PN ACC-940

EAST

Environmental Audits for Sustainable Tourism

Environmental Management Audit
Fern Hill Club
Port Antonio, Jamaica, W.I.

Final Report
EAST Report No 97-233

January 1998

Prepared for
EAST Project
c/o Jamaica Hotel and Tourist Association
2 Ardenne Road
Kingston
Jamaica, W I

By
Hagler Bailly Services, Inc
1530 Wilson Boulevard
Arlington, Virginia 22209
U S A

A project funded by the U S Agency for International Development

Table of Contents

Executive Summary 3

Summary of Implementation Costs and Paybacks 4

Summary of Initiatives Already Underway 6

1 Introduction 7

1 1 EAST Project 7
1 2 Audit Team 7
1 3 Audit Protocol 7

2 Background Information 8

2 1 Description of the Property 8
2 2 Occupancy Data 8
2 3 Water Consumption and Wastewater Generation 9
2 3 1 Current water use and wastewater generation at Fern Hill 9
2 3 2 Impact of water conservation at Fern Hill 10
2 4 Electricity Consumption 11

3 Guidelines for the Development of an Environmental Management System 12

3 1 Environmental Management System (EMS) Overview 12
3 2 Motivation 13
3 2 1 Appoint the environmental program's "Champion" 13
3 2 2 Create a "Green Team" 13
3 2 3 Develop an environmental policy for Fern Hill 14
3 2 4 Motivate the staff 15
3 2 5 Participate in external activities 16
3 3 Planning Action 16
3 3 1 Select and assess the program's focus areas 18
3 3 2 Prepare a plan 18
3 3 3 Set targets 18
3 4 Taking Action 19
3 4 1 Prepare personal action plans 19
3 4 2 Provide support and training 19
3 4 3 Publish results 20
3 4 4 Show leadership 20
3 5 Reviewing Progress 20
3 5 1 Monitor progress 20
3 5 2 Conduct an annual review 21

4 Recommendations for Improving the Property's Environmental Performance 22

Summary 22
Table 1 Recommendations for Improving the Property's Environmental Performance 23

5 Detailed Analysis of Selected Recommendations 38

Project 1 Install flow aerators on all faucets 38
Project 2 Install low-flow shower heads 40
Project 3 Install flow diverters in toilet tanks 43
Project 4 Install displacement devices and adjust the water level in the toilets' water tanks 45
Project 5 Replace existing conventional toilets with water-saving toilets 47
Project 6 Improve and expand rainwater collection and use at Fern Hill 50
Project 7 Reduce the time of operation of the pool filter pumps 53
Project 8 Upgrade to energy efficient lighting 54
Project 9 Implement a property-wide waste management program 57
Project 10 Implement a linen and towel reuse program 62
Project 11 Implement a composting program 65

Appendix I Hotel Environmental Policy

Appendix II Summary of Fern Hill's environmental aspects, impacts and EMS objectives

Appendix III Action Plan Form

Appendix IV Personal Action Plan Form

Appendix V Sample Water and Electricity Monitoring Forms

Appendix VI Flow diverters Technical Information

Appendix VII Fern Hill Club Hotel, Guest and Occupancy Form

Executive Summary

What is an environmental management system?

- An environmental management system (EMS) is a management tool through which a property can evaluate and improve its environmental performance, and establish, achieve and sustain its own environmental performance objectives

Why should Fern Hill develop an EMS?

- An EMS will help Fern Hill sustain the social and physical environment on which it depends for its survival Tourists visit Port Antonio to savor the beauty of its beaches and nature and to experience the warmth and kindness of its people The day Port Antonio loses these valuable attributes will mark the end of its tourism industry

- Hotel guests are increasingly taking an interest in the environment A recent poll conducted by *Conde Nast Traveler* revealed that

  - 91% of the respondents were concerned about the environmental conditions at the destination to which they are making travel plans,
  - 50% claimed that the environment had become a factor in their travel planning over the last ten years,
  - 25% have changed travel plans because of what they perceived to be an environmental issue at their chosen destination

  The "green" image created and sustained through an effective EMS will therefore provide Fern Hill with an additional marketing tool

- Since many environmental measures are aimed at reducing the consumption of water, energy, chemicals and materials, an effective EMS will help the property save money and ensure the sustainability of the measures and actions that yield these savings

  During the course of the audit, the EAST team reviewed Fern Hill's water, energy, chemicals and materials consumption practices, evaluated its policies, procedures and management structure, identified ways to improve its environmental performance and develop an effective EMS As illustrated in the following section, the audit revealed that Fern Hill could greatly benefit by becoming a more "environmentally friendly" property

Summary of Implementation Costs and Paybacks

The following table summarizes the costs and benefits of 11 of the more than 60 recommendations presented in this report The detailed analysis of these 11 recommendations, or projects, is presented in Section 5 of this report

Project no and description	Environmental benefits	Financial savings	Implementation cost	Payback period
1) Install flow aerators on all faucets	• Reduces water consumption and wastewater generation • Saves energy	1,470 J$/year for each typical back-of-house faucet	60 J$ per aerator	2 to 4 weeks
2) Install low-flow shower heads	• Reduces water consumption and wastewater generation • Saves energy • Enables Fern Hill to supply water to guest room blocks by gravity	2,280 J$/year for each low-flow shower head installed in a high water pressure area	300 to 850 J$ per low-flow shower head	4 5 months
3) Install flow diverters in toilet tanks	• Reduces water consumption and wastewater generation	4,260 J$/year for 60% of the property's toilets	2,400 J$	< 7 months
4) Install displacement devices in toilet tanks	• Reduces water consumption and wastewater generation	4,260 J$/year for 60% of the property s toilets	960 J$	< 3 months
5) Replace existing toilets with water-saving models	• Reduces water consumption and wastewater generation	340 J$/year for guest bathrooms	500 J$ per guest bathroom	1 5 years
		2 930 J$/year for public restrooms	3 500 J$ per public restroom	1 4 years
6) Improve and expand rainwater collection and use at Fern Hill	• Reduces the use of NWC water • Reduces the use of water softening system and chemicals	10 300 J$/year for the laundry's rain catchment	4,000 J$	< 5 months
7) Reduce the time of operation of the pool filter pumps	• Reduces electricity consumption • Extends the service life of the pump	37 900 J$/year	0 to 3 600 J$	0 to 1 month

8) Upgrade to energy efficient lighting	• Reduces electricity consumption	See table in Project 8	478 J$ per energy-efficient bulb	typically 6 to 12 months
9) Implement a waste management program	• Reduces the volume of waste generated by the property • Reduces the negative impact of the waste generated by the property	unknown	moderate	probably <1 year
10) Implement a linen and towel reuse program	• Reduces water consumption and wastewater generation • Reduces energy consumption • Reduces chemicals consumption	can reduce laundry costs by up to 40%	negligible	immediate
11) Implement a composting program	• Provides the property with a free source of fertilizer and soil conditioner	unknown	low to moderate	probably <1 year

Summary of Initiatives Already Underway

To its credit, Fern Hill has already implemented a variety of environmental initiatives, some of which are listed below

- The hotel uses photocells to control the operation of its exterior lights, ensuring that the lights only operate as needed
- The staff is very good about turning off lights and fans that are not needed
- The hotel uses ceiling fans throughout the property to reduce the need for air conditioning
- The kitchen staff regularly cleans the kitchen equipment, ensuring maximum performance and more efficient operations
- The use of the walk-in freezer is ideal it has controlled access (only opened three times per day), curtains at the doorway (preventing cold air loss), and organized contents (allowing the kitchen staff to find what they need more quickly)
- The maintenance staff regularly cleans all air conditioning filters, ensuring maximum performance, more efficient operations, and a longer service life of the a/c units
- Glass bottles are collected and returned to the bottler or sold to local businesses
- The hotel makes good use of its empty containers to store cleaning products and pool chemicals However, since some of the products stored in these containers are dangerous, they should be labeled properly to prevent accidents If some of the staff is unable to read, management should use the "skull and crossbones" symbol to warn of danger
- The hotel makes good use of live plants in the restaurant and the guest rooms Using live plants in these areas instead of fresh flowers reduces waste
- The hotel recently purchased a computer for the front desk area If the staff makes good use of this computer, it should considerably reduce the amount of paperwork in this area
- Much of the property's used paper (printed on one side) is reused as scrap paper in the offices and in the restaurant This practice reduces waste and saves money
- The maintenance department saves parts from old equipment and furniture to repair others This practice not only reduces waste but also makes it possible to repair other furniture and equipment without having to purchase spare parts
- Furniture that cannot be used by the hotel anymore is donated to a local charity
- The hotel does a good job of buying items in bulk (sugar, salt, pepper, butter, jelly, cream, syrup, condiments) rather than individually-packaged products It may however be a good idea to use tight-sealing sugar containers which keep the ants out of the sugar

I. Introduction

1 1 EAST Project

The Environmental Audits for Sustainable Tourism (EAST) Project is an activity funded by the U S Agency for International Development (USAID) that is designed to assist the tourism and hospitality industry implement effective environmental management systems (EMS)

The specific objectives of this project are (1) to develop greater awareness and understanding of the benefits of environmental management systems and audits among hoteliers, restaurateurs, allied tourism businesses, as well as in the manufacturing industry, (2) to train Jamaican consultants on EMS auditing techniques, (3) to assist a select, representative number of tourism establishments in carrying out environmental audits, and (4) to help finance, on a cost-sharing basis, specific audit recommendations in the participating establishments to demonstrate the financial benefit of the systematic application of environmentally friendly practices and, thereby, encourage others in the tourism industry to do likewise EAST is being implemented by Hagler Bailly Services (USA) under the direction of USAID/Jamaica and the Jamaica Hotel and Tourist Association

1 2 Audit Team

The audit of the Fern Hill was conducted by an interdisciplinary team in November 1997 The team members included Hugh Cresser, EAST Project Coordinator, Peter Illig, Team Leader and EMS Specialist, Hagler Bailly (USA), Patricio Gonzalez Morel, Environmental Engineer, Hagler Bailly (USA), Cara Holley Montrief, Hotel Environmental Consultant (USA)

The EMS audit consisted of a detailed analysis of all departments and key service areas designed to identify the environmental aspects and impacts of the property's activities, and to formulate recommendations on how to improve the property's environmental performance and its environmental management system (EMS)

1 3 Audit Protocol

The audit protocols used by the audit team covered the following issues

- ISO 14 000 EMS gap analysis
- Water use and wastewater generation
- Energy use and efficiency
- Solid waste generation and handling
- Chemicals use and management
- Hotel procedures and operations

2. Background Information

2 1 Description of the Property

Fern Hill is a 31-room hotel located in the hills near Port Antonio on the northeast coast of Jamaica The property covers 20 acres of land, 4 of which are developed Fern Hill is owned by Ms Linda Jupp and is managed by Mr Vincent Holgate

Fern Hill has various facilities for its guests' comfort and entertainment, including

- a main dining room,
- a bar,
- three pools,
- private Jacuzzis in the 16 spa suites,
- a tennis court,
- a game room, and
- access to a private beach

2 2 Occupancy Data

The occupancy information given by Fern Hill to the audit team covers the 12-month period from November 1996 to October 1997 This data is summarized in the following table and is used as the basis for the calculations presented in this report

Month	Occupancy	
	Room Nights (RN)	Guest Nights (GN)
November 1996	317	413
December	278	570
January 1997	266	541
February	397	730
March	306	567
April	226	406
May	242	470
June	250	452
July	295	566
August	402	847
September	298	518
October	318	497
Annual total	3 595	6 577

Note
- The hotel s records indicate that 63% are local guests
- The audit team discovered a number of errors in the hotel's calculation of the monthly occupancy percentages The form given in Appendix VII should help Fern Hill with these calculations

The data presented in the previous table yields the following occupancy criteria for Fern Hill

Average occupancy = 300 RN/month
= 548 GN/month

2 3 Water Consumption and Wastewater Generation

2 3 1 Current water use and wastewater generation at Fern Hill

- Most of the water consumed by Fern Hill is purchased from the National Water Commission Only a small amount of rainwater is collected and used for laundry operations
- The property's effluent is disposed on-site using 5 different septic tank/tile field systems

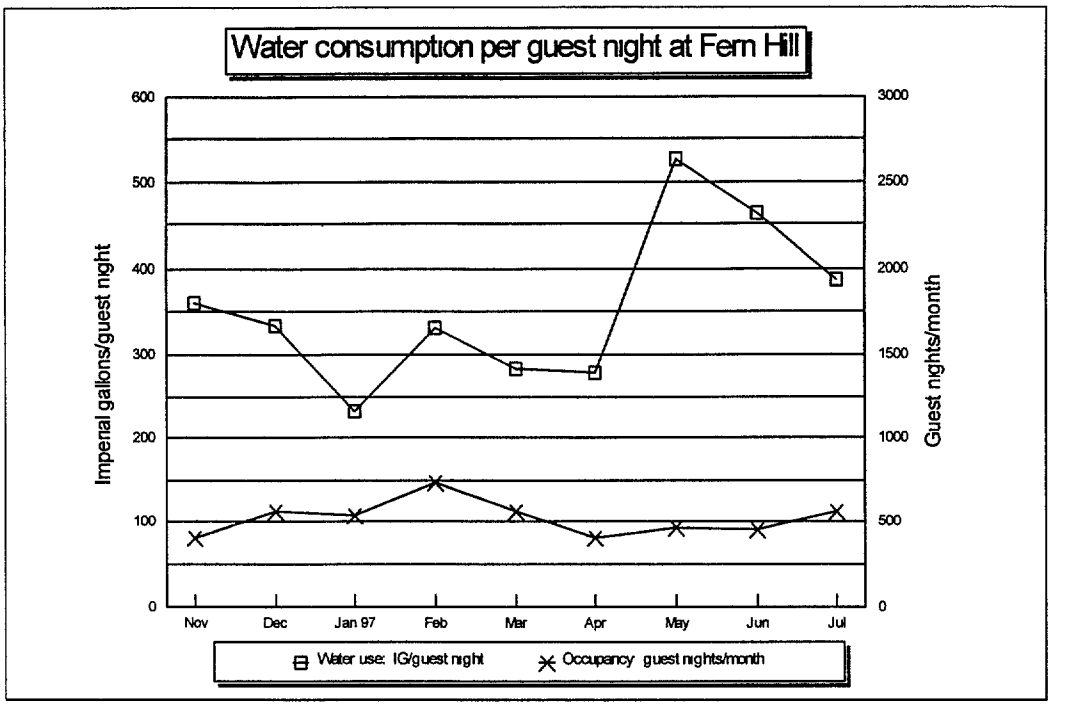
The water consumption information collected from Fern Hill's NWC water bills is presented in the following table and graph This data is used as the basis for the calculations presented in this report

