>	<b>Partial</b>	<b>No</b>
<b>Planning &amp; Compliance</b>	<b>12</b>	<b>7</b>	<b>1</b>
<b>Operations &amp; Maintenance</b>	<b>16</b>	<b>2</b>	<b>2</b>
<b>Water Resource Management</b>	<b>16</b>	<b>2</b>	<b>2</b>
<b>Conservation</b>	<b>15</b>	<b>4</b>	<b>1</b>
<b>Pesticides &amp; Pollution Prevention</b>	<b>17</b>	<b>1</b>	<b>2</b>
<b>Totals</b>	<b>76</b>	<b>16</b>	<b>8</b>

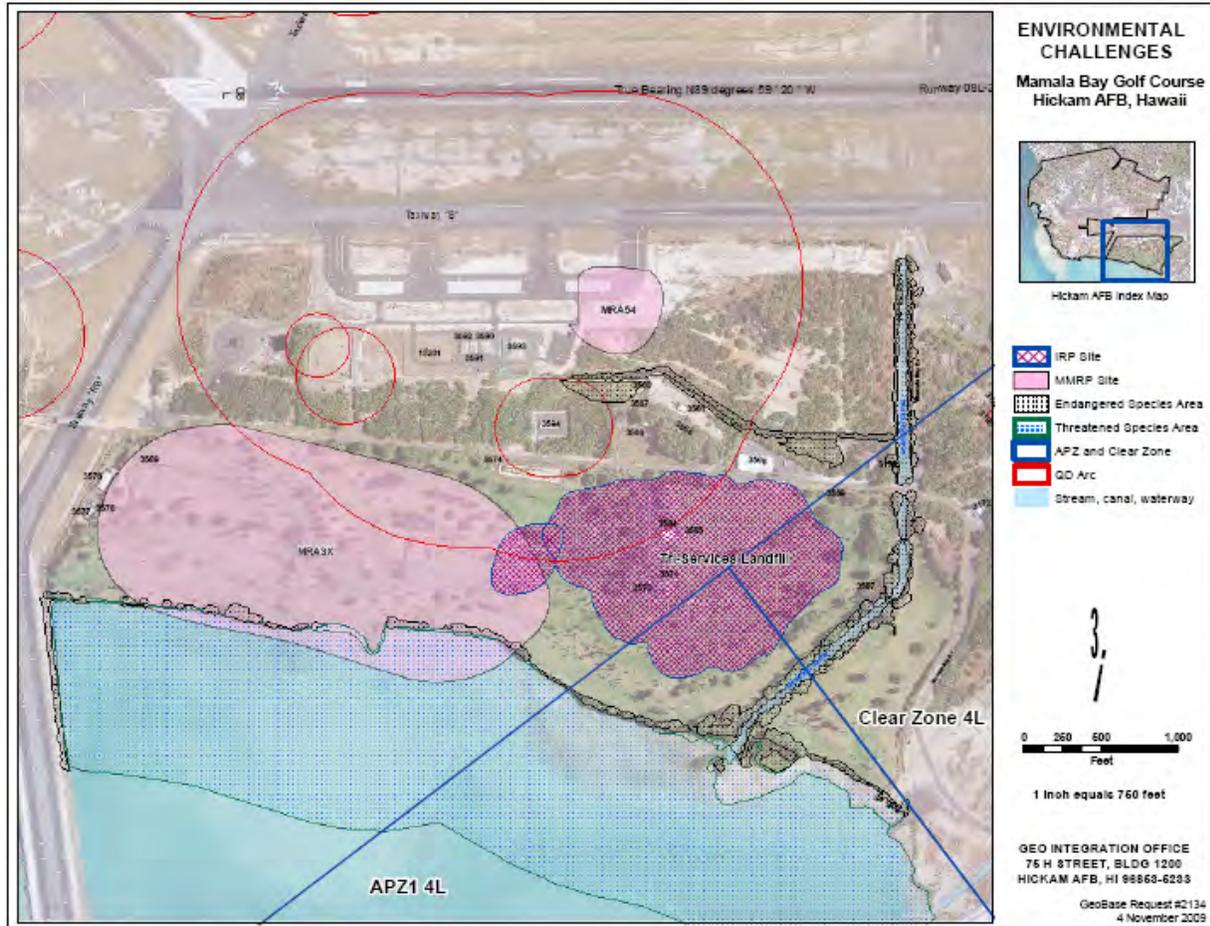
Key to checklist responses

- **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

**Oct 09 – Hickam AFB Golf Courses ECQ:**

- Actual ECQ = 76, Showing progress (**Yellow**)
- Potential ECQ = 92, Advanced (**Green**)

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



## Mamala Bay Golf Course Environmental Challenges Map

### Environmental Challenges

One of the important results of the GEM process is the identification of significant environmental challenges to be addressed in the GEM Plan. Along with the newly established baseline, the GEM Plan consists of a map and description of the final environmental challenges and the prescribed approach to their management. In addition, the GEM Plan includes a comprehensive list of future environmental management goals and objectives and a course-specific set of best practices.