NWC water consumption figures					
Month	**Water use Imp gal/month**	**Water cost J$/month**	**Unit cost J$/1,000 IG**	**GN/month**	**IG/GN**
August 1996	229,000	45,084	196 9	-	-
September	193,000	37,589	194 8	-	-
October	242,000	47,263	195 3	-	-
November	149,000	29,202	196 0	413	361
December	190,000	37 267	196 1	570	333
January 1997	126,000	24,865	197 3	541	233
February	242,000	47,762	197 4	730	332
March	161 000	32,070	199 2	567	284
April	113,000	22 746	201 3	406	278
May	247,000	49,320	199 7	470	526
June	209,000	41,839	200 2	452	462
July	220,000	44,213	201 0	566	389
Annual total	2,321,000	459 221			
Nov-Jul total	1,657,000	329 284		4 715	

Based on this data, the average water figures for Fern Hill are

Current water cost = 201 J$/1,000 IG

Average water use = (2 321 000 IG/year) / (12 months/year)
= 193 400 IG/month
= (1,657,000 IG/9 months) / (4,715 guest nights/9 months)
= 351 IG/guest night



As shown in the graph, Fern Hill's water consumption index (i e , the consumption of water per guest night) varies widely throughout the 9 month period covered by the overlapping water use and occupancy data In fact, the water consumption index for May (526 IG/GN) is more than twice that for January (233 IG/GN) Although the water consumption index is expected to vary with time because of changes in weather, occupancy rates and guest type, the 230% variation seen at Fern Hill is excessively high

Fern Hill should therefore try to define and control the factors responsible for the large fluctuations in the amount of water consumed per guest night

2 3 2 Impact of water conservation at Fern Hill

Because of the high cost of water, it is in this property's best interest to engage in an aggressive water conservation program The comparison made in the following table between Fern Hill and a "water efficient" hotel (as defined by the International Hotels Environmental Initiative) shows that this property could achieve significant savings through water conservation

Average water consumption for hotels		Savings if Fern Hill achieved the water consumption of a water efficient property	
Location	**Water use**	**Water savings**	**J$ savings**
Water efficient hotel	96 IG/guest night	1,680,000 IG/year	337,000 J$/year
Fern Hill	351 IG/guest night		

Notes • The savings presented in this table are based on the average occupancy figure calculated in Section 2 2 of this report

• The International Hotels Environmental Initiative uses the following figures to rate the relative water efficiency of hotels

Property size (with gardens and laundry)	Water efficiency rating - water use figures are in IG/guest night				
	Good	**Fair**	**Poor**	**Very poor**	**Fern Hill**
4 - 50 rooms	< 96	96 - 111	111 - 128	> 128	351

2 4 Electricity Consumption

Given the gradual development which occurred at Fern Hill, its electricity supply system is highly decentralized In fact, there are 9 independent electricity meters around the property - 6 meters are billed at rate 20 (general service) and 3 at rate 10 (residential service) However, only 3 of the rate 20 meters account for 75% of Fern Hill's electric energy consumption

Unfortunately, detailed information on the month by month consumption of electricity at the property's principal meters was not available at the time of the audit Instead, Fern Hill's management provided the audit team with the following global consumption figures

Total expenditure for electricity = 1,200,000 J$/year
= 100,000 J$/month

By taking into account an average electricity cost of 4 64 J$/kWh, the electricity billing figures can be translated into the following energy consumption figures

Total electricity consumption = (1 200,000 J$/year) / (4 64 J$/kWh)
= 258,620 kWh/year
= 21 550 kWh/month

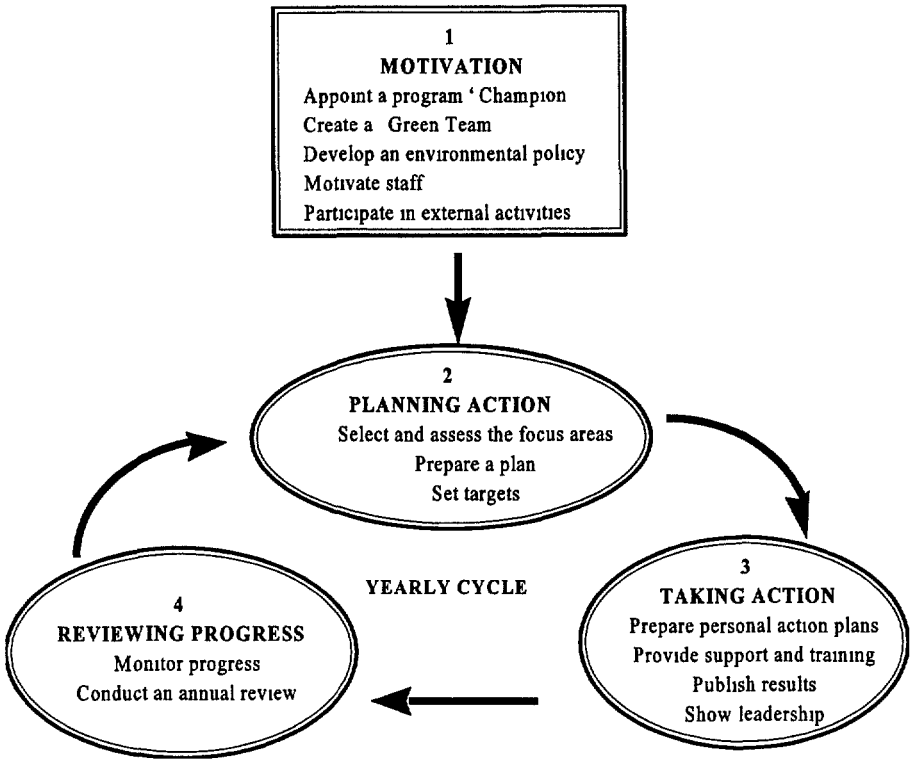
Using the occupancy figures presented in Section 2 2 , the property's electricity consumption index (that is, the consumption of electricity per guest night) can be calculated as follows

Av electricity consumption index = (21,550 kWh/month) / (548 GN/month)
= 39 3 kWh/GN

3. Guidelines for the Development of an Environmental Management System

3 1 Environmental Management System (EMS) Overview

Becoming an environmentally friendly property is not a challenge that can be met overnight It is a long-term commitment and a continuous process of improvement which should be integrated in the daily operations at a pace which is right for each property The key phases in the creation and development of an effective environmental management system are illustrated below



Note This EMS cycle is based on the approach developed by the International Hotels Environmental Initiative

The four phases are

- **Motivation** -- in which you begin to integrate the initiative in your property by appointing a "Champion' to coordinate the program creating a "Green Team" to assist in the implementation and monitoring of the program, developing a policy which defines the property's environmental objectives and by motivating the staff to participate and contribute to the program

- **Planning action** -- in which you select and conduct a detailed review of the property's priority areas, identify measures to be taken, prepare an action plan and set a timetable for

the implementation of the program

- **Making it happen** -- in which staff commitment is gained for the action plan, responsibilities are allocated, and the plan is implemented

- **Reviewing process** -- in which progress is monitored against set targets and objectives, an annual review of overall progress is conducted to assess the successes and failures, and priorities are set for the coming year

As shown above, phases 2, 3 and 4 form a yearly environmental management cycle Each year the property will go back though this cycle again, using the review of the previous year's successes and failures to improve the effectiveness of its EMS and revise, if necessary, its environmental policy

3 2 Motivation

Fern Hill has an advantage over many hotels in that its employees have a strong sense of loyalty and ownership and are exhibiting great individual efforts toward conservation and waste management These efforts need to be recognized and pulled under the umbrella of the hotel's overall environmental program

3 2 1 Appoint the environmental program's "Champion"

Once the hotel is ready to move ahead with its environmental program, Fern Hill will need to appoint a "Champion" who will have the responsibility for coordinating and implementing the environmental program This person must have a good operational knowledge of the hotel, the respect of other employees, a commitment to the project, and the full support of the property's owners and top management The Champion will keep the environmental program on line, ensure good business and environmental results are achieved, and ensure the participation or cooperation of all staff members

3 2 2 Create a "Green Team"

The creation of a "Green Team is crucial to ensure the introduction and the implementation of environmental policies The functions of the Green Team include

- assist the program Champion in the day-to-day management, supervision and troubleshooting of the environmental program,
- keep the property's staff motivated and dedicated to the principles of the environmental program,
- develop new ideas and strategies for improving the program,
- act as the principal link between the property and local community groups or environmental organizations

To be most effective, the Green Team must be composed of highly motivated individuals,

selected from each of the property's departments and representing all levels of employee hierarchy -- from executive-level to line-level employees The actual size of the Green Team will depend on the requirements of Fern Hill's environmental program, however, when assembling the team, keep in mind that as the group gets larger, the team as a whole becomes less focused and less productive

The employees selected for the Green Team must have the motivation and the character needed to ensure the success and the dissemination of the program Criteria for the selection of team members may include

- recommendations by managers or supervisors,
- nomination by fellow employees, or
- a simple application process which requires the candidates to explain their expected contribution to the environmental program and their reasons for wanting to join the team

Note Fern Hill should create more personalized names for the "Champion" and "Green Team" to reflect the property's "personality " In this report, the terms "Program Champion" and "Green Team" are used as generic names to represent two key components of an effective EMS

3 2 3 Develop an environmental policy for Fern Hill

An environmental policy is an important tool for communicating, both internally to employees and externally to guests, that the property is serious about its role in preserving and protecting the environment The policy should therefore embody the property's commitment to the environment and define the goals it wishes to achieve

The formulation of the environmental policy should be a concerted effort, involving management, the program Champion, the Green Team, and all interested staff members This combined effort will ensure that the environmental policy is understood and respected by all employees, and will provide the staff with a sense of ownership over the property's environmental program

The breadth of the environmental policy adopted by the hotel will define the complexity and magnitude of the environmental management system that will be needed to put the policy's words into actions The property is therefore advised to develop a first policy that is appropriate to the nature and scale of its environmental impact, but not overly ambitious The first environmental policy should include manageable commitments which bring obvious benefits to the property or help remedy its most significant environmental impacts Examples of commitments appropriate for a first environmental policy include

- safeguarding natural resources by achieving a more efficient use of water energy chemicals and materials
- preventing pollution by reducing the amount of waste generated by the property
- complying with all applicable environmental regulations

After mastering the basic principles and operations of its EMS, Fern Hill should broaden the scope of its environmental policy and review its objectives and targets Examples of complete and comprehensive environmental policies are given below and in Appendix I

The environmental policy must be clearly communicated and explained to all current employees and all new hires It should be discussed in staff meetings, included in employee handbooks, and posted on the staff notice board Once the property has put into practice the key elements of its EMS and achieved the first noticeable results, management should place a framed copy of the environmental policy in the hotel lobby, in full view to all guests and visitors

Hotel Code of Conduct

By the Negril Area Environmental Protection Trust (NEPT) and the Negril Chapter of the JHTA

We pledge our commitment to the environment of our area, as well as that of the whole Earth and therefore strive always to

- *Make the best most efficient use possible of the resources available to us including water and energy, knowing that in so doing we are not only being good neighbors in our resort community but also minimizing negative impacts inherent in the provision of these services*
- *Respect preserve and protect the air water, land plants and animals within our care*
- *Comply with all regulations and statutes concerning development and the environment*
- *Minimize waste and all forms of pollution*
- *Make the smallest impact possible on the natural beauty and bounty of our area our city our country and our world, and to enhance this beauty and bounty wherever we can*
- *Create wise management policies to benefit our business our customers our staff and the environment realizing that these are integrated*
- *Work together with others to achieve wider environmental and development goals*
- *And in all way to be good stewards of our natural world for this and future generations*

3 2 4 Motivate the staff

Use staff meetings to inform all employees of the program's objectives and to call for their ideas and support Involving the staff not only helps gain their commitment to the initiative, but it also allows the program to benefit from their creativity and experience line-level

employees often know best how to reduce waste and improve efficiency, and how to carry out specific programs and actions in the most practical manner The Champion and the Green Team should, therefore, strive to gain the support and collaboration of their colleagues at all levels and in all the departments of this property

In most cases, staff will not effectively practice environmentally-conscious behavior unless they are given proper training and motivated through an appropriate incentives program For example, employees will engage more willingly in good housekeeping practices once they are clearly instructed on what must be done, informed of the benefits of these practices, and encouraged and rewarded by management Since staff participation in the environmental program can generally save the property a lot of money, management should take the time to devise an appropriate and effective incentive program

Incentives can include monetary rewards such as sharing with the staff part of the water and energy savings achieved through the environmental program, or giving bonuses to particularly deserving employees Incentives can also include non-monetary rewards such as extra paid vacation days, parties and gifts (e g , t-shirts with the hotel's "green team" logo, gift certificates)

3 2 5 Participate in external activities

Fern Hill's management and staff should get involved in local and national initiatives, attend events, subscribe to environmental publications, discuss environmental issues with colleagues in the industry, and promote "networking" of good ideas through the JHTA Participation in external activities will help the property gain a deeper understanding of the issues, learn of how others are tackling their environmental problems, and enhance the property's reputation in the industry

An effective and productive way for Fern Hill to further enhance its environmental program is by developing strong community relationships By actively participating in local civic and environmental activities, Fern Hill will highlight its leadership role and bolster the motivation of its employees by allowing them to positively affect the community in which they live and by providing them an alternate means for professional growth

3 3 Planning action

3.3 1 Select and assess the program's focus areas

The Green Team under the leadership of the Program Champion must review the property s activities in order to determine which areas departments or issues should be targeted first by the environmental management program This review process is generally conducted by

1) identifying the environmental aspects of the property's activities -- an environmental aspect is an element of a property's activity which interacts, in a beneficial or detrimental manner, with the environment,

2) evaluating these environmental aspects in order to determine which of these have a significant negative impact on the environment,

3) highlighting the areas of significant negative environmental impact that can be affected through the property's environmental program

The environmental aspects of the various activities carried out in hotels can generally be classified in at least one of the following categories

- water use,
- energy use,
- solid waste generation,
- generation of water pollutants,
- use of hazardous products,
- generation of air emissions, and
- damage to the eco-system

A description of the environmental impacts and the types of activities associated with Fern Hill's principal environmental aspects is given in Appendix II

The identification of environmental aspects and impacts provides the property with a sense of its current environmental performance and enables the property to establish the environmental targets and objectives of its future EMS activities The background information and the recommendations given in this report should help Fern Hill identify its principal priority areas

After selecting the priority areas for the environmental program, the Green Team will have to conduct a detailed review of each priority area The purpose of this review process is

1) To assess current performance in each particular priority area Current performance can be best evaluated by calculating environmental performance indicators from the property's energy, water and solid waste bills, chemicals and materials purchase records, and hotel occupancy records Examples of the type of indicators which can be used by Fern Hill to gauge its current environmental performance include

   - gallons of water consumed by the property per guest night
   - kWh consumed by the property per guest night
   - number of tanker loads pumped from the septic tank per 1,000 guest nights
   - gallons of water consumed per pound of material processed through the laundry
   - pounds of laundry (or number of wash loads) processed per guest night
   - pounds of laundry chemicals used per guest night
   - pounds (or volume) of solid waste hauled out of the property per guest night
   - pounds of materials (glass paper, plastic metals) recycled per guest night
   - pounds of a specific chemical product used per guest night

   This initial assessment is very important since it provides the benchmark against which progress will be measured in a particular focus area (e g , the laundry room) or in the property as a whole