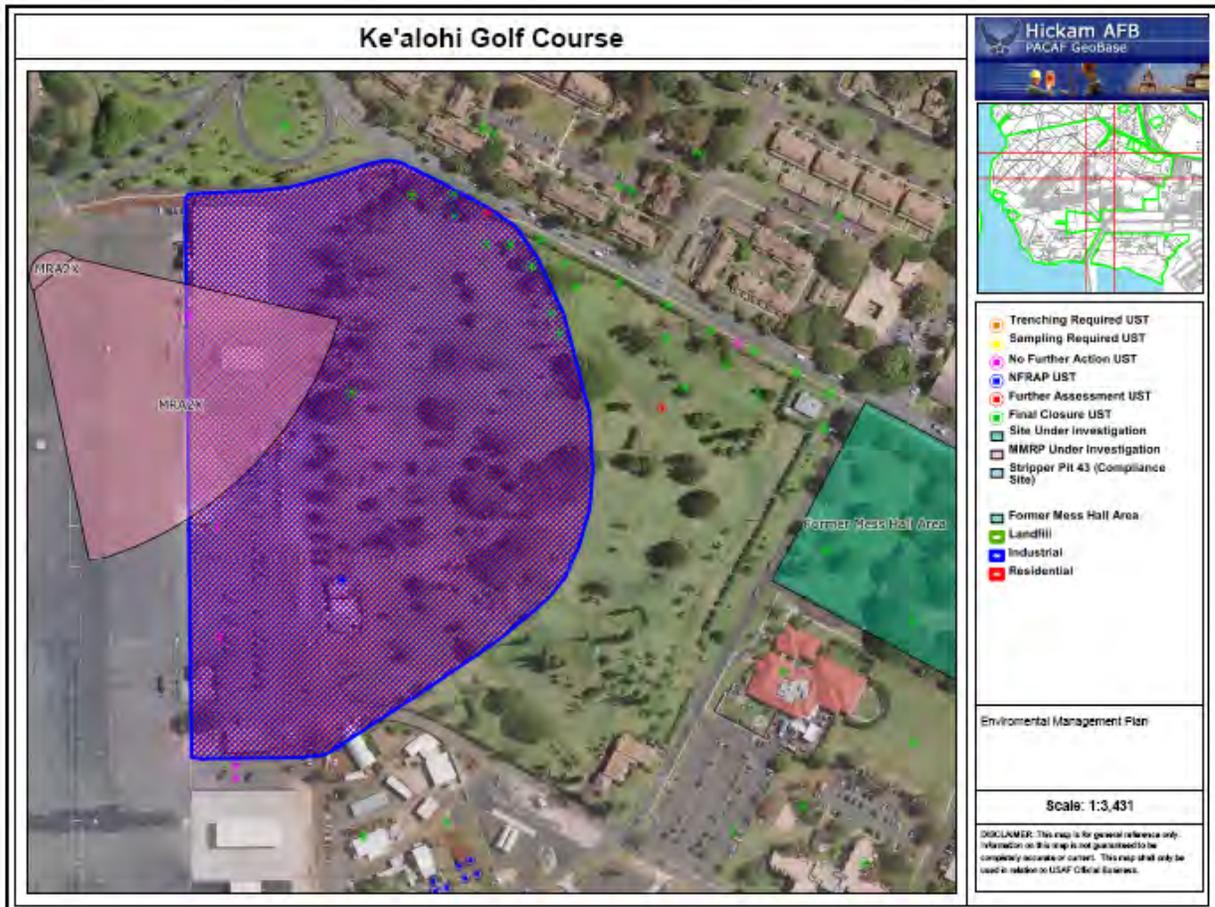
The following environmental challenges were identified during the GEM process:

- Coastal zone management
- Potable water use
- Airfield safety criteria
- Invasive species
- Explosive safety standards
- Installation Restoration Program (IRP) sites
- Military Munitions Restoration Program (MMRP) sites
- Underground Storage Tanks (USTs)
- Wetlands



*Hickam AFB  
Golf Courses  
Hickam AFB, HI*

*The Ke'alohe Clubhouse has a pro shop, bar and restaurant.*



## Ke'alohe Golf Course Environmental Challenges Map

## **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.

### **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.

### **MANAGEMENT APPROACH**

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

### **TARGET**

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



*This is an ideal practice for storing batteries in the cart storage facility.*

*Hickam AFB  
Golf Courses  
Hickam AFB, HI*



*Hickam AFB  
Golf Courses  
Hickam AFB, HI*

*Ahua Bay comes into play at the outstanding 3<sup>rd</sup> hole at Mamala Bay.*

## **COASTAL ZONE MANAGEMENT**

The Coastal Zone Management Program (CZMP) was first created in 1977 and approved by the federal government in 1978. Due to Hawaii's geographic nature (islands), the coastal zone area includes all lands, plus waters extending to the limit of state jurisdiction. In 1990, the State of Hawaii ruled that "lands owned, leased, held in trust, or otherwise subject solely to the discretion of the federal government" are administratively excluded from the coastal zone. Despite this exclusion, the national Coastal Zone Management Act of 1972 requires that direct federal activities be consistent with state programs "to the maximum extent practicable" and are subject to review by the state Office of Planning (OOP; Department of Business, Economic Development, and Tourism).

In addition, projects requiring federal licenses and permits, or that apply for federal assistance grants, are also subject to consistency review, but to a lower standard than direct activities. Consequently, the Air Force will submit consistency determinations for all development activities to the OOP for review and consider modifications to action plans if the OOP does not concur with the determination.

### **Driver/requirement**

- Section 307 of the Coastal Zone Management Act of 1972, as amended
- Coastal Zone Management Act, as amended (16 U.S.C. 1451 *et. seq.*)
- Estuary Protection Act (16 U.S.C. 1221-1226)
- AFI 32-7064, Integrated Natural Resource Management
- 15 Code of Federal Regulations (CFR) 923.3

**Objective**

Ensure that all aspects of the golf course maintenance operation that may potentially impact the management of coastal zones are in accordance with the installation consistency determination or natural resource manager approval.

**Management approach**

- Control pesticide, herbicide and fertilizer use
- Continue to work closely with installation environmental staff on all coastal zone or erosion management practices
- Coastal Zone Management Act (CZMA) section 307(c)(1)(C) requires the consistency determination to be provided at least 90 days before final approval of the activity unless the federal agency and the state agree to an alternative schedule

**Target**

Regularly consult with installation environmental staff to ensure appropriate actions are being taken by all parties.

Provide input to the consistency determination promptly as required by the installation environmental staff.



*Hickam AFB  
Golf Courses  
Hickam AFB, HI*

*The slope off the back of the 3<sup>rd</sup> teeing area is a great example of how close the managed areas of the course can be to the ocean.*



*Hickam AFB  
Golf Courses  
Hickam AFB, HI*

*Cattle egrets are regular visitors to Mamala Bay and are subject to the installation's BASH reduction efforts.*

### **BIRD/WILDLIFE AIRCRAFT STRIKE HAZARD (BASH)**

The objective of U.S. Air Force Bird-Aircraft Strike Hazard (BASH) plans is to minimize bird strikes to aircraft by minimizing the presence of birds in the vicinity of its airfields. Bird strikes and BASH management activities can have a direct, unavoidable impact on local bird populations. At Hickam AFB this includes the federally endangered black-necked stilt. Bird-aircraft strikes can lower population sizes directly, and vegetation management decreases the available bird and wildlife habitat. Other BASH management practices that are likely to impact wildlife include reducing potential food sources, eliminating pond and wetland habitats in the airfield area, and eliminating roosting sites. These measures are helpful in reducing the number of collisions between birds and aircraft.

Traditional guidance on airfield mowing is an area where golf courses tend to receive unwanted attention. At Hickam AFB this is not the case. According to the Grass height management section of the BASH Plan, "15 AW/SE has an AF Safety Center approved waiver from the AFI 91-202, 7-14" grass height requirement dated 26 March 2004". The BASH Plan requires that airfield "mowing operations shall maintain a short, uniform grass height (between three and four inches) in areas between taxiways, runway clear zones, and infields". The golf staff should not have to change its current minimally-maintained area mowing procedures.

### **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
- AFD 91-2, Safety Programs

### Objective

The golf staff shall continue to cooperate and assist the environmental and airfield management staffs with BASH reduction efforts to minimize or eliminate the potential for installation BASH concerns as a result of golf course management practices.

### Management approach

- Coordinate coast, pond and stream maintenance procedures with installation environmental management staff
- Secure membership on BASH Working Group and attend all meetings
- Ensure minimally-maintained or non-play areas are mowed in accordance with Hickam airfield mowing criteria
- Continue to assist installation airfield and environmental managers with BASH concerns on the golf course
- Install wire grid system or use other bird reduction techniques over the irrigation pond

### 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 INRMP.

Install wire grid system or use other bird reduction techniques over irrigation pond.



*Hickam AFB  
Golf Courses  
Hickam AFB, HI*

*Liner on the irrigation pond is failing while birds love the shallow depth.*



*Hickam AFB  
Golf Courses  
Hickam AFB, HI*

*Although the course is usually maintained “firm and fast”, the lifeblood of the golf course is its irrigation system. The pump house above is the heart of the system.*

### **POTABLE WATER USE**

The INRMP states that “water is a major concern in Honolulu and surrounding areas”. Other than reiterating that statement, there is no other language on the topic. Water conservation on golf courses is paramount. This is never more important than when a course is using potable water supplies for 100% of its irrigation needs. Combine this with the latest presidential orders and congressional mandates for water conservation efforts and the issue becomes significant. So significant, in fact, that the civil engineering energy staff has secured military construction funds for a 2012 project that will pipe spring water to both courses for irrigation use.

The ECIP (Environmental Conservation Improvement Program) funds will bring approximately 1 million gallons of albeit highly saline water to supplement potable water supplies through the Spring Well Water Pipe Installation project. Based on 2004 dollars, the project is expected to save nearly \$260K providing a less than 5-year payback for the effort. Although management techniques will have to be modified to accommodate the additional salts in the water, sustainable measures will have been taken to ensure a greener future for the Hickam AFB golf courses.

### **Driver/requirement**

- Executive Order 13123, Greening the Government Through Efficient Energy Management
- Executive Order 13423, Strengthening Federal Environmental, Energy and Transportation Management
- Energy Independence & Security Act
- Energy Policy Act
- Executive Order 13514, Federal Leadership in Environmental, Energy, and Economic Performance

**Objective**

Contribute to the region-wide conservation of all water resources while still providing the best quality golfing experience for customers.

Greatly reduce or eliminate use of potable water for irrigating any of the golf course grounds.

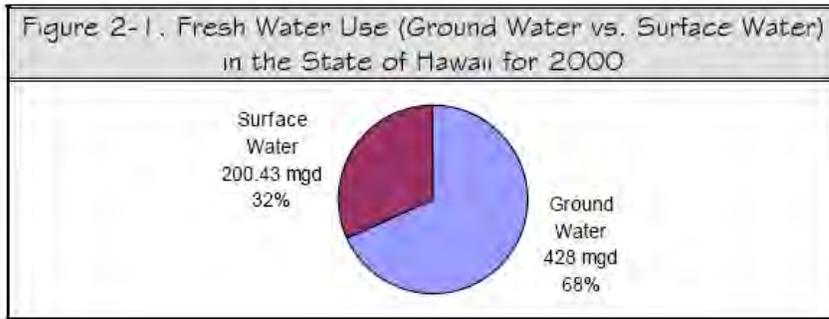
**Management approach**

- Water only as much as the turf needs and the soils can absorb
- Compile a comprehensive Water Resource Management Plan to include a Drought Management Plan for the entire golf course facility
- Continue to pursue water sources other than potable for long-term stewardship
- System is regularly checked for efficient operations