2) To identify improvement options The Green Team will need to identify what is already being achieved in order to gain an idea of where improvements can be made without sacrificing other operational criteria This is where discussion with key staff in each area is not only very useful (they often understand best where and how improvements can be made) but also essential if they are to be committed to the process

The findings and conclusions of this preliminary review process should be recorded so that they may be used, at the end of the yearly EMS cycle, to evaluate the results and achievements of the environmental program

3 3 2 Prepare a plan

The preparation of the action plan involves four important steps

- decide which of the actions identified by the review should be pursued first,
- define the steps needed to implement each action,
- allocate responsibility for these steps,
- set target dates for action

The action plan should prioritize

- actions needed to meet environmental laws and standards,
- good management practices which are simple and will bring a combination of environmental and business benefits,
- investment measures which have a rapid payback

The action plan form given in Appendix III illustrates the outputs of this task

The task of working up the plan of action may involve testing the performance, cost and operational implications of an option It may be wise to try out an idea before fully implementing it

Programs that solicit guest participation such as a Linen and Towel Reuse Program, are best introduced after the hotel is well underway in its environmental efforts Guests are more likely to participate if they can see that the hotel has made some efforts toward conservation or waste management Once Fern Hill has documented its environmental achievements, established a Green Team, and formulated an environmental policy, it should have great success in asking for guest participation in its efforts

3 3 3 Set targets

The purpose of setting targets is to provide clear benchmarks against which to measure the success of the program However, since changing environmental practice takes time and effort, the Green Team should carefully evaluate the program's targets It is often better to set targets which are achievable and which can provide real satisfaction once achieved, than to set

over-ambitious targets which only lead to failure and staff demoralization

The targets established by the Green Team for the property's environmental program can either be based on environmental performance indicators or on specific actions that must be completed by a given date

Examples of indicator-based targets include

- Reduce the amount of water consumed by the property per guest night in 1998 by 10% with respect to the 1997 figure
- Reduce the mass of solid waste hauled out of the property per guest night in 1998 by 20% with respect to the 1997 figure
- Before the end of 1998, achieve a water use ratio of 2 1 IG per pound of laundry processed

Examples of action-based targets include

- Start a composting program for all garden waste by March 1998
- Develop a check list for a guest room preventive maintenance program by January 1998 and begin the program by February 1998

3 4 Taking action

3 4 1 Prepare personal action plans

Fern Hill's employees must clearly understand that responsibility for minimizing the waste of energy, conserving water, recycling materials, and other tasks defined by the property's environmental program is part of their job They must be aware that they will be recognized if they carry out these responsibilities successfully, and noticed if they do not The key to achieving this objective is to translate the overall action plan into personal action plans which detail the specific and general actions expected of specific employees

An example of a personal action plan is provided in Appendix IV

3 4 2 Provide support and training

The key to success for any environmental program is education Employees must learn how to perform their daily tasks in a manner that will maximize conservation and understand why Fern Hill is undertaking this effort and the positive effects this effort will have on them, their families and the local community This understanding will provide a sense of ownership in the environmental effort that will contribute to its long-term success

The objectives of the training program are simple to ensure that all employees understand the property's important environmental issues and have acquired the skills to perform their work in an environmentally responsible manner Employees need to realize that resources are limited and that proper waste disposal in an island environment is critical Many of Fern Hill's employees indicated during the audit that they never realized that fresh water was scarce

or expensive because there is so much water everywhere you look in Jamaica The hotel needs to educate its employees on these types of issues in order to gain their participation

3 4 3 Publish results

Employees want to know the results of their endeavors Management and the Green Team should therefore regularly post the results of monitoring on the staff notice board, congratulate success, and rewarding individuals or departments that have done particularly well

Many hotels put up energy and water consumption monitoring results on their staff notice boards The results for the current month are displayed in a simple graphic format and compared with the previous month and the same month in the previous year Staff take a great interest and pride in these results

Fern Hill may also decide to publicize the results of its environmental program in promotional literature

3 4 4 Show leadership

Achieving staff commitment is an ongoing task -- if enthusiasm is to be maintained, staff need to be constantly reminded of the objectives and targets which have been set Management and the Green Team must demonstrate its continued commitment and leadership, notice when action is being taken and when lapses occur, and continually refresh enthusiasm in the challenge of transforming Fern Hill in an environmentally friendly property Like customer care, good environmental management practices must become part of the management culture

3 5 Reviewing progress

3 5 1 Monitor progress

The saying, "you can't manage what you don't measure " applies as much to environmental management as to other areas Fern Hill needs to establish good monitoring procedures to ensure that the program is working and achieving its objectives Monitoring should be regular and scheduled (i e , readings should be taken at a predetermined hour) Monitoring should be sufficiently frequent to enable corrective action to be taken if there is a significant change in the average daily consumption or a large deviation from targeted performance Ideally, water and electricity meters should be checked on a daily basis This activity need not take a member of staff more than 30 minutes per week

Examples of water and energy monitoring forms are provided in Appendix V

Especially in the early days when progress will be patchy, and difficulties will arise, the Green Team should frequently hold short meetings with relevant individuals to review the progress made, and to help sort out problems as they arise

Effective sub-metering of utilities will pay back very rapidly Some hotels have installed separate utility metering for different parts of the hotel This enables them to better identify where energy or water wastage is occurring Typically the cost of installing new meters will be met from utility cost savings in the first year

3 5 2 Conduct an annual review

Once a year Fern Hill will need to step back to check the progress in its environmental performance This review might best be undertaken by the Champion and may take the form of a short report attaching competed targeting and monitoring forms of the initiatives undertaken Alternatively, management may prefer to use independent consultants if it feels that Fern Hill does not have the resources or expertise in house to perform this task The review should cover the property's environmental management capabilities as well as the progress made with specific environmental actions It should entail

- A general review of the property's environmental performance to assess what progress has been made, and to help re-prioritize action
- A summary of measured achievements against set targets and objectives
- Discussions with relevant staff to identify the difficulties that have arisen, and the successes, and their recommendations for future action

This review process is invaluable It will highlight problem areas as well as help identify the most appropriate environmental management approach for Fern Hill Management and the Green Team can then begin to plan for the coming year -- but this time on the basis of the experience acquired over the past year

4. Recommendations for Improving the Property's Environmental Performance

Table 1 provides a summary of the recommendations proposed by the audit team to help the property address many of its activities that have a negative impact on the environment It is important to note, however, that this list only contains the recommendations identified during the course of a three day audit, these recommendations should therefore be viewed as only a the first phase of the property's continuous EMS process

The recommended actions listed in Table 1 are classified by department or area of activity (e g , maintenance department, housekeeping department, guest rooms, gift shop) and by the environmental aspect category addressed by each recommendation (e g , water use, energy use, solid waste generation) Table 1 also provides an evaluation of the environmental impact, the implementation cost and the cost effectiveness of each recommended action The ratings used to qualify the recommendations are defined as follows

Criteria	Rating	Description of rating
Environmental benefit of the action	High (H)	Significant reduction of the property's impact on the environment (e g , a large reduction in the toxicity or volume of generated waste, a significant improvement in the use of water, energy, chemicals or other products)
	Moderate (M)	Moderate reduction of the property's impact on the environment
	Low (L)	Low or insignificant reduction of the property's impact on the environment
Cost to implement the action	High	Cost > 1,750 J$ per room (> 50 US$ per room)
	Moderate	Cost = 350 to 1,750 J$ per room (10 - 50 US$ per room)
	Low	Cost < 350 J$ per room (< 10 US$ per room)
Cost effectiveness of the action	High	Payback < 2 months
	Moderate	Payback = 2 months to 1 year
	Low	Payback > 1 year

The property's management and staff can use the ratings to select the recommendations that should be implemented first and to identify the recommendations that yield the greatest benefits -- that is High environmental benefit Low implementation cost and High cost effectiveness

The high priority actions are highlighted with the "✪" symbol These actions are those which either have an immediate payback (cost effectiveness = H) or have a high environmental benefit combined with a moderate payback (cost effectiveness = M)

Table I Recommendations for Improving the Property's Environmental Performance

Env aspects	Description and rating of the recommended action (H = high, M = moderate, L = low)		
MAINTENANCE DEPARTMENT			
General maintenance issues	Action's env impact = H	Cost = L	Cost effectiveness = H
	❂ Implement a program to regularly monitor the consumption of energy, water and chemicals, and the amount of solid waste generated by the property At the end of each month, the property should calculate how much electricity, LPG, water, and chemicals was consumed and how much garbage was produced per guest night (i e , gallons of water/guest night, kWh/guest night, etc) This data will help the property • define its normal consumption patterns, • identify any unusual shifts in consumption which may indicate equipment problems (e g , water leaks) or operational problems, • ensure that employees are complying with water, energy and materials conservation guidelines, • ensure the effectiveness of preventive maintenance operations, and, • evaluate the progress of the property's conservation and environmental efforts Monitoring should be sufficiently frequent to enable the property to take corrective action if there is a significant change in consumption or a large deviation from targeted performance Ideally, water and electricity meters should be checked on a daily basis This activity need not take a member of staff more than 30 minutes per week Samples of water and electricity monitoring forms are presented in Appendix V		
General maintenance issues	Action's env impact = M	Cost = M	Cost effectiveness = N/A
	Formalize a preventive maintenance program Formal preventive maintenance should include written maintenance schedules, and maintenance activities should be formally tracked in a preventive maintenance log book A comprehensive preventive maintenance program ensures that equipment is running efficiently and safely and extends the useful life of the equipment		
General maintenance issues	Action's env impact = M	Cost = L	Cost effectiveness = H
	❂ Establish a procedure for all staff to quickly report maintenance issues to the maintenance department		
Water use	Action's env impact = H	Cost = see specific actions	Cost effectiveness = see specific actions
	Water consumption at Fern Hill (351 Imperial gallons per guest night) is greater than the industry average for a water efficient property (96 Imperial gallons per guest night) Given the high cost of NWC water (201 J$/1,000 IG), it is in this property's best interest to engage in an aggressive water conservation program		

Env aspects	Description and rating of the recommended action (H = high, M = moderate, L = low)		
Water use	Action's env impact = M	Cost = L	Cost effectiveness = H
	✪ Promptly fix all leaks in faucets, toilets and pipes and ensure that all water-using fixtures are in proper working order The audit team detected only one leaking faucet and one creeping toilet while inspecting the property, suggesting that Fern Hill provides effective and timely maintenance to its water-using fixtures However, since even a single dripping tap can waste up to 10,000 IG/year (2,000 J$/year) and an overflowing toilet can easily lose 53,000 IG/year (10,600 J$/year), Fern Hill should persevere in its leak detection and maintenance efforts Maintaining Fern Hill's water-using fixtures in proper working order requires an effective preventive maintenance program and the collaboration of all employees All staff members -- and in particular housekeepers, kitchen and laundry workers -- should be trained to detect leaks and malfunctioning toilets (leaky flapper valves, sticking flush mechanism, overflowing toilet tanks), and to promptly report these problems to maintenance Maintenance staff should have the training and the means to promptly answer the maintenance requests and to conduct a regular and effective preventive maintenance program As part of the preventive maintenance program, maintenance staff should conduct the following operations • Replace missing or damaged faucet aerators • Ensure that there are no excessive leaks in the valves which divert water from the tub faucet to the shower head -- that is, only a minimum amount of water should come out of the tub faucet while the valve is on the "shower" position • Ensure that there are no excessive leaks around the packing of tub and sink faucets • Periodically clean the carbonate deposits from shower heads Clogged shower head may encourage guests to take baths rather than showers -- an average bath consumes 4 times more water than a shower • Ensure that tub and sink stoppers seal properly Repair or replace leaking stoppers • Check for broken flush lever mechanisms A damaged or jammed flush mechanism can waste more than 5 IG/minutes (7,200 IG/day) until it is detected and corrected • Check for damaged and leaking toilet flapper valves • Remove scale deposits in toilet tanks that obstruct the flapper valve • Adjust the water level in toilet tanks to the minimum level required for proper operation An excessively high water level in the toilet tank can waste up to 0 5 IG/flush, letting the water level rise above the top of the tank overflow pipe can result in a constant loss of more than 0 5 IG/min The cost of these maintenance operations is generally minimal		
Water use	Action's env impact = M	Cost = L	Cost effectiveness = H
	✪ Install faucet aerators wherever possible Many of Fern Hill s faucets are not equipped with flow aerators (e g kitchen laundry guest bathrooms and guest room kitchenettes) The absence of these low-cost water saving devices contributes to the excessive consumption of water at Fern Hill The use of flow aerators is particularly important in areas where taps are left running for long periods of time **This recommendation is detailed in Project 1**		

Env aspects	Description and rating of the recommended action (H = high, M = moderate, L = low)		
Water use	Action's env impact = M	Cost = L	Cost effectiveness = H
	❂ In addition to flow aerators, the output of faucets can be further controlled by adjusting the shut-off valves located on the pipes that bring water to the faucets In many cases, these valves are wide open and thus subject the faucets to the full pressure carried by the water distribution system These valves should be adjusted to lower the water pressure acting on the faucets and reduce their maximum flow output Fern Hill should use this technique to limit the output of its older faucets which cannot accommodate flow aerators and cannot be economically replaced by new faucets 6 out of the 9 sinks in public and employee bathrooms are equipped with old faucets and could benefit from this measure		
Water use	Action's env impact = M	Cost = M	Cost effectiveness = M
	• A few years ago Fern Hill evaluated the possible use of low-flow shower heads in its guest bathrooms But the idea was rejected because the water pressure available in many parts of the property was below the limit needed for the operation of low-flow shower heads However, since several manufacturers now produce low-flow shower heads specifically designed for low pressure conditions Fern Hill should reconsider the use of low-flow shower heads These fixtures provide a high quality shower and use less than 2 1 Imperial gallons/minute Low-flow shower heads save water and energy (by reducing the consumption of hot water), and would allow Fern Hill to supply water to most of its guest room blocks by gravity, thereby simplifying the property's existing water distribution and pressurization system Currently, Fern Hill uses pumps and pressure tanks to boost the water pressure in several guest room blocks during periods of medium to high occupancy • Install standard low-flow shower heads in areas which regularly experience high water pressure (e g , Great House 4) **This recommendation is detailed in Project 2**		
Water use	Action's env impact = M	Cost = L	Cost effectiveness = H
	❂ Ensure that there are no excessive leaks in the valves which divert water from the tub faucet to the shower head -- that is only a minimum amount of water should come out of the tub faucet while the valve is on the 'shower" position 3 out of the 4 shower diverter valves inspected by the audit team had significant leaks In addition to wasting water and energy (if the water is hot) leaking shower diverter valves also compounds the hotel's low water pressure problems by further reducing the output of the shower head Certain types of shower diverter are difficult or impossible to repair Fern Hill should take this factor into consideration the next time it purchases new shower fixtures or spare parts		

Env aspects	Description and rating of the recommended action (H = high, M = moderate, L = low)		
Water use	Action's env impact = M	Cost = L	Cost effectiveness = H
	◎ Ensure that all guest bathroom sinks are equipped with stoppers which seal properly The lack of properly fitting stoppers forces guests to use running faucets when shaving, washing clothes, etc Out of the 5 guest bathrooms sinks inspected, 3 had no toppers and 2 had leaking or poorly fitting stoppers ◎ Ensure that if the tubs are equipped with stoppers these do not leak Poorly fitting or leaking stoppers lead guests to use more water whenever they take baths ◎ Since baths consume on average 4 times more water than showers, Fern Hill may want to discourage guests from taking baths In such a case, Fern Hill should remove all tub stoppers or dismantle all tub stopper mechanisms		
Water use	Action's env impact = M	Cost = L	Cost effectiveness = M
	Install a flow diverter on the hose which feeds water to the to the bowl's refill pipe of conventional toilets By diverting back into the water tank part of the flow that normally drains to the toilet bowl, this simple device can be used to set a suitable water level in the toilet bowl and avoid the waste of water resulting from overfilling the toilet bowl Flow diverters can be easily installed on almost any conventional toilet (i e , toilets that use 3 3 to 4 2 IG per flush) and can save from 0 4 to 0 8 IG per flush **This recommendation is detailed in Project 3**		
Water use	Action's env impact = M	Cost = L	Cost effectiveness = M
	Install displacement devices in the water tanks of conventional toilets (3 3 to 4 2 IG/flush) The use of these devices can reduce by approximately 0 4 IG the amount of water used for each flush This water conservation measure requires only a minimum investment since toilet dams are generally home-made (plastic bottles filled with pebbles and water) **This recommendation is detailed in Project 4**		
Water use	Action's env impact = M	Cost = M/H	Cost effectiveness = L
	• Establish a policy to replace any damaged or unusable guest bathroom toilet with a water-saving toilet (i e , a toilet that uses 1 3 IG/flush) • Replace conventional toilets with 1 3 IG/flush toilets in frequently used public or employee restrooms **This recommendation is detailed in Project 5**		

Env aspects	Description and rating of the recommended action (H = high, M = moderate, L = low)		
Water use	Action's env impact = H	Cost = L	Cost effectiveness = M/H
	❍ Lower the float valve in the rainwater collection tank so that more rainwater and less city water can be used in the laundry The current position of this float at the top of the tank means that each time the laundry uses water, the tank is refilled with city water When it rains, rainwater enters the tank but an equal volume of water drains out of the tank through the overflow pipe ❍ The mesh used to screen the rainwater at the tank's inlet should be cleaned regularly (after each rainfall if necessary) At the time of the audit, the mesh was covered with so much grime that it actually prevented any rainwater from entering the tank ❍ Increase the size of the laundry rainwater catchment area ❍ Consider expanding the use of rainwater at this property **This recommendation is detailed in Project 6**		
Energy use	Action's env impact = M	Cost = L	Cost effectiveness = H
	❍ While the lower-level pool is equipped with a timer which shuts off the filter pump from 8 PM to 10 AM, the pumps of the upper and mid-level pools operate 24 hours per day In order to save energy and increase the useful life of its equipment, Fern Hill should shut off all filter pumps during nighttime **This recommendation is detailed in Project 7**		
Energy use	Action's env impact = M	Cost = L	Cost effectiveness = H
	❍ The seals on the dryer should be checked regularly and replaced when they are broken The audit team found that the seal around the dryer window is broken allowing hot air to escape or cool air to enter thus requiring the dryer to work harder than it should The dryer door also does not close tightly		
Energy use lighting	Action's env impact = M	Cost = M	Cost effectiveness = M
	There are approximately 370 40-W incandescent bulbs and 20 60-W incandescent bulbs used around the property In addition, there are several 100-Watt bulbs scattered throughout the hotel Wherever possible Fern Hill should consider retrofitting existing lights with energy efficient fixtures (e g compact fluorescent bulbs) Priority should be given to replacing the incandescent bulbs that have a medium to high wattage (60 W or higher) or that burn for long periods of time (> 8 hours per day) **This recommendation is detailed in Project 8**		

Env aspects	Description and rating of the recommended action (H = high, M = moderate, L = low)		
Energy use lighting	Action's env impact = L	Cost = L	Cost effectiveness = H
	✪ The high-wattage spot lights over the patio doors inside the 2-bedroom villas should be removed or replaced with lower-wattage fixtures These lights use a great deal of energy, produce considerable heat, and are unnecessarily bright		
Energy use lighting	Action's env impact = L	Cost = L	Cost effectiveness = H
	✪ The hotel is already using many 4-foot, 40 W fluorescent lamps (tubes) in the back-of-house areas 34 W Watt-Miser Energy saving lamps have been developed as a more efficient alternative to the traditional 40 W fluorescent lamps In the future, the hotel should consider purchasing 34 W energy-saving lamps which are a direct retrofit, these lamps cost a bit more but will produce the same amount of light and use less energy For each 40 W fluorescent lamp replaced by a 34 Watt-Miser lamp, Fern Hill will save 120 kWh, valued at 560 J$, over the life of the lamp (20,000 hours)		
Energy use lighting	Action's env impact = M	Cost = N/A	Cost effectiveness = H
	✪ Eliminate lighting inconsistencies by establishing a formal guide for the maintenance staff regarding the wattage and number of bulbs used in the property's light fixtures Lighting inconsistencies are especially evident in guest bathrooms, which have total bulb wattages ranging from 40 to 160 watts Consider the following facts • Every extra (and unneeded) 40 W bulb that is used in a bathroom fixtures increases the cost of Fern Hill's energy bill by 150 J$ over the life of the bulb (for an 800 hours bulb life and an electricity cost of 4 64 J$/kWh) • Installing a 100 W bulb instead of a 40 W bulb increases Fern Hill's energy bill by 220 J$ over the life of the bulb Since this increased energy consumption is equivalent to the cost of approximately 10 40-W bulbs Fern Hill's management should ensure that an adequate stock of 40 W bulbs is kept on hand at all times		
Energy use lighting	Action's env impact = M	Cost = L	Cost effectiveness = H
	✪ Establish a program to regularly clean all guest room light bulbs to ensure they perform at maximum efficiency The audit team found many dirty bulbs in the guest rooms and guest baths Dusty or dirty bulbs give 1/3 less light and therefore waste approximately 1/3 of the energy consumed For example a dirty 60 W bulb produces no more light than a clean 40 W bulb and therefore wastes 16 kWh of energy (75 J$) over its service life		

Env aspects	Description and rating of the recommended action (H = high, M = moderate, L = low)		
Energy use air-conditioning	Action's env impact = M	Cost = L	Cost effectiveness = M/H
	✪ The louvered windows and the large gaps under the entrance doors result in a significant heat gain in the guest rooms which adds to the load on the air-conditioning units Install durable weather stripping on the louvered windows and at the base of the entrance doors to reduce heat gain and the energy consumed by the air-conditioners Special attention should be paid to Great House 6 Many of its louvers are damaged and do not shut properly		
Energy use air-conditioning	Action's env impact = L	Cost = L	Cost effectiveness = H
	✪ The maintenance staff should ensure that the exhaust vanes of all a/c units are closed An open exhaust vane lets fresh outside air enter the room and thus forces the a/c unit to work harder Since all Fern Hill's guest rooms receive plenty of fresh air (through improperly sealing louvers and doors), the additional fresh air supplied by the exhaust vane is not necessary and wasteful		
Energy use air-conditioning	Action's env impact = L	Cost = L	Cost effectiveness = H
	✪ The person who cleans the air conditioning filters should carry extras in case one falls apart while it is being cleaned The audit team found one unit that was missing a filter for this reason An air conditioner should not be allowed to operate without a filter		
Energy use refrigeration	Action's env impact = M	Cost = L	Cost effectiveness = M
	The maintenance staff should check the seals on refrigerators and freezers regularly The audit team noted some condensation build-up around these seals on several units Also, cold air could be seen escaping from the bottom of the walk-in freezer door		
Energy use hot water supply	Action's env impact = M	Cost = L	Cost effectiveness = H
	✪ The hot water supplied by most water heaters at Fern Hill is excessively hot Ensure that all water heater thermostats are set to the "energy efficiency" range indicated on the thermostats High water heater temperatures increase heat/energy losses from the surface of the water tanks and hot water pipes, and increase the risk of scalding guests and employees In many parts of the US, setting water heaters higher than 120 to 125°F is prohibited by law		
Solid waste generation	Action's env impact = H	Cost = M	Cost effectiveness = M
	✪ Fern Hill should implement a hotel-wide recycling program to segregate glass plastics metal cardboard and paper waste from its general waste stream **This recommendation is detailed in Project 9**		

Env aspects	Description and rating of the recommended action (H = high, M = moderate, L = low)		
Use of chemicals	Action's env impact = H	Cost = L	Cost effectiveness = H
	✪ Avoid the use of drain cleaning chemicals whenever possible Drain cleaning chemicals are toxic, hazardous and expensive, they should therefore be used sparingly and only as a last resource Furthermore, when discharged to an on-site wastewater disposal system, these chemicals harm the bacteria which decompose and purify the waste in septic tanks and tile fields The destruction of these beneficial bacteria increases the rate at which solids accumulate in septic tanks and increases the mass of pollutants which reach the ground water table The maintenance staff should first try to clear clogged drains with a plunger or "snake" before using chemicals Snakes are long, highly flexible metal wires or coils which are used to clean and unclog drains, they can be operated manually or powered through a drill-like device The cost of these tools range from 20 US$, for a manual snake, to 250 US$, for a top-of-the-line power-driven snake		

Env aspects	Description and rating of the recommended action (H = high, M = moderate, L = low)		
PURCHASING			
Solid waste generation	Action's env impact = H	Cost = L	Cost effectiveness = N/A
	❂ Purchase as many recycled paper products as possible (office paper, toilet paper, facial tissues, paper towels, etc) Most paper products manufacturers have environmentally-friendly alternatives which contain a minimum of 20% POST CONSUMER waste The price and quality of recycled paper products are often comparable to those of virgin paper products The use of these products also helps to convey the hotel's concern for the environment to its guests		
Solid waste generation	Action's env impact = H	Cost = L	Cost effectiveness = H
	❂ The hotel should favor suppliers which use as little packaging as possible Any packaging brought into the hotel has to be disposed of by the hotel		
Use of hazardous chemicals	Action's env impact = H	Cost = L	Cost effectiveness = M
	❂ Obtain ingredient lists or material safety data sheets (MSDS) from chemical manufacturers or distributors and keep them on file This will help the property identify and possibly discontinue the use of certain hazardous products It will also allow the property to better respond to possible emergencies related to the use of these hazardous chemicals		
General issues	Action's env impact = M	Cost = M	Cost effectiveness = M
	Liquid soap dispensers were once used in the public restrooms but these dispensers have either been removed or no longer work These dispensers should be repaired or replaced, since liquid soap is less wasteful and less expensive than the bars currently being used		
FRONT OFFICE AND GIFT SHOP			
Solid waste generation	Action s env impact = M	Cost = M	Cost effectiveness = M
	Consider converting to a computerized reservation and accounting system This conversion will reduce paper waste and be a more reliable cost-tracking system		
Solid waste generation	Action's env impact = L	Cost = L	Cost effectiveness = H
	❂ Whenever feasible don t automatically give out plastic bags for gift shop purchases instead ask guests if they would like one		

Env aspects	Description and rating of the recommended action (H = high, M = moderate, L = low)		
GUEST ROOMS & HOUSEKEEPING			
Water use/ energy use / generation of water pollutants	Action's env impact = H	Cost = L	Cost effectiveness = H
	❂ Let guests decide if they want to replace their linens and towels every day The hotel currently has a policy of changing sheets every three days (although some housekeepers change them daily) and has no towel reuse option International and Jamaican (JHTA) experience has revealed that these measures can reduce the laundry load by up to 40% By reducing the amount of material processed through the laundry, Fern Hill will be able to lower its water, chemicals and energy consumption and costs **This recommendation is detailed in Project 10**		
Water use	Action's env impact = M	Cost = L	Cost effectiveness = H
	❂ The housekeepers often flush the toilet too many times when cleaning (the audit team observed one housekeeper flushing the toilet in a guest room three times) Since each toilet flush wastes more than 3 3 IG of water, housekeepers should be instructed to flush the toilets only once per room		
Energy use	Action's env impact = M	Cost = L	Cost effectiveness = H
	❂ Many guests leave the air conditioner running and lights on after leaving their rooms Fern Hill should place a tactful note in the rooms to encourage guests to turn off air conditioners and lights whenever they leave their rooms for extended periods Other action that can be taken by Fern Hill to reduce the energy consumed by its a/c units include • When entering a guest room, ask the housekeepers to turn the a/c units off or, if this is unacceptable to the guests, to adjust the a/c thermostat to a "low cool" setting (or the lowest possible setting) • Unless special ventilation is required, ask housekeepers keep the guest room door closed during guest room preparation this will keep the room cooler and prevent insects (especially mosquitoes) from entering the room If the door must be left open during guest room preparation, ask housekeepers to turn off the a/c units The audit team observed that many housekeepers left guest room doors open for extended periods while cleaning despite the fact that the air conditioner was on • If housekeepers have to leave a room for any length of time while it is being cleaned they should turn the lights off The audit team found that housekeepers often left to clean another room or to get fresh towels leaving guest bathroom lights on for up to four hours before returning The bathroom lights were also typically left on while the housekeeper was cleaning the patio and living rom area This needless waste of energy should be discouraged • Investigate the possibility to control the operation of the a/c units with infrared sensors and magnetic door switches		

Env aspects	Description and rating of the recommended action (H = high, M = moderate, L = low)		
Energy use	Action's env impact = L	Cost = L	Cost effectiveness = H
	✪ Housekeepers should close blinds or curtains on large guest room windows during the day This will prevent the room from becoming so hot, reducing the need for air conditioning when the guest returns When the time comes to replace the existing blinds, Fern Hill should consider replacing them with curtains Curtains generally last longer than blinds (blinds are easily tangled and damaged) and do a better job at keeping guest rooms cool		
Solid waste generation	Action's env impact = L	Cost = L	Cost effectiveness = H
	✪ The housekeepers should minimize the use of facial tissue in the guest rooms They now use facial tissue under the glasses in the bathroom and at the bar, as well as under the fresh flowers that are placed on the bed and/ or nightstand each day The hotel should consider purchasing some type of trays for this purpose instead of using expensive facial tissue		
Solid waste generation	Action's env impact = L	Cost = L	Cost effectiveness = H
	✪ Fern Hill should reduce the number of plastic bags currently used by the housekeeping staff • Housekeepers should be given reusable cloth or canvass bags to collect dirty linens from guest rooms These bags can either be purchased or made from old sheets or table cloths • Whenever possible, housekeeper should empty the contents of guest room trash cans into a larger collection bag or reusable container rather than automatically removing and replacing the trash can liners The plastic trash can liners should be replaced only when damaged, soiled or no longer fit for reuse		
Use of hazardous chemicals	Action's env impact = M	Cost = L	Cost effectiveness = H
	✪ Management should review the cleaning products used by the housekeepers, it appears that they are using more products than needed (for example, housekeepers use both ammonia and a disinfectant) In addition, except for the laundry detergent, none of the products used are labeled as being environmentally-friendly, non-toxic, or phosphate-free Since the hotel uses septic tanks and disposes of its laundry wastewater directly onto the adjacent land, it is important that the cleaning products used be environmentally-friendly Products containing acids, ammonia, and bleach are harmful to the environment and kill the naturally-occurring bacteria in the septic tanks and tile fields		