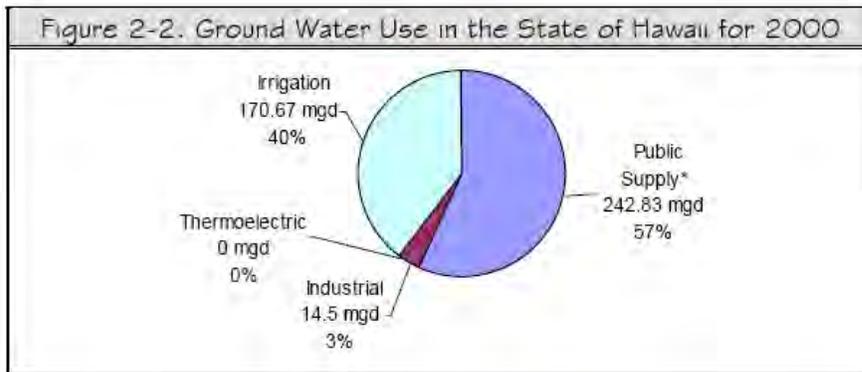
**Target**

Maintain vigilance on water conservation concerns at all times.

Assist civil engineering/environmental staff with new irrigation source project.



*Hickam AFB  
Golf Courses  
Hickam AFB, HI*



*(Water Conservation  
Manual for Hawaiian  
Facilities)*

2000 Hawaii water use data.



*Hickam AFB  
Golf Courses  
Hickam AFB, HI*

*Thousands of passengers arrive every day at the joint use Honolulu International Airport. The airfield clear zone bisects Mamala Bay's 12<sup>th</sup> tee.*

### **AIRFIELD SAFETY CRITERIA**

The U.S. Air Force mission is to fly, fight and win! U.S. Air Force golf courses support this mission every day by providing quality recreational experiences. It is imperative that golf course management practices never hinder the ability to perform an installation mission. A large portion of the Mamala Bay Golf Course is within the Clear Zone (CZ) and Accident Potential Zone 1 for the 4L runway. Waivers are usually required for any obstructions within the CZ or other imaginary surface.

According to UFC 3-260-1, obstructions are defined as a "natural or man-made object that violates airfield or heliport clearances or projects into imaginary airspace surfaces. Imaginary surfaces are "The area surrounding a runway that must be kept clear of objects that might damage an aircraft is bounded by imaginary surfaces that are defined in this manual. An object, either man-made or natural, that projects above an imaginary surface is an obstruction. These imaginary surfaces include the primary surface, approach-departure surface, inner horizontal surface, conical surface, outer horizontal surface, transitional surface and the graded portion of the clear zone. Obviously, this is a complicated and important business. Compliance is a long-term task worthy of performing well.

### **Driver/requirement**

- AFI 32-7063, Airfield Installation Compatible Use Zones, (AICUZ)
- UFC 3-260-1, Airfield & Heliport Planning & Design

### **Objective**

Minimize potential impacts to the joint use flying mission.

### **Management approach**

- Assist installation managers in providing a safe and efficient joint use airfield

### **Target**

Regularly consult with installation airfield management to ensure mitigation or elimination of potential impacts.



*Hickam AFB  
Golf Courses  
Hickam AFB, HI*

*This large airliner appears to be on the course as it heads for the reef runway.*



*Hickam AFB  
Golf Courses  
Hickam AFB, HI*

***Photo credit:  
Unknown***

*Rubus fruticosus, or Florida blackberry, can be difficult to control.*

### **INVASIVE SPECIES**

Hawaii is one of the most sensitive areas when it comes to invasive species. The tropical climate allows nearly any plant to take hold and potentially thrive – sometimes at the expense of sometimes fragile natives. Some of the species identified as potentially invasive include mangrove, pickleweed, fountain grass, Florida blackberry, ginger, impatiens, and firespike. Other species such as monkeypod and kiawe are so widespread as to generally escape the invasive tag yet are pervasive in their ability to survive. In many cases, these trees are intentionally planted in Hawaii.

Ironically, the mangrove, although invasive, may actually be performing a quantifiable ecosystem service by minimizing erosion of valuable coastal soils. All in all, controlling invasive species is a major issue in the Hawaiian Islands. For example, efforts to keep out the brown tree snake are one of America's largest and most important tasks.

**Driver/requirement**

- Federal Noxious Weed Act of 1974
- 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)

**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 undesirable varieties prior to the end of FY10.



*Hickam AFB  
Golf Courses  
Hickam AFB, HI*

*Photo credit:  
Unknown*

*Pickle weed (*Batis maritima*) is an invasive, (spread rapidly) or introduced plant in Hawaii. It has succulent, (fleshy, juicy) brilliant green leaves. These leaves are about 1 to 3 centimeters long. It has small, greenish white flowers.*



*Hickam AFB  
Golf Courses  
Hickam AFB, HI*

*Standing on the 9<sup>th</sup> tee, one is within one of the quantity distance zones emanating from the north side of the golf course property.*

## **EXPLOSIVE SAFETY STANDARDS**

No information provided for this challenge. Installation staff to complete at later date.

### **Driver/requirement**

- Air Force Policy Directive (AFPD) 91-2, Safety Programs
- DoD 6055.9-Std, DoD Ammunition and Explosives Safety Standards
- Air Force Manual (AFMAN) 91-201, Explosives Safety Standards

### **Objective**

No losses due to inadequate explosives safety communication or planning.

### **Management approach**

- Limit access to affected areas during times of increased risk to personnel or property
- Warn all customers and employees of the potential risk

### **Target**

Continue to act immediately upon notification of potential increased risks.

Maintain compliance with all land use restrictions.



*Hickam AFB  
Golf Courses  
Hickam AFB, HI*

*Two separate restoration demonstrations are underway to the right of the 1<sup>st</sup> fairway.*

### **INSTALLATION RESTORATION PROGRAM (IRP) SITES**

According to the INRMP, “As of May 2007, there are 60 IRP sites being actively managed under the IRP. Groundwater, surface water, soil, and air impacts are being evaluated. Appendix B [INRMP] includes tables taken from the Management Action Plans for those facilities. These tables provide the status of the evaluation and clean-up.” Restoration activities have long been observed at the Mamala Bay Golf Course. The “hill” where the clubhouse was constructed many years ago is actually a tall pile of potentially dangerous waste from the 1950s.

One of the primary IRP sites affecting the Mamala Bay Golf Course is the 93-acre LF-05. Past studies revealed “elevated concentrations of arsenic were present in surface soil (less than 3 feet below ground surface) and that elevated concentrations of chlorinated volatile organic compounds (VOCs), dioxins were found in subsurface soil (greater than 3 feet below ground surface) and elevated levels of chlorinated VOCs were detected in groundwater beneath the site”.

According to the Record of Decision for the “Tri-Service Landfill”, “During the RI, intact 5-gallon glass bottles containing liquid solvents were discovered approximately 300 feet west of the primary landfill boundary. Consequently, a time-critical removal action (TCRA) was conducted between February 2002 and September 2003 to excavate, remove, and properly dispose of the buried bottles. Approximately 163 intact and broken bottles, along with 230 gallons of liquid waste, were removed from this area. The liquid waste contained elevated concentrations of trichloroethene (TCF) and tetrachloroethene, and was characterized as hazardous.

Site LF-05 land use controls (LUCs) are in place to protect both customers and employees. “The LUCs will be enforced through the digging permit process for excavation and construction projects. The USAF will conduct periodic inspections to

verify the effectiveness of LUCs, consider LUCs in future land use designations, conduct periodic training of golf course workers, and post internal notices to keep Base personnel informed on the LUCs.”

Land use controls include “No intrusive activity shall occur within the site without the knowledge and concurrence of the 15th Airlift Wing Civil Engineer Squadron Environmental Restoration Element (15 CES/CEVR). Any authorized intrusive activity will require an approved health and safety plan, use of appropriate personal protective equipment (PPE), and any other appropriate precautions to protect site workers from unacceptable occupational exposure to soil COCs. Material removed from the site (i.e. soil) must be appropriately managed.”

### Driver/requirement

- AFI 32-7020, The Environmental Restoration Program
- Resource Conservation Recovery Act (RCRA)
- 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 specified land use controls (LUCs)
- Work closely with installation restoration program manager to ensure compliance



*Hickam AFB  
Golf Courses  
Hickam AFB, HI*

*Photo credit:  
Unknown*

*This photo from 1963, just a short time before the Mamala Bay Golf Course was constructed, depicts a relatively active landfill.*

**Target**

Immediately integrate specified land use controls into regular maintenance practices.