Env aspects	Description and rating of the recommended action (H = high, M = moderate, L = low)		
LAUNDRY			
Water use/ Energy use	Action's env impact = M	Cost = L	Cost effectiveness = H
	✪ Only wash full loads of laundry The washers will use the same amount of water and energy regardless of the amount of laundry in them It is better to purchase extra turns of laundry so that partial loads can wait until the next day to be washed instead of washing partial loads		
Energy use	Action's env impact = M	Cost = N/A	Cost effectiveness = H
	✪ Since all laundry loads at Fern Hill are currently washed with hot water, the laundry staff should experiment with washing some loads with only cold water Many hotels wash most of their laundry in cold water and use hot water only for heavily-stained loads Pre-washing heavily-stained items can also be used to reduce the laundry's consumption of hot water If Fern Hill determines that all its loads must be washed in hot water, it should at least save energy by lowering the temperature setting on the laundry's water heater At the present time, the water temperature in the laundry room is excessively hot		
Energy use	Action's env impact = M	Cost = L	Cost effectiveness = H
	✪ Designate an area where clothes can be line dried This will allow larger items such as shower curtains and door mats to dry without excessive energy use		
Generation of water pollutants	Action's env impact = M	Cost = L	Cost effectiveness = M
	The laundry detergents used to be connected to a dispenser system, but this system is no longer used Bulk detergent is less expensive than smaller containers, and the dispenser system ensures that excess detergent is not used Management should begin using this system, including repairing it or replacing it if it is broken and purchasing the correct detergent for the system		
Solid waste generation	Action's env impact = M	Cost = L	Cost effectiveness = H
	✪ To reduce its generation of solid waste Fern Hill should return (for a credit) empty detergent drums to the distributor Fern Hill should ask its supplier if their containers can be returned and reused and should give preference to suppliers that provide this service		

Env aspects	Description and rating of the recommended action (H = high, M = moderate, L = low)		
KITCHEN			
General	Action's env impact = N/A	Cost = L	Cost effectiveness = N/A
	The stove hood fan is missing and should be replaced This fan will remove heat from the kitchen, improving the employees' work environment, and will collect smoke and airborne grease from the stove		
Water use	Action's env impact = M	Cost = L	Cost effectiveness = H
	✪ Food should be thawed in the refrigerator rather than under running water The kitchen staff indicated that they generally thaw food in advance using the refrigerator but sometimes use running water If it is necessary to quickly thaw food, it should instead be placed in a tub of cold tap water Replacing the cold water in the tub every 15 minutes will speed up the process without wasting as much water as a running faucet		
Energy use	Action's env impact = M	Cost = L	Cost effectiveness = M
	The griddle (cooking surface) is often left on for long periods of time This wastes energy and creates a great deal of excess heat in the kitchen The griddle takes only a few minutes to preheat and should therefore be turned on immediately before it is needed		
Solid waste generation	Action's env impact = M	Cost = L	Cost effectiveness = M
	Purchase sealable, reusable plastic containers (e g , Tupperware) to reduce the use of disposable plastic wrap for food storage The hotel staff should be instructed to minimize the use of plastic wrap and aluminum foil Currently a large amount of plastic wrap is used in the kitchen (almost every item in the refrigerator was wrapped in plastic)		
Solid waste generation	Action's env impact = H	Cost = L	Cost effectiveness = H
	✪ Management indicated an interest in raising pigs on the property The pigs could be used to eat the food waste from the kitchen and could then be served in the restaurant This is an excellent way to divert food waste from the trash and should be investigated further		

Env aspects	Description and rating of the recommended action (H = high, M = moderate, L = low)		
RESTAURANT AND BAR			
Water use	Action's env impact = M	Cost = L	Cost effectiveness = H
	✪ Discontinue the practice of supplying guests with new glasses for each drink they order at the bar If a guest orders the same beverage twice, offer to refill the glass as an alternative to giving a new glass This measure will cut down on water used for dish washing and chemical use		
Solid waste generation	Action's env impact = L	Cost = L	Cost effectiveness = H
	✪ Buy reusable coasters instead of using paper napkins as coasters The bar staff currently uses two paper napkins under each drink and replaces them with each new drink A coaster could be reused many times and would be more effective		
Solid waste generation	Action's env impact = L	Cost = L	Cost effectiveness = H
	✪ Do not give straws out automatically with drinks Place straw dispensers on the bar or ask guests if they need a straw before serving the drinks Also, replace plastic straws with paper straws		
Solid waste generation	Action's env impact = L	Cost = M	Cost effectiveness = M
	The bar has two taps that are not in use because they no longer work Management should consider repairing these taps for use with the most popular drinks, since this will reduce the hotel's costs		
Solid waste generation	Action's env impact = M	Cost = L	Cost effectiveness = M
	The hotel currently purchases a large number of disposable products, such as paper towels, plastic cups, and napkins The use of these items should be discouraged and suitable replacement products identified		

Env aspects	Description and rating of the recommended action (H = high, M = moderate, L = low)		
POOL			
Energy use	Action's env impact = M	Cost = N/A	Cost effectiveness = H
	❍ Make sure that the person responsible for cleaning the guest room Jacuzzis turns the blowers off after completing his job The audit team found out that the blowers were often left running after the Jacuzzis were cleaned This practice wastes energy and shortens the service life of the blowers		
GARDENS			
General	Action's env impact = L	Cost = L	Cost effectiveness = M
	The grounds staff should cut back the vegetation around the exterior light fixtures Many of the pathway light fixtures are overgrown with vegetation and therefore not lighting the pathway effectively		
Water use	Action's env impact = M	Cost = L	Cost effectiveness = H
	❍ All hoses should be equipped with spray nozzles to ensure that they are not left running needlessly ❍ Leaking hoses and hose/faucet connections should be repaired		
Solid waste generation	Action's env impact = H	Cost = L	Cost effectiveness = M
	The clippings and leaves from the grounds should be collected and placed in a compost pile The hotel is currently disposing of these items in the woods around the property, which is better than putting them in the trash bin, but the compost could be used as fertilizer and mulch around the grounds Compost adds needed nutrients to the ground and helps the ground to retain its moisture **This recommendation is detailed in Project 11**		

5. Detailed Analysis of Selected Recommendations

Project I: Install flow aerators on all faucets

Summary of results and benefits

- Reduces water consumption and wastewater generation by 7,300 IG/year, corresponding to savings of 1,470 J$/year for each flow aerator installed in a typical back-of-house faucet
- Saves energy and money by reducing the use of hot water from faucets
- The payback period of this water conservation measure is typically 2 to 4 weeks

Current situation

- Many faucets in guest rooms (bathrooms and kitchenettes), back-of-house areas (laundry room, kitchen, bar), and public areas (public restrooms) are not equipped with flow aerators
- Only few of Fern Hill's faucets are equipped with flow aerators and, in most cases, these aerators are of an older model with a maximum output of 2 75 US gallons/min (or 2 3 IG/min)

Recommendations

- Install flow aerators on all faucets which can be equipped with these inexpensive water saving devices Flow aerators screw directly at the end of faucets and reduce their output without affecting the "feel" of the flow The maximum flow output of standard aerator models ranges from 1 3 to 2 1 IG/min 1 3 or 1 7 IG/min aerators are generally used for bathroom faucets, while 2 1 IG/min models are generally installed on kitchen or bar faucets In most instance, the actual output of a flow aerator is well below its rated maximum output

  The use of flow aerators is particularly important in areas where taps are used frequently (e g , public and employee restrooms), are left running for long periods of time (e g , kitchen, bar and laundry room) or have exceedingly high outputs (e g , the output of standard kitchen faucets generally ranges from 4 to 10 IG/minute)

- Replace the few existing 2 75 US gallons/min aerators with more efficient aerators

Input, assumptions and calculations

a) Calculation of the savings achieved by installing a flow aerator on a typical back-of-house faucet

- Assume a typical back-of-house faucet is operated for 20 minutes per day

- The typical flow of a back-of-house faucet with no aerator is 3 0 IG/min By installing an aerator, this flow can be reduced to less than 2 0 IG/min
- The cost of water is 201 J$/1,000 IG

The savings achieved by installing a flow aerator on a single back-of-house faucet are

Water savings = (20 min/day/faucet) x (3 0 IG/min - 2 0 IG/min) x (365 days/year)
= 7,300 IG/faucet/year
= (7,300 IG/faucet/year) x (201 J$/1,000 IG)
= 1,470 J$/faucet/year

---

b) Calculation of the implementation cost and payback period

- The cost of a faucet aerator ranges from 30 to 60 J$ Therefore, the cost effectiveness of this measure is

Implementation cost = 60 J$/faucet

Payback period = (implementation cost) / (annual savings)
= (60 J$/faucet) / (1,470 J$/faucet/year)
= 2 weeks

Comments

- The savings achieved with flow aerators can justify, in certain cases, the cost of purchasing new fixtures to replace old fashioned faucets which cannot be equipped with aerators The following table illustrates this point by presenting the savings resulting from the purchase of aerators and new fixtures for faucets that are operated from 5 to 60 minutes each day

Faucet use (min/day)	Water savings (IG/year)	Water savings (J$/year)	Payback period for a 60 J$ aerator	Payback period for a 3,000 J$ faucet
5	1 825	370	2 months	8 years
10	3 650	735	1 month	4 years
20	7,300	1,470	2 weeks	2 years
40	14 600	2 940	1 week	1 year
60	21 900	4 410	5 days	8 months

Note
- The savings presented in this table are based on the same flow assumptions used in the preceding calculations -- that is, initial flow of 3 0 IG/min reduced to 2 0 IG/min with the use of an aerator or with a new fixture equipped with an aerator The cost of a new faucet is estimated at 3,000 J$
- In areas where hot water is drawn from the faucets, the installation of a flow aerator will also save energy by reducing the consumption of hot water

Project 2: Install low-flow shower heads

Summary of results and benefits

- Installing a low-flow shower head in a high water pressure area reduces water consumption by 3,180 IG/year and electricity consumption by 354 kWh/year, and saves the property 2,280 J$/year in water and electricity
- The payback period for this water and energy conservation measure is typically less than 4 5 months

Current situation

- Most of Fern Hill's water supply system operates by gravity However, pump and pressure tank systems are used to boost water pressure in several guest room blocks
- Because of the low water pressure available in many parts of the hotel, Fern Hill does not use low-flow shower heads
- The output and quality of Fern Hill's shower heads vary greatly according to the available water pressure The performance of the shower heads inspected by the audit team is summarized in the following table

Location	Max flow (IG/min)	Flow quality
Spa suite L4	2 1	Good
Pimento 1&2	0 8 0 8	Poor Poor
Great House 4	4 2	Good
Great House 6	1 0	Poor - medium

Recommendations

- Several manufacturers now produce low-flow shower heads that are specifically designed for low pressure conditions (as low as 3 psi) and could be readily installed at Fern Hill Low-flow shower heads save water and energy (by reducing the consumption of hot water) and would allow Fern Hill to supply water to most of its guest room blocks by gravity thereby simplifying the property s existing water distribution and pressurization system
- Fern Hill should install standard low-flow shower heads on all showers that constantly experience high water pressure conditions (e g , the shower in room Great House 4) Standard low-flow shower heads generally output less than 2 IG/min under medium to

high water pressure conditions

Input, assumptions and calculations

a) Calculation of the water and energy savings achieved for each low-flow shower head installed in a guest bathroom experiencing high water pressure conditions

- Assume two 5-minute showers per guest night
- Assume a piped water temperature of 70°F (21°C) and a shower water temperature of 105°F (41°C)
- Assume low-flow shower heads consume less than 2 0 IG/min while the old shower heads consume more than 3 5 IG/min in high water pressure conditions
- The cost of water is 201 J$/1,000 IG
- The property has 31 guest rooms and an occupancy of 6,577 guest nights per year This corresponds to an average of 212 GN/year/room
- The electricity consumed by Fern Hill's electric water heaters costs 4 64 J$/kWh and yields 860 kcal/kWh The water heaters have an assumed efficiency of 95%

Given this information, the savings achieved by installing a low-flow shower head in a high water pressure area are

Water savings
= (2 x 5 min/GN) x (3 5 IG/min - 2 0 IG/min)
= 15 IG/GN
= (15 IG/GN) x (212 GN/year/room)
= 3,180 IG/year/room or 14,470 liters/year/room
= (3,180 IG/year/room) x (201 J$/1,000 IG)
= 640 J$/year/room

Energy savings
= (14,470 lit/year/room) x (1 kcal/lit/°C) x (41°C - 21°C) x (1/0 95)
= 304,600 kcal/year/room
= [(304,600 kcal/year/room) / (860 kcal/kWh)] x (4 64 J$/kWh)
= (354 kWh/year/room) x (4 64 J$/kWh)
= 1,640 J$/year/room

Total savings
= water savings + energy savings
= 2,280 J$/year/room

---

b) Calculation of implementation cost and payback period

- The cost of a low-flow shower head ranges from 300 to 850 J$, but the following calculations will use a conservative cost of 850 J$/unit The cost effectiveness of this water and energy conservation measure is

Implementation cost = 850 J$/shower head

Payback period = (850 J$/shower head) / (2,280 J$/year/shower head)
= 4 5 months

Comments

- Low-flow shower heads must be cleaned periodically to remove the scale deposits and other impurities which may affect the quality of the water stream
- To avoid possible guest dissatisfaction, the property is strongly encouraged to identify, test, and purchase low-flow shower heads that have a proven performance record in Jamaica

Project 3: Install flow diverters in toilet tanks

Summary of results and benefits

- Reduces water consumption and wastewater generation by 21,200 IG/year if flow diverters are installed in 60% of the property's toilets
- Saves the property 4,260 J$/year in reduced water bills
- The payback period for this recommendation is less than 7 months

Current situation

Most of Fern Hill's bathrooms and restrooms are equipped with conventional toilets which consume more than 3 3 IG per flush None of the conventional toilets inspected had any type of water conservation device in place

Recommendations

Whenever possible, install a flow diverter on the hose which feeds water to the toilet bowl refill pipe of conventional toilets By diverting back into the water tank part of the flow that normally drains to the toilet bowl, this simple device can be used to set a suitable water level in the toilet bowl and avoid the waste of water resulting from overfilling the toilet bowl In most cases, flow diverters do not affect the performance of the toilet because they do not reduce the water level in the toilet tank or the amount of water used to flush the waste from the bowl Flow diverters can be easily installed on most conventional toilets (i e , 3 3 to 4 2 IG per flush) and can save from 0 4 to 0 8 IG per flush

Flow diverters are used in many US hotels which are not equipped with water-saving toilets