*Hickam AFB  
Golf Courses  
Hickam AFB, HI*

*Cleanup continues on the 1<sup>st</sup> hole at Mamala Bay.*

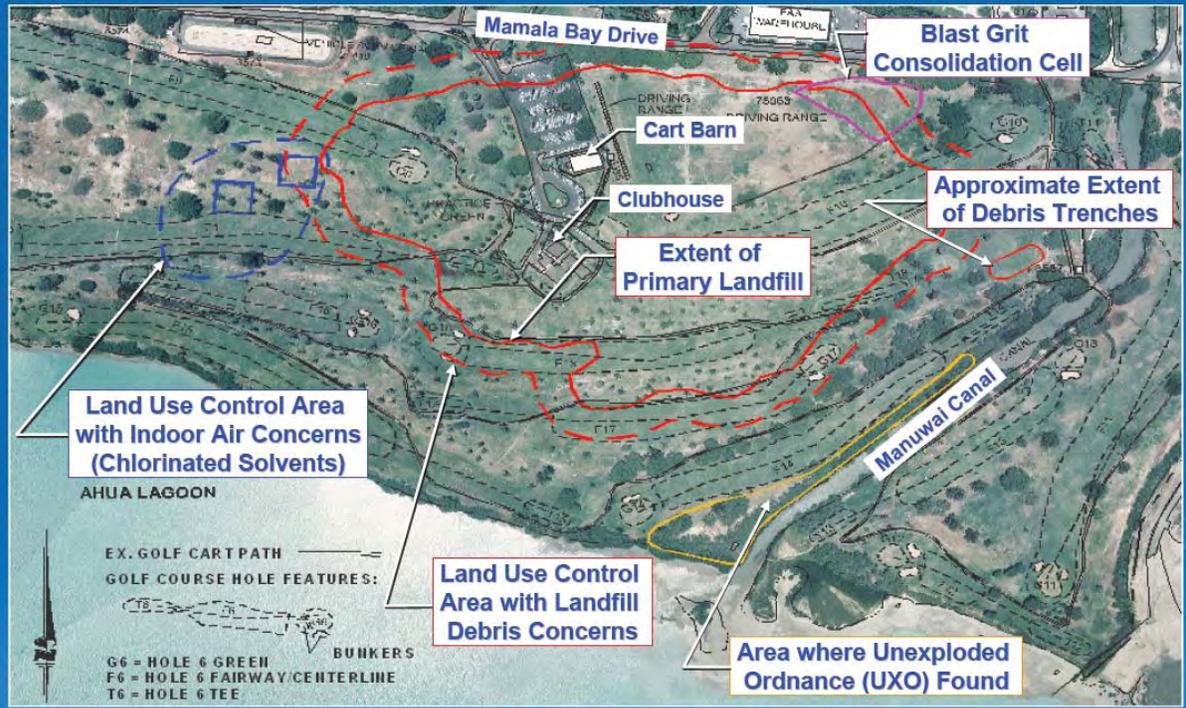


*Hickam AFB  
Golf Courses  
Hickam AFB, HI*

*Photo credit:  
Unknown*

*The 1<sup>st</sup> fairway just prior to construction commencing in June 1965.*

# Locations of Potential Hazards



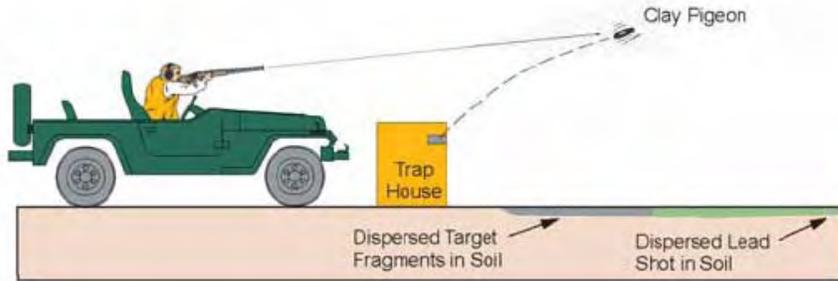
The environmental staff frequently provides safety information to the golf staff. This graphic is gleaned from their 26-slide safety training presentation.



*Hickam AFB  
Golf Courses  
Hickam AFB, HI*

*Photo credit:  
Unknown*

Initial October 1964 grading study results were “excellent”.



*Hickam AFB  
Golf Courses  
Hickam AFB, HI*

*The Moving Base Skeet range, MRA3X, used clay pigeons for targets and shotguns.*

### **MILITARY MUNITIONS RESTORATION PROGRAM (MMRP) SITES**

Training Airmen in the same situations they will encounter in battle – with live ammunition - is a key to success. Despite precautions to limit the spread of unexploded ordnance, some gets lost. “The Military Munitions Response Program (MMRP) was established in 2001 to manage the environmental, health and safety issues presented by UXO, discarded military munitions and munitions constituents. The MMRP is an element of the Defense Environmental Restoration Program (DERP), under which the Secretary of Defense carries out environmental restoration resulting from historical activities. The DERP, through the Installation Restoration Program (IRP), had historically focused on cleaning up sites contaminated with hazardous components, including explosives, but generally has not addressed either UXO or challenges presented by sites containing discarded military munitions and munitions constituents.”

According to the fact sheet, “The purpose of Comprehensive Site Evaluation (CSE) Phase I investigations is to gather information from historical records, visual surveys and interviews to identify and characterize MMRP sites. This information is used to create interim conceptual site models, complete munitions response prioritization, hazard ranking, and CSE Phase I reporting. The data will be used by the USAF to establish priorities and determine site sequencing on a program-wide basis based on the risk posed by each site.”

Two sites occur on or near the golf course. The first, MRA3X, is a former Moving Base Skeet Range covering approximately 79 acres located at the present day Mamala Bay Golf Course. A portion of the range fell over currently filled areas to the south. There is presently no surface evidence of the former range’s existence.” Munitions or explosives of concern (MEC) include shotgun shells for MRA3X.

The second, MRA54, is a former EOD Proficiency Range covering approximately 6 acres. The site was used from the 1960s through the 1970s for explosive ordnance disposal training including small demolition activities within protective works. No large bomb disposal or destruction is known to have occurred at the site. Potential MEC includes blasting caps, detonating cord and explosives and possibly other MEC.

**Driver/requirement**

- Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, 42 United States Code (U.S.C.) 9605, as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), Pub. L. 99-499

**Objective**

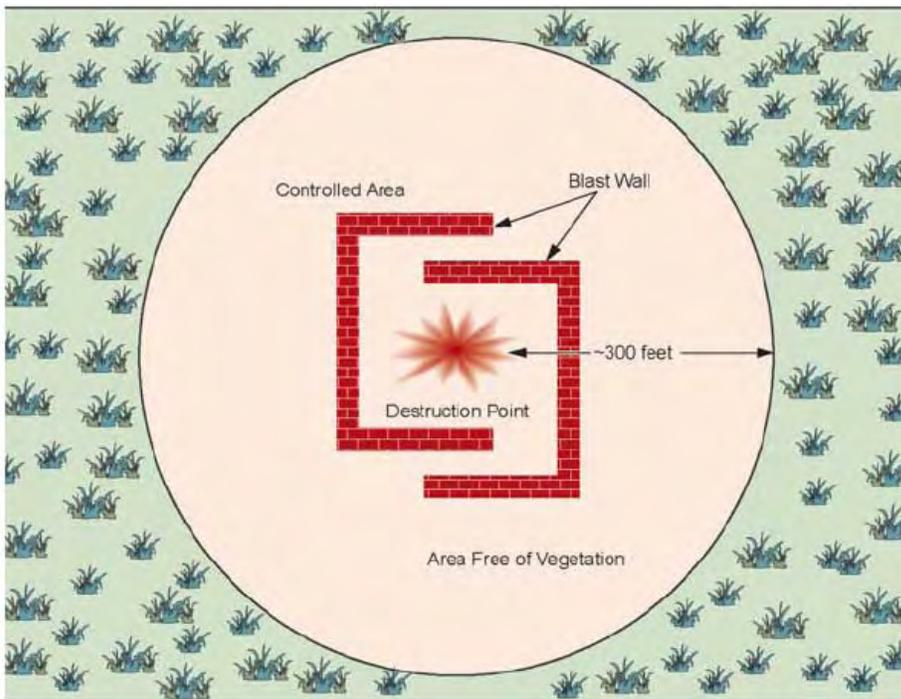
Ensure the safety of all customers and employees at all times.

**Management approach**

- Work closely with installation restoration program manager to ensure compliance with all land use controls and safety precautions

**Target**

Coordinate all aspects of MMRP regularly and ensure golf course customers and employees are safe at all times.



*Hickam AFB  
Golf Courses  
Hickam AFB, HI*

*Disposal training was the primary training activity at MRA54.*



*Hickam AFB  
Golf Courses  
Hickam AFB, HI*

*Several underground storage tanks have been found in the area of the 8<sup>th</sup> hole at Ke'aholi Golf Course.*

### **UNDERGROUND STORAGE TANKS (UST)**

From 1983 to present, 27 former USTs were identified at the Par 3 Golf Course. The USTs were installed circa 1943 to provide fuel oil to boilers in former mess halls and latrines. Aerial photo evidence shows the “tent camp” facilities were removed by 1954. In 1999, USTs were investigated using geophysical methods to determine their locations since there were no existing maps showing their locations. Beginning in 2003, the geophysical anomalies were trenched and USTs removed. To date, all USTs have been investigated and removed/closed-in-place under the Installation Restoration Program.

Tank removals included removal of contaminated soil exceeding environmental action levels to a reasonable extent following Hawaii UST Technical Guidance Manual and federal regulations for CERCLA removal actions. Remaining soil and groundwater contamination exceeding risk-based action levels will be documented in an Environmental Hazard Management Plan (EHMP) following HDOH guidance set forth in the *Long-Term Management of Petroleum-Contaminated Soil and Groundwater*, June 2007. Any land use controls necessary to protect workers and recreational users will be documented in the Record of Decision for UST Site ST35, which encompasses this area.

### **Driver/requirement**

- 40 CFR Part 280, 40 CFR Part 281
- 40 CFR Parts 282.50-282.105
- Air Force Instruction (AFI) 32-7044, "Storage Tank Compliance
- Hawaii Administrative Rules (HAR) 11-451
- HAR 11-281



*Hickam AFB  
Golf Courses  
Hickam AFB, HI*

*Concrete area is a former UST site.*

**Objective**

Ensure daily compliance with UST program site requirements as well as the safety of customers and employees at all times.

**Management approach**

- Abide with all specified land use controls (LUCs)
- Work closely with installation restoration program manager to ensure compliance



*Hickam AFB  
Golf Courses  
Hickam AFB, HI*

*Photo credit:  
Unknown*

*Cutting a coupon in UST F-7-2105 exposed at 2.1 feet below ground surface.*

**Target**

Immediately integrate all UST-related specified land use controls into regular maintenance practices.



*Hickam AFB  
Golf Courses  
Hickam AFB, HI*

*Photo credit:  
Unknown*

*1943 aerial photo of the Ke'aholi Golf Course.*



*Hickam AFB  
Golf Courses  
Hickam AFB, HI*

*Photo credit:  
Unknown*

*UST F-21B exposed at 2.7 feet below ground surface.*



*Hickam AFB  
Golf Courses  
Hickam AFB, HI*

*Photo credit:  
Kirk Aeder*

*The nene is the Hawaii state bird.*

### **THREATENED OR ENDANGERED SPECIES**

The INRMP states that “Hickam AFB has proceeded with Section 7 review and is currently in consultation with the USFWS regarding incidental take of four endangered Hawaiian water birds--coots, stilts, moorhen, and koloa”. There are several rare, threatened or endangered species that may be found at Hickam AFB to include green sea turtles, Hawaiian monk seals, common moorhen, Hawaiian duck, Hawaiian coot, short-eared owl, black-necked stilt, Hawaiian hoary bat, and humpback whales. Some of these species may occur within the management influence of the Hickam AFB golf courses.

### **Driver/requirement**

- Endangered Species Act of 1973, as amended (16 U.S.C. 1531-1543)
- USAFI 32-7064, Integrated Natural Resources Management, 21 October 1996
- Air Force Policy Directive (AFPD) 32-70, Environmental Quality, 20 July 1994