Product information on flow diverters is included in Appendix VI

Input, assumptions and calculations

a) Calculation of the water savings resulting from the use of flow diverters

- There are approximately 30 toilets in guest rooms 6 in public restrooms and 4 in employee restrooms The two public toilets located by the lower pool are used infrequently
- Assume 4 flushes per guest night in guest bathrooms, 20 flushes/day/toilet in frequently used public and employee restrooms and 5 flushes/day/toilet in infrequently used public restrooms
- Assume flow diverters reduce by 0 4 IG the amount of water used to refill the bowl after each flush
- Assume flow diverters can be installed in 60% of all toilets
- The cost of water is 201 J$/1,000 IG
- The hotel has an occupancy of 6,577 guest nights per year

Given the preceding information, the water savings achieved by installing flow diverters in the property's toilets are

Water savings = 60% x [(4 flushes/GN) x (0 4 IG/flush) x (6,577 GN/year)
+ (20 flushes/day/toilet) x (8 toilets) x (0 4 IG/flush) x (365 days/year)
+ (5 flushes/day/toilet) x (2 toilets) x (0 4 IG/flush) x (365 days/year)]
= 21,200 IG/year
= (21,200 IG/year) x (201 J$/1,000 IG)
= 4,260 J$/year

---

b) Calculation of the implementation cost and payback period

- Since flow diverters cost approximately 100 J$/unit, the cost effectiveness of this measure is

No of diverters purchased = 60% x (30 + 10)
= 24 units

Total implementation cost = (100 J$/unit) x (24 units)
= 2,400 J$

Payback period = (2,400 J$) / (4,260 J$/year)
< 7 months

Comments

- Possible supply sources for flow diverters include

Mr John Albino
Aquasaver Sales Inc
5062 South 108 th Street #291
Omaha, NE 68137
Tel (402) 895-4073

The flow diverters (AquaSaver™) supplied by AquaSaver Sales cost 2 50 USD/unit
Shipping 50 - 100 flow diverters from the US to Jamaica costs approximately 10 USD

Project 4: Install displacement devices and adjust the water level in the toilets' water tanks

Summary of results and benefits

- Reduces water consumption and wastewater generation by 21,200 IG/year if displacement devices are installed in 60% of the property's toilets
- Saves the property 4,260 J$/year in reduced water bills
- The payback period for this recommendation is less than 3 months

Current situation

- Most of Fern Hill's bathrooms and restrooms are equipped with conventional toilets which consume more than 3 3 IG per flush None of the conventional toilets inspected had any type of water conservation device in place

- The water depth in the toilet tanks inspected by the audit team ranged from 7 75 to 9 0 inches (for an identical toilet model) Both the high and low water levels allowed the toilets to perform adequately, but, the tank with 9 0" of water used 0 5 IG/flush more than the tank with 7 75" of water

- A total of 15 toilets were inspected by the audit team In 2 of the toilets (13%), the water level coincided with the top of the tank's overflow pipe and, therefore, allowed some water to drain off to the tank at the end of the tank refill cycle In 1 toilet (7%), the water level rose above the top of the tank overflow pipe, resulting in a constant loss water of approximately 0 5 IG/min

Recommendations

- Whenever possible, equip all conventional toilets with displacement devices to reduce the amount of water used in each flush Displacement devices include home-made plastic bottles filled with pebbles and water, flexible panels, and filled bags, these devices are placed in the storage tank of conventional toilets to reduce the volume but not the height of the stored water The displacement device must be compatible with the existing toilet and not interfere with the flush mechanism

- Adjust all float valves to achieve a consistent and reasonable water depth in all toilet water tanks Periodically check the toilet tanks to ensure that the water depth is at the predetermined height and never reaches the top of the overflow pipe

Input, assumptions and calculations

a) Calculation of water savings resulting from the use of displacement devices

- There are approximately 30 toilets in guest rooms, 6 in public restrooms and 4 in employee restrooms The two public toilets located by the lower pool are used infrequently
- Assume 4 flushes per guest night in guest bathrooms, 20 flushes/day/toilet in frequently used public and employee restrooms, 5 flushes/day/toilet in infrequently used public restrooms
- Assume the displacement devices reduce by 0 4 IG the amount of water used in each flush Reported water savings range from 0 4 to 0 8 IG per flush
- Assume displacement devices can be installed in 60% of all toilets
- The cost of water is 201 J$/1,000 IG
- The hotel has an occupancy of 6,577 guest nights per year

The water savings achieved by installing displacement devices in all guest room toilets are

Water savings = 60% x [(4 flushes/GN) x (0 4 IG/flush) x (6,577 GN/year)
+ (20 flushes/day/toilet) x (8 toilets) x (0 4 IG/flush) x (365 days/year)
+ (5 flushes/day/toilet) x (2 toilets) x (0 4 IG/flush) x (365 days/year)]
= 21,200 IG/year
= (21,200 IG/year) x (201 J$/1,000 IG)
= 4,260 J$/year

---

b) Calculation of the implementation cost and payback period

- The cost of a commercial displacement device is approximately 170 J$ Fern Hill could however produce home-made displacement devices at a minimum cost (e g , a recycled plastic bottle filled with pebbles and water) The following calculations assume a cost of 40 J$ for a home-made displacement device

The cost effectiveness of this water conservation measure is

No of displacement devices = 60% x (30 + 10)
= 24

Total implementation cost = (40 J$/toilet) x (24 toilets)
= 960 J$

Payback period = (960 J$) / (4,260 J$/year)
< 3 months

Comments

- Fern Hill should test the effectiveness of the displacement units in a few toilets before implementing this water conservation measure throughout the property

Project 5: Replace existing conventional toilets with water-saving toilets

Summary of results and benefits

- Replacing a damaged guest bathroom toilet with a water-saving model lowers water consumption and wastewater generation by 1,700 IG/year and saves 342 J$/year The payback period for this water conservation measure is 1 5 years
- Installing a water-saving toilet in a frequently used public or employee restroom reduces water consumption and wastewater generation by 14,600 IG/year and saves 2,930 J$/year The payback period for this water conservation measure is 1 4 years

Current situation Most of this property's toilets consume from 3 3 to 4 2 IG per flush

Recommendations

- For guest bathrooms, establish a policy to replace any damaged or unusable toilet with a water-saving model which uses 1 3 IG/flush (1 6 US gallon/flush)

- For all frequently used public or employee restrooms, replace the conventional toilets with 1 3 IG/flush toilets

Input, assumptions and calculations

a) Calculation of the savings achieved by installing a water-saving toilet in a guest bathroom

- Assume 4 flushes per guest night
- Water-saving toilets use 1 3 IG/flush while the existing toilets use more than 3 3 IG/flush
- The cost of water is 201 J$/1,000 IG
- The property has 31 guest rooms and an occupancy of 6,577 guest nights per year This corresponds to an average of 212 GN/year/room

Given the preceding information, the savings achieved from replacing an existing guest room toilet with a 1 3 IG/flush toilet are

Water savings = (4 flushes/GN) x (3 3 IG/flush - 1 3 IG/flush) x (212 GN/year/room)
= 1,700 IG/year/room
= (1,700 IG/year/room) x (201 J$/1,000 IG)
= 342 J$/year/room

b) Calculation of the implementation cost and payback for replacing a guest bathroom's damaged 3 3 IG/flush toilet with a 1 3 IG/flush toilet

- Cost of a conventional toilet = 3,500 J$
- Average cost of a 1 3 IG/flush toilet = 4,000 J$

The cost effectiveness of replacing a damaged guest bathroom toilet with a water-saving model rather than a conventional model is calculated as follows

Implementation cost = (4,000 J$/room - 3,500 J$/room)
= 500 J$/room

Payback period = (500 J$/room) / (342 J$/room/year)
= 1 5 years

- The preceding analysis shows that it is economically beneficial to replace any damaged 3 3 IG/flush toilet with a water-saving model even in low use areas, such as guest bathrooms

---

c) Calculation of the savings achieved by replacing a 3 3 IG/flush public restroom toilet with a 1 3 IG/flush toilet

- Assume that on average a public or employee restroom toilet is flushed 20 times per day
- The cost of water is 201 J$/1,000 IG

The savings achieved by replacing a 3 3 IG/flush public restroom toilet with a 1 3 IG/flush model are

Water savings = (20 flushes/day/toilet) x (3 3 IG/flush - 1 3 IG/flush) x 365 days/year
= 14,600 IG/year/toilet
= 2,930 J$/year/toilet

---

d) Calculation of the implementation cost and payback for replacing an operational 3 3 IG/flush public restroom toilet with a 1 3 IG/flush model

- Average cost of a 1 3 IG/flush toilet = 4,000 J$
- These calculations assume the replaced conventional toilet has no economic value

The cost effectiveness of this water conservation measure is

Implementation cost = 4,000 J$/toilet

Payback period = (4,000 J$/toilet) / (2,930 J$/year/toilet)
= 1 4 years

- The preceding analysis shows that it is economically beneficial to replace all frequently used public restroom toilets with new water-saving units, even if the existing toilets are still in good conditions

Comments

In order to minimize the clogging problems associated with some water-saving toilet models, the property is strongly encouraged to identify and purchase water-saving toilets that have a proven performance record Many Jamaican hotels have been using water-saving toilets for a number of years -- most of these toilets are reported to perform very well

The purchase of low-cost water-saving toilets of uncertain performance may end up costing the property dearly and causing much aggravation The property is also encouraged to purchase and test a few water-saving units before implementing this recommendation throughout the property

Project 6: Improve and expand rainwater collection and use at Fern Hill

Summary of results and benefits

- Upgrading the laundry's rain catchment system will reduce the purchase of NWC water by 51,200 IG/year and save the property 10,300 J$/year
- The use of rainwater for laundry operations will reduce the property's consumption of detergent, water softening chemicals, and rust removing chemicals
- Using rainwater in guest room blocks will significantly reduce the property's consumption of NWC water which currently costs approximately 460,000 J$/year

Current situation

- The Port Antonio area receives approximately 97 inches of rainfall per year, therefore, each ft^2 of rain catchment surface could theoretically collect 50 Imperial gallons of water per year

- At the present time, Fern Hill collects and uses rainwater only to supply its laundry room operations Unfortunately, due to the faulty position of the float valve and poor maintenance of the inlet screen, Fern Hill is actually capturing only a small fraction of the water falling on the catchment area

- Fern Hill collects rainwater from only ½ of the roof area available near the laundry room The size of the existing rain catchment is approximately 640 ft^2 (16 ft x 40 ft)

- In the past, most of the water used on this property was collected from its rooftops This practice was discontinued and now Fern Hill purchases most of its water from NWC

Recommendations

- Lower the float valve in the rainwater storage tank The float valve should allow the entry of NWC water only when the tank is nearly empty

- Clean the inlet screen frequently A dirty screen is virtually impermeable and wastes all the rainwater collected on the catchment area

- Collect water from the full roof area available near the laundry room The 640 ft' area currently used is too small and does not satisfy the water needs of the laundry operations

- Consider resuming the use of rainwater in other parts of the hotel Currently, Fern Hill purchases each year 2 320,000 IG of potable water at a cost of 460,000 J$ Less than 5% of this volume of potable water is actually used for human consumption, the rest is used in showers, flushing toilets, watering the gardens, hosing down paved surfaces, washing clothes, filling up the pools, and various other operations which could be carried

out with rainwater

Fern Hill should refurbish its extensive rainwater catchment and storage system and resume operations of its guest room blocks with collected rainwater With the significant savings achieved by reducing its use of NWC water, Fern Hill could purchase a small "point of use" filtration and purification system to provide high quality bottled water to its guest rooms

Input, assumptions and calculations

a) Calculation of the savings resulting from upgrading the laundry's rainwater collection system

- The cost of NWC water is 201 J$/1,000 IG
- Since the amount of water consumed by Fern Hill's laundry is unknown, it will be estimated as follow

  - Industry surveys show that towel/linen use in hotels ranges from 4 to 6 lb per guest night and, according to commercial laundry equipment manufacturers, institutional washing machines use from 1 7 to 2 1 IG per pound of linen laundered
  - It is therefore conservatively assumed that Fern Hill uses 13 IG of laundry water per guest night (i e , 6 lb/GN x 2 1 IG/lb of laundry)
  - It is assumed that linens and towels account for 75% of the total laundry load

  Laundry water consumption = (13 IG/GN) x (6,577 GN/year) / (0 75)
  = 114,000 IG/year

- The existing rain catchment has an area of 640 ft^2 Fern Hill should be able to double the size of its catchment by collecting water from all the roofs located near the laundry room
- Assume that 80% of the rain which falls on the catchment area is collected and stored (i e , 20% loss) The existing 10,000 IG storage tank can handle most of the water falling on the catchment surface and sustain the laundry room operations through dry spells
- Increasing the use of rainwater in the laundry will reduce the consumption of detergent (rainwater is naturally soft and therefore consumes less soap), water softening chemicals, and rust remover (collected rainwater is practically free of iron ions which stain the laundry) However, due to lack of data, the following calculations will not include the savings achieved by reducing the consumption of laundry chemicals

Volume of collected rainwater = 80 % x (50 IG/ft^2/year) x (2 x 640 ft^2)
= 51 200 IG/year
= 45% of the yearly laundry water needs

Resulting water savings = (51,200 IG/year) x (201 J$/1,000 IG)
= 10,300 IG/year

b) Calculation of the implementation cost and payback period

- The cost of repositioning the float valve and regularly cleaning the inlet screen is negligible
- Connecting other sections of the building's roof to the water storage tank will require some minor plumbing work The cost of the materials needed to complete this work is estimated to cost less than 4,000 J$ (for a 3" PVC hoses to connect gutters to the tank)

Payback period = 4,000 J$ / (10,300 J$/year)
< 5 months

Project 7: Reduce the time of operation of the pool filter pumps

Summary of results and benefits

- Reduces Fern Hill' energy consumption by 8,180 kWh/year, resulting in savings of 37,900 J$/year
- Extends the service life of the pool filter pumps
- The payback of this recommendation is 1 month

Current situation While the lower-level pool is equipped with a timer which shuts the filter pump off from 8 PM to 10 AM, the pumps of the upper and mid-level pools operate 24 hours per day These pumps are equipped with 1 5 HP (1 1 kW) motors

Recommendations Shut off the pumps of the upper and mid-level pools at night in order to save energy and increase the service life of the pumps The pumps can either be shut off manually or Fern Hill may decide to purchase automatic timers for the filter systems

Input, assumptions and calculations

- Assume that the 2 pool filter pumps are shut off from 8 PM to 10 AM
- The pump's estimated average power draw is 0 8 kW
- The cost of energy is 4 64 J$/kWh

a) Calculation of the savings resulting from shutting off the pumps during nighttime

Energy savings = 14 hr/day x 2 x 0 8 kW x 365 days/year
= 8,180 kWh/year
= 37,900 J$/year

---

b) Implementation cost and payback period

- If Fern Hill decides to manually control the operation of the pool pumps, the implementation cost of this recommendation would be nil
- A timer costs less than 1 800 J$ Therefore if Fern Hill decides to purchase automatic timers for its two pools, the corresponding implementation cost and payback period are

Total implementation cost = 2 x 1 800 J$
= 3 600 J$

Payback period = 3 600 J$ / (37 900 J$/year)
= 1 month

Project 8: Upgrade to energy efficient lighting

Summary of results and benefits

- Reduces Fern Hill's energy consumption and saves money Savings and payback periods vary depending on bulb wattage and hours of operation
- Typical payback periods range from 6 months to 1 year

Current situation Most lights at this property use inefficient incandescent bulbs

Recommendations Wherever possible, replace incandescent bulbs with CF bulbs Although it is almost always economically beneficial to use CF bulbs instead of incandescent bulbs, this property should first focus on replacing the incandescent bulbs that have a medium to high wattage (60 W to 100 W) and those that burn for extended periods of time (> 8 hours per day) -- these fixtures offer the greatest potential savings and shortest payback periods

Compact fluorescent bulbs consume less energy than incandescent bulbs to produce the same amount of light, CF bulbs also last up to 13 times longer than standard incandescent bulbs Therefore, although CF bulbs cost more than incandescent bulbs, they save electricity and money The following table shows the equivalence, in terms of light output, between CF and incandescent bulbs

Compact fluorescent		Incandescent
9 Watt bulb	replaces a ⇨	25 Watt bulb
11 Watt bulb	replaces a ⇨	40 Watt bulb
15 Watt bulb	replaces a ⇨	60 Watt bulb
20 Watt bulb	replaces a ⇨	75 Watt bulb
23 Watt bulb	replaces a ⇨	90 Watt bulb

Input, assumptions and calculations

a) Sample calculation of the savings achieved by replacing a single 60 W incandescent bulb which burns for 12 hours per day with a 15 W compact fluorescent bulb

- The cost of energy is 4 64 J$/kWh
- The characteristics of the incandescent and CF bulbs are as follows

Cost of a 60 W incandescent bulb = 22 J$/bulb
Service life of an incandescent bulb = 800 hours/bulb

Cost of a 15 W compact fluorescent bulb = 500 J$/bulb
Service life of a compact fluorescent bulb = 10,000 hours/bulb

a 1) Operating cost of a single lamp equipped with a 60 W incandescent bulb

Hours of operation = 12 hr/day/lamp x 365 days/year
= 4,380 hr/year/lamp

Energy cost = 60 W x (4,380 hr/year/lamp) x (4 64 J$/kWh)
= (263 kWh/year/lamp) x (4 64 J$/kWh)
= 1,225 J$/year/lamp

Cost to replace burnt bulbs = [(4,380 hr/year/lamp) / (800 hr/bulb)] x (22 J$/bulb)
= (5 48 bulbs/year/lamp) x (22 J$/bulb)
= 120 J$/year/lamp

Total operating cost = energy cost + cost to replace burnt bulbs
= 1,345 J$/year/lamp

---

a 2) Operating cost of a single lamp equipped with a 15 W compact fluorescent bulb

Hours of operation = 4,380 hr/year/lamp (same as above)

Energy cost = 15 W x (4,380 hr/year/lamp) x (4 64 J$/kWh)
= (65 7 kWh/year/lamp) x (4 64 J$/kWh)
= 305 J$/year/lamp

Cost to replace burnt bulbs = [(4,380 hr/year/lamp) / (10,000 hr/bulb)] x 500 J$/bulb
= (0 44 bulb/year/lamp) x 500 J$/bulb
= 219 J$/year/lamp

Total operating cost = energy cost + cost to replace burnt bulbs
= 524 J$/year/lamp

---

a 3) Savings and payback period for replacing a single 60 Watt incandescent bulb with a 15 Watt compact fluorescent bulb

Total savings = (total operating cost for inc) - (total operating cost for CF)
= 1 345 J$/year/lamp - 524 J$/year/lamp
= 821 J$/year/lamp

Implementation cost = cost of a CF bulb - cost of an incandescent bulb
= 500 J$/bulb - 22 J$/bulb
= 478 J$/bulb

Payback period = (implementation cost) / (savings for 1 lamp)
= (478 J$/bulb) / (821 J$/year/bulb)
= 7 months

---

b) The same approach can be use to calculate savings and payback for other bulb outputs and operating hours These results are summarized in the following tables

Financial savings achieved by replacing an incandescent bulb with a CF bulb					
Incandescent bulb	CF replacement bulb	hours of operation of the bulbs (hours/day)			
		6 hours/day	8 hours/day	10 hours/day	12 hours/day
40 W	11 W	**245 J$/year**	**327 J$/year**	**409 J$/year**	**491 J$/year**
60 W	15 W	**408 J$/year**	**544 J$/year**	**680 J$/year**	**816 J$/year**
75 W	20 W	**510 J$/year**	**679 J$/year**	**849 J$/year**	**1,019 J$/year**
90 W	23 W	**632 J$/year**	**842 J$/year**	**1,053 J$/year**	**1,263 J$/year**

Payback period for replacing an incandescent bulb with a CF bulb					
Incandescent bulb	CF replacement bulb	hours of operation of the bulbs (hours/day)			
		6 hours/day	8 hours/day	10 hours/day	12 hours/day
40 W	11 W	**2 0 years**	**1 5 year**	**1 2 year**	**1 0 year**
60 W	15 W	**1 2 years**	**0 88 year**	**0 70 year**	**0 59 year**
75 W	20 W	**0 94 year**	**0 70 year**	**0 56 year**	**0 47 year**
90 W	23 W	**0 76 year**	**0 57 year**	**0 45 year**	**0 38 year**

Comments Before purchasing CF bulbs

- Find out from local hoteliers or other reliable sources which brands of CF bulbs have a good track record in Port Antonio or Jamaica
- If you suspect that theft of CF bulbs will be a problem on your property, purchase CF bulbs equipped with an anti-theft feature This locking mechanism increases only slightly the cost of the compact fluorescent bulbs (approximately 40 J$/bulb)

Project 9: Implement a property-wide waste management program

A waste management program will help Fern Hill reduce the amount of waste it produces, save materials, resources, energy and money, and reduce the property's impact on the environment by drastically reducing the amount of solid waste disposed in its dump or other locations The principal elements of an effective waste management program include what is generally called the three R's reduce, reuse and recycle These three elements are detailed below

A waste management program beings with a waste review, where the quantity and type of waste produced in the property are examined Once this review is completed, the possibilities for the waste management program can be assessed by considering each kind of waste and deciding whether it is possible to avoid the generation or the disposal of this waste through the reduce, reuse, and recycling options Whatever waste cannot be avoided through the reduce, reuse, and recycle components of Fern Hill's waste management program will have to be discarded In most cases, however, an effective waste management program can have a significant impact in reducing the amount of waste generated by a property

Reduce

Reduce the quantity and the impact of the waste produced by the property by avoiding natural wastage, by using more durable goods that will need to be disposed less frequently, by avoiding the purchase of excessively packaged goods, and by minimizing the use of hazardous materials or other products which have a significant impact on the environment The reduce component of the waste management program is obviously the first option that should be considered by the property By reducing the generation of wastes, Fern Hill will conserve resources, reduce its use of natural resources, and reduce the amount of materials its employees will need to handle and the volume of waste the property will need to dispose

The bulk of the responsibility for the "reduce" element of the waste management program lies with the purchasing department, since the less material that is brought into the property, the less the property will have to discard (be it by disposal to a dump site, donation, or recycling) Employees who have the authority to decide what is discarded as waste also play an important role in reducing the property's waste output The type of actions which can be taken by the property to reduce the production of waste and to lower the impact of the generated waste include

- Avoid purchasing items (e g foods chemicals, appliances, parts, maintenance items) that are excessively packaged In North America packaging alone can account for up to 40% of a hotel s waste stream
- Purchase food items in bulk rather than in individually packaged portions (e g , sugar salt, pepper jams/jellies condiments butter cereals syrup cream, juice etc) Bulk items are less expensive and create less waste
- Reduce or eliminate the use of disposable plates place mats wares, and cups Inexpensive reusable plastic plates, tableware, and glassware can be used at guest and employee functions held outside

- Use refillable containers for chemicals, cleaners and foods, reduce the use of aerosols, which are not refillable
- Minimize the use of straws, and replace plastic straws with paper straws
- Do not automatically supply guests with new glasses or paper cups for each drink ordered at the bar, but offer to refill the glass if a guest orders the same beverage twice
- Eliminate the use of paper wrap or covers for guest room drinking glasses Instead, store the drinking glasses upside-down
- Use cloth napkins rather than paper napkins and cloth rags for cleaning rather than paper towels
- Use cloth napkins instead of disposable doilies for buffet lines, platters, high-tea service, and in bread baskets
- Purchase durable coasters for use in the bar and restaurants instead of using paper napkins and replacing them with each drink
- Use cloth or canvas bags or a small basket to collect and return guest laundry, towels, and linens
- Use cloth or canvas bags or a wheelbarrow or yard cart to collect garden waste rather than disposable plastic bags
- Install soap dispensers in guest bathrooms, public bathrooms, and employee locker rooms
- Purchase reusable plastic containers for food in the refrigerators and freezers The hotel currently uses a great deal of plastic wrap for both of these purposes, which wastes money and creates additional waste
- Avoid using laundry, kitchen, or housekeeping detergents which contain phosphates
- Minimize the purchase and keep track of the use of harsh or hazardous chemicals (e g , drain cleaning agents, solvents, bleach)
- Purchase rechargeable or mercury-free batteries
- Reduce the number of garnishes purchased for drinks by saving them for several days before throwing them away The bar staff currently throws leftovers away at the end of each day
- Coordinate the purchasing process to reduce the number of orders placed with each vendor This will likely save money and will also reduce packaging
- Reduce the amount of paper used in the offices by discontinuing the practice of placing guest bills in envelopes (they can instead be stapled shut for privacy) and no longer using fax cover sheets

Reuse

Reuse items in their original form for the same or a different purpose rather than disposing of them If an item cannot be reused by the property, Fern Hill should investigate the possibility of selling or donating them to employees outsiders, charitable organizations, local schools and businesses Examples of reuse actions are listed below

- Reuse computer or other paper (i e printed on one side only) as scrap paper for taking notes and writing internal memos
- Give preference to vendors which supply their products in returnable/refillable containers This should save the hotel money and will reduce the amount of waste disposed of by the hotel Someone on the staff should be made responsible for ensuring that containers that can be returned are returned This is especially important when there is a rebate given for returned packaging

- Designate someone in each department to be responsible for returning packaging to the supplier
- Only remove used soaps from guest rooms at checkout and then save these bars for use in cleaning floors and equipment (such as the water sports equipment)
- Give used amenities to any interested parties (e g , charities, local schools, employees) rather than discarding them
- Replace the trash can liners only when these are soiled or unsuitable for further use
- Repair and reuse damaged furniture or donate it to interested parties (e g , charities, schools, employees, businesses)
- Use a bucket to collect water from restaurant tables to use in watering plants
- Offer all leftovers foods, including the soup of the day, to employees in the employee cafeteria Food should only be disposed of when it can no longer be served to the staff

Recycle

Many items that cannot be reused in their original form can be sold or given away to processors for recycling Even if the hotel cannot make a profit from its recycling efforts, diverting items from the waste stream should allow the hotel to reduce the frequency of trash collection, which will save the hotel money The type of products which can generally be recycled include

- Green waste from kitchen and garden (this material can be composted on site or given to a local composting program)
- White paper and mixed paper
- Glass bottles and jars
- Plastic bottles and containers made of PET (typically used for soft-drink and water bottles) and HDPE (typically used for milk jugs and chemical containers)
- Aluminum cans and foil
- Steel cans or "tins"
- Steel scrap such as old pipes and appliances
- Other metals such as copper and brass
- Frying oil and grease
- Motor oil (from cars, motor boats and jet skis)

Glass Recycling

West Indies Glass Company Contact - Michael Austin, (809) 923-0787-9 Glass must be sorted into three color groups clear brown, and green The company pays 300 J$ per ton (2,000 lbs) and will provide free transportation to pick up the recyclables when there are five tons of any color glass available at any site Many of the glass bottles sold in Jamaica can be returned to the bottler for reuse which should be the first priority However if the hotel produces enough other glass that is suitable for recycling (drink bottles or food jars and containers) a glass recycling program should be implemented Recycling bins should be placed under the bars and in the kitchen to collect this glass separate from other recyclables The bins should be clearly labeled as to what color glass can be placed in them, and the signage should strongly discourage staff from contaminating the bin with other non-glass items A heavy plastic or cloth bag should be used inside of the bin so that the bag can easily be removed when the bin is full and the hotel will not have to worry about tearing if the glass

breaks The West Indies Glass Company can help the hotel to estimate visually when five tons have been collected The hotel can then determine if it wants to deliver the glass itself or accumulate the glass in the loading dock area until there is enough to qualify for the free pickup

Plastics

Wysinco Environmentals, Ltd Contact- Mrs Pat Wright, (809) 943-9800 As of October 1997, this company only collects plastic (PET) bottles from schools and specific media-announced pickup points Therefore, they ask that plastic bottles be donated to a school in the community, which earns "points" for kilograms of plastic and trades them in for computers, videos, paint, tools, etc If the hotel wishes to drop off PET bottles at the Wysinco Recycling Plant (located at PO Box 367 White Marl, Spanish Town, St Catherine, Jamaica), the company will pay the hotel 8 J$ per kilogram for them If the hotel produces a significant amount of plastic and wishes to begin collecting either for a local school or for profit, recycling bins should be placed in the areas where the majority of the plastic waste is produced (i e the kitchen) These bins should also be properly labeled so that the staff will know what can and cannot be placed in them Once enough plastic has been collected the hotel can either take it to a local school or transport it to Spanish Town

Plastic/Metal Drums

Kemcan Development Company Contact - Ms Usherwood, (809) 922-5270 At present, this company is only recycling plastic and metal drums, which it will pick up provided there are 30-50 drums Again, the hotel's first resort should be to return these drums to the supplier for reuse whenever possible However, any drums that cannot be returned should be collected in the loading dock area until there are enough to warrant a pickup

Paper

Nature's Handmade Paper Contact - Ms Gloria Dorman, (809) 993-8172 Nature's Handmade Paper is a small company set up with the assistance of the Peace Corps in 1986

JA Pottinger & Co , Ltd Contact - Mr Pottinger or Ms Nadine Higgins, (809) 926-8957 This company picks up paper products from hotels – provided there is one truck load full (50 large garbage bags) – and exports the paper for recycling The price for this service is negotiable Recycling bins for paper should be placed in the housekeeping area (to collect paper from guest rooms), at the front desk, and in offices at a minimum Each desk in the office area should receive its own recycling bin It is important, especially with paper, to collect the recyclables as close to their source as possible Paper must be clean and dry to be recyclable The hotel should first reuse paper whenever possible and then should collect the paper for recycling If the bags of paper are exposed to the elements, it is important that plastic bags be used and that the bags be properly sealed to prevent the paper from getting wet If the bags are to be stored in a weather-proof area, the hotel should talk to JA Pottinger & Co about using reusable cloth bags that are returned to the property for reuse after the recycler collects the paper

Another paper recycling option is to sell it to companies needing packaging materials, such as