### **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 installation environmental staff

### **Target**

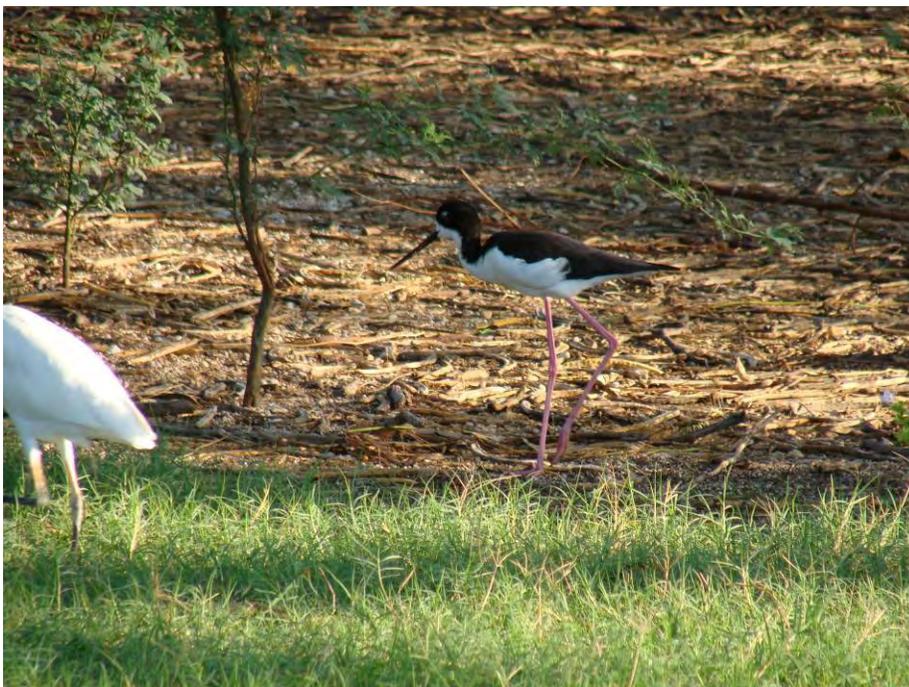
Regularly request a site assessment and review of current management practices from the appropriate installation environmental manager.



*Hickam AFB  
Golf Courses  
Hickam AFB, HI*

*Photo credit:  
NRCS*

*The pueo, or short-eared owl is under pressure due to loss and degradation of habitat, predation by introduced mammals, and disease.*



*Hickam AFB  
Golf Courses  
Hickam AFB, HI*

*The black-necked stilt is a regular visitor to Mamala Bay.*



*Hickam AFB  
Golf Courses  
Hickam AFB, HI*

*Manuwai Canal is classified as a wetland.*

## **WETLANDS**

The INRMP states that “Most of the wetlands at Hickam AFB are located in flat or depressional areas in the southern portion of the base, along the coastline, and along the edge of the channel in Kumumau'u Canal and Manuwai Canal. Wetlands are divided into three habitat types: shoreline wetlands, ephemeral emergent wetlands, and canal wetlands. Of these three types of wetlands on Hickam AFB, the primary wetland challenge at Mamala Bay Golf Course is the Manuwai Canal which cuts through the incoming nine holes.

“Wetlands occur within the channels of Manuwai Canal and Kumumau'u Canal, and are well-defined by the canal banks. Mangrove, the dominant plant species in these areas, has been cut back in both canals in an effort to maintain water conveyance capacity. The canals are classified as estuarine, subtidal, open water, subtidal inundation and excavated.”

### **Driver/requirement**

- Clean Water Act, Section 404
- National Pollutant Discharge Elimination System (NPDES)
- Executive Order 11990, Protection of Wetlands

### **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 canal 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
- Compile a comprehensive Water Resource Management Plan for the entire golf course facility

**Target**

Eliminate the potential for degradation of the water resources at the golf course by establishing, documenting and communicating all pesticide and fertilizer application buffers to appropriate personnel prior to the end of the year.

Maintain positive relationship with civil engineering and environmental staffers to attain and maintain compliance without delay on all water-related regulations and requirements.



*Hickam AFB  
Golf Courses  
Hickam AFB, HI*

*The banks of the wetland are not inviting but the quest for a shiny new golf ball will entice any golfer to explore. This simple and direct sign should help.*

## Implementation

No plan is worth the time it took to compile it if it does not generate or include active implementation in the field. The golf course management staff should use the following goals and objectives as the roadmap for their future. The GEM Plan is an example of the quality a cooperative effort can produce. Let's get something done and better take care of the environment, our community and our customers.

### **GEM Plan goals & objectives**

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

- Post environmental policy and environmental challenges map for customer and employee information
- Compile a written comprehensive golf course development plan for both courses detailing both short- and long-term facility improvements
- Document training of all employees with the GEM Plan goals and objectives and environmental performance and stewardship

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

- Compile a Tree Management Plan that includes planting plan and maintenance schedule for both courses
- Compile a written comprehensive Water Resource Management Plan delineating the care and management of water features at both courses
- Compile an Energy Management Plan for both courses that will demonstrate a 3% reduction in annual energy use since FY03

## Conclusion

Golf in paradise is hard to beat whether you are playing at a high dollar resort or on one of Hickam's fine courses. Mamala Bay Golf Course provides some of the best golf for the money while Ke'alohe has phenomenal potential for growing the game. As one might expect, managing highly utilized golf courses on an island is rife with challenges. At Hickam AFB golf courses, the management staff is among the best in the Department of Defense. With the type of assistance provided by the equally talented installation environmental staff, there are no challenges that cannot be overcome.

### **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 biowall restoration experiment components.*



*This poster communicates safety hazards to employees.*



*Renovation is a continuous process.*



*Mamala Bay is one of the finest Air Force golf facilities.*



*Coconut palms require pruning twice a year.*



*Manuwai Canal is susceptible to impacts.*



*The opening hole at Ke'alohe Golf Course.*



*Undesirable turf varieties are invading the greens.*



*Ke'alohe has its own set of monitoring wells.*



*Light poles at Ke'alohe need replacing.*



*Turf quality can suffer due to overuse of undersized tees.*



*The par 3 facility deserves upgrading.*

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**Air Force Center for Engineering & the Environment  
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Please visit our Golf Course Environmental Management Program website:  
**<http://www.afcee.brooks.af.mil/ec/golf/>**