Exotic Flowers of Montego Bay If the hotel decides to pursue this option, it should purchase a shredder to ensure that confidential documents are not released from the property

Metal/Aluminum

Contact Louis Daley for information regarding the recycling efforts organized by Mr McLaughlin in Mandeville

Waste vegetable oil (frying oil) and grease

Recycling Corp of Jamaica (RYCO-JA) Contact - Mr Kevin Mullane, (809) 968-7002, (1-800) 991-7926 RYCO-JA collects used vegetable oils and grease from kitchens which is then recycled in the production of chicken feed RYCO provides, free of charge, covered steel drums for the storage of the used oil and grease and collects the material from each participating property on a regular schedule This recycling scheme benefits the hotel by reducing the discharge of oil and grease to the septic tank (thus reducing potential clogging problems in the tile field) and helps the country by reducing the amount of yellow grease imported into Jamaica for the production of animal feed If the hotel chooses to recycle its cooking grease, it is important that the drum be kept covered (to prevent the rainwater dilution) and be kept free of contaminants, which will make the grease non-recyclable

Other Waste Management Issues

The hotel should ensure that there are adequate trash receptacles and ash trays around the grounds and throughout the public areas so that guests can easily find one when they need it The audit team found a great deal of waste and cigarette butts on the ground in these areas because there are not enough receptacles Guests will usually make an effort to dispose of trash and cigarette butts properly if they can easily find a receptacle

Project 10: Implement a linen and towel reuse program

Many hotels around the world have found success with a program in which the guest determines when sheets and towels are replaced The audit team suggests that Fern Hill consider implementing a program of this type once other initiatives are already firmly established Guest reaction is typically more positive if they can see that the hotel is truly concerned with protecting the environment They do not want to feel like they are making all of the sacrifices or that the hotel is simply trying to save money

Fern Hill currently has a policy of changing linens every three days, but many housekeepers are either uninformed about this policy or choose to change the sheets every day anyway The hotel does not give its guests the option of reusing towels

This program informs the guest that the hotel is interested in protecting the environment by reducing the amount of water and chemicals that it uses The towels portion of the program is straightforward guests are asked to leave their towels hanging up if they wish to use them again or put them on the floor if they would like to have them replaced The sheets portion of the program is designed in one of two ways

The guest is told that the hotel would like to save water by reducing the number of sheets washed each day The guest is asked to leave a card on the door or on the bed indicating that it is not necessary to change the sheets that day Otherwise, the guest's sheets are changed every day This method works but gets fairly low guest participation, since even environmentally-concerned guests often forget to indicate that it is not necessary to change their sheets In their rush to leave the room in the morning, they neglect to leave the card in the correct place

The guest is told that in an effort to save water, the hotel only changes sheets every two or three days (depending on the wording on the materials selected) If the guest would like to have the sheets changed more frequently, the materials ask that a card be placed on the door or on the bed to have them changed that day This method puts the burden on the guest and therefore results in considerably higher participation Hotels that have implemented this type of program in conjunction with towel reuse have found that their laundry costs are reduced by as much as 30% to 40%

Once the hotel is ready to begin this program, it should purchase attractive, colorful in-room materials to communicate the program to the guest These materials are available through a variety of sources, including the Caribbean Hotel Association The CHA cards offer two key advantages over some of the other cards on the market

The design of the CHA materials will capture the guests' attention better than many other cards It is important that the guests be clearly told abut the program so that they feel that they have been given the opportunity to make a choice The program is not designed to trick the guest into participating, but that is how they will feel if the program is not properly communicated

The CHA materials state that it is the hotel's policy to change sheets every three days unless the guest would like to have them changed more often As indicated above, this is the verbiage that results in the greatest savings

If this program is implemented, housekeepers need to be properly trained to carry it out effectively Housekeeper understanding of this program is crucial Because of the high turnover rate in this area, each new housekeeper must be fully trained on the program Most hotels have found the greatest success with one of the following procedures

Designating certain days as sheet changing days Under this format, all of the sheets in the hotel are changed on certain days of the week (for example Tuesdays and Fridays) instead of every three days This method makes it easy for the hotel to increase housekeeping and laundry staff on those days if necessary and also gets the housekeepers in the habit of recognizing those days as sheet change days On the other days, the housekeepers will only change sheets in checkout rooms and rooms where the guest has requested a change

Actually counting off every three days and posting a notice in the housekeeping area on the sheet changing days This ensures that the sheets are changed on the exact schedule noted on the in-room materials and still makes it relatively easy for the housekeepers to know when to change the sheets As mentioned in the paragraph above, on the other two days the sheets would only be changed in the checkout rooms and rooms where the guest has requested a change

Hotels have had difficulty tracking the length of time that each guest has actually been in the room so that each guests' sheets are changed three days after they check in and then every three days after that Unless the hotel has a very complex reservation system, this method of tracking sheet changing is nearly impossible If this method is possible, it results in the greatest savings, since either of the above alternatives will often result in changing a guest's sheets one of the two days following check-in when they technically are not yet ready to be changed

The hotel will have to determine which method it believes will work best and then make modifications as needed Regardless of the method chosen to implement the program, it is important that all of the housekeepers be fully trained to understand their role in the initiative If they do not do what they are supposed to do, the program cannot be successful

Two other issues are key to the success of this program

- Even if the guest does not request that the sheets be changed on a given day, if the housekeeper determines that the sheets are soiled, they should be changed anyway A bed should never be made with dirty linens

- If a guest checks out early on a day when sheets were not changed, it is important that someone be designated to change the sheets before a new guest checks in One way to know for sure whether the sheets were changed is to leave the bedspread in a turn-down type of configuration when the sheets are left on the bed If the bed is completely remade, it will look just like a bed with fresh sheets, but leaving the bedspread partly

turned back will allow anyone entering the room to know that the sheets have been used

This program can result in tremendous savings for the hotel but only if it is implemented properly It is important that the proper materials be used, that the housekeepers be fully trained, and that everyone is left feeling good about the program

Project II: Implement a composting program

Composting has become the increasingly popular method by which to dispose of food scraps, floral waste and garden waste The hotel should start with a basic green waste (yard waste) composting program and then expand it to include food waste as well unless it starts raising pigs on the property

A well-run composting programs yields significant benefits including

- a reduction in the cost of waste handling and disposal,
- a reduction in the environmental impact resulting from the disposal of wastes in dumps or landfills,
- it provides the property with a high-profile program which can be advantageously used in public relations and media efforts,
- it provides the property with a constant supply of high quality fertilizer and soil conditioner

Studies have revealed that up to 75% of waste generated in food service functions consists of compostable food scraps and other organic materials If the compostable material, along with the recyclable plastic, glass, and metal items are diverted from the waste stream, the property can achieve a truly significant reduction in the amount of waste generated by the food service area

Both pre-consumer and post-consumer food scraps can be composted Pre-consumer food scraps include cuttings left from vegetable preparations, as well as complete servings of food which have been prepared, left unserved, and cannot be reused Post-consumer scraps are food left on dishes after meals have been served Although food scraps will be numerous and diverse, other wastes can be composted as well Below is a list of commonly composted wastes

- Produce – vegetables, fruits, peels, rinds, salads, etc
- Bread and pastries, excess batter
- Frozen foods
- Coffee grounds/filters, tea bags
- Egg shells
- Flower waste (wilted cut flowers from restaurants and guest rooms)
- Green waste from the garden and beach (grass, leaves, twigs, branches, seaweed)
- Paper items – paper, napkins, paper towels, paper plates and cups, paper food wrappers
- Dairy products (see note 1)
- Seafood (see note 1)
- Meat trimmings, without bones or large quantities of grease or fat (see note 1)

Note (1) Although these items can be composted, they often generate foul odors and attract animals and pests If the compost pile will be located close to public or work areas, Fern Hill should exclude these items from its composting

program If these items are composted, the compost pile should be kept covered

Not everything is compostable, and some materials can lower the quality of the finished compost or hamper the composting process The staff should be educated on the importance of preventing the following items from being placed in the composting receptacles and the composting pile

- Garden waste contaminated with pesticides
- Weeds with heads/ seeds (these will reproduce quickly in the compost heap)
- Glass
- Metals
- Unsoiled paper (if it can be recycled)
- Cardboard
- Plastics
- Aluminum foil or plastic wrap
- Batteries
- Diseased plants
- Wood chips from chemically treated wood products

Contamination of compostable material can be avoided only if employees know which items should not be discarded in the container for compostable materials Continuous employee education and motivation and appropriate signage will help In most instances, placing a sign on a container which reads "Compost only – no bones, plastics, glass or metals" should make the point

Hotels and resorts often find it easier to have the composting program evolve slowly, that is, to start with flower and garden wastes and pre-consumer food scraps from prep stations in the kitchens, then add additional materials like paper, and finally add post-consumer leftovers from guests' and employees' plates This is the process that is recommended for Fern Hill

Fern Hill may find it beneficial to purchase a wood chipper and paper shredder to allow even more items to be composted Large pieces of wood (branches, lumber) and full pieces of paper cannot be added to the compost pile The chipper and shredder can be used to convert these items to a more manageable size (less than one inch) so that they will decompose more readily

In addition the composting site should be large enough for all phases of composting (unloading materials storing items before they are added to the compost, aerating/ mixing the compost, storing equipment such as the chipper, and storing the finished compost before it can be used) The hotel should also build a fence around the composting site to hide it from guest view and to prevent rodents and other animals from entering the area Some items used in a compost pile will be unattractive or will attract animals, making this fence necessary The hotel should also ensure proper drainage from the site, quickly clean up any food spills, and add food waste to the center of the pile to prevent bad odors

It is especially important to ensure that the compost pile is properly aerated Aeration helps the bacteria in the pile to grow faster, which speeds the decomposition process The staff overseeing the composting program should aerate the pile, either manually or with a small bulldozer (depending on the size of the pile), at least once each week Without proper aeration, the compost pile will develop a rotten-egg odor and will take much longer to fully decompose

It is important to keep the program simple and efficient, in the long-run, it should not require additional staff time In fact, the system, in coordination with a comprehensive recycling program, can streamline the entire disposal system from both a labor and a space efficiency standpoint

Once the compost is ready for use (usually in about one month if the pile is managed properly), the resulting product should be used on the grounds Compost is classified as a soil conditioner, not a fertilizer, because its levels of nitrogen, potassium, and phosphorus are not as high as commercial fertilizers Finished compost will add these elements to the soil but will add them much more slowly and in lower quantities than fertilizers Unlike fertilizers, compost also adds organic material to the soil, increases the water-retaining capabilities of sandy soil, and promotes root growth The compost should be used over grassy areas or as a mulch around plants

Appendix I

Hotel Environmental Policy

By the International Hotels Environmental Initiative

We recognize that our business has an important role to play in protecting and enhancing the environment for future generations, and to help secure the long term sustainability of the tourism industry

To this end our hotel is committed to taking action

- To achieve sound environmental practices across our entire operation
- To comply fully with all environmental legislation
- To minimize our use of energy, water and materials
- To reduce our pollution to a minimum and, where appropriate, to treat effluents
- To invite our customers, suppliers and contractors to participate in our efforts to protect the environment
- Where we can, to work with others in the tourism industry, in public agencies and the community to achieve wider environmental goals
- To provide all employees with the training and resources required to meet our objectives
- To openly communicate our policies and practices to interested parties
- To monitor and record our environmental impacts on a regular basis and compare our performance with our policies, objectives and targets

Appendix II: Summary of Fern Hill's environmental aspects, impacts and EMS objectives

Type of environ aspect of the hotel's activities	Type of activities which have these environmental aspects	Environmental impact of the activities	Objective of the property's EMS
WATER USE	- Use of guest room and public bathrooms - Laundry room and operations - Housekeeping and cleaning operations - Kitchen and bar operations - Garden upkeep	- Inefficient use of a valuable resource	- Reduce water consumption
ENERGY USE	- Operation of a/c units, water heaters, washing machines, dryers and pool pumps - Use of hot water and lighting	- Inefficient use of valuable and non-renewable resources - Generates air pollution (mainly at the power plant), greenhouse gases, acid rain	- Reduce energy consumption
SOLID WASTE GENERATION	- Office operations (paperwork) - Food purchasing, preparation and serving - Bar operations - Maintenance operations - Garden and beach upkeep	- Disposal of solid wastes in inadequate municipal dumps - Contamination of groundwater and surface water - Loss of raw materials	- Reduce the amount of solid waste generated by the property
GENERATION OF WATER POLLUTANTS	- Laundry room operations (e g , use of phosphate based detergents) - General housekeeping and cleaning operations (excessive use of chemical cleaning and disinfecting products) - Maintenance operations (improper disposal of used oil and spent solvents) - Food preparation (disposal of grease/oil)	- Increases pollutant load discharged to surface and groundwater - Reduces the effectiveness of septic tanks and wastewater treatment systems	- Reduce the pollutant load contained in the hotel's effluent
USE OF HAZARDOUS PRODUCTS	- Laundry room operations (use of bleach, and acid or caustic cleaners) - General housekeeping and cleaning operations (use of bleach toxic cleaning chemicals insecticides) - Maintenance operations (use of lead paint, drain clearing chemicals) - Grounds keeping (pesticides/insecticides)	- Exposes guests and employees to hazardous products	- Reduce the number and amount of hazardous products used on the property Improve gray water handling
GENERATION OF AIR EMISSIONS	- Maintenance operations (e g release of CFC from air-conditioning units use of solvents) General housekeeping and cleaning operations (use of aerosols) Grounds keeping (insecticide fogging)	- Release of CFCs to the atmosphere - Exposes guests and employees to hazardous air pollutants	Phase out CFC refrigerants - Reduce the use of solvents insecticides pesticides
DAMAGE TO THE ECOSYSTEM	Use of fertilizer insecticides and pesticides in the gardens	- Damages the environment and ecosystem surrounding the property	Reduce the damage caused by the property's operations on the ecosystem

Appendix III

ACTION PLAN FORM MAINTENANCE DEPARTMENT - WATER CONSERVATION ISSUES			
Action	**By whom**	**Target date**	**Actual date**
Implement a leak detection and prevention program			
• Prepare a plan for carrying out a monthly inspection of the property's water distribution system, guest bathrooms, public restrooms, kitchen, bar, beach showers, and irrigation system	J Doe	12/1/97	
• Develop the checklist forms that will be used to track the preventive maintenance work conducted by this program	J Doe	1/1/98	
• Hold a training workshop to teach housekeeping staff on how to detect and report malfunctioning equipment and leaks Prepare a summary of this information for inclusion in housekeeping staff's training manual	G Bush	1/15/98	
• Begin the first round of inspections Repeat the cycle of inspection each month	Maint staff	2/1/98 - onw	
• After each round of inspection, present summary of findings to general manager	J Doe	3/1/98 - onw	
Install 1 6 US gallon/flush toilets in the beach-side public restrooms			
• Identify the type/brand of 1 6 US gal/flush toilets which have given satisfactory results in Jamaica Get recommendations from maintenance staff of other hotels	P Peters	2/1/98	
• Contact vendor and place order for 4 units	S Holmes	3/1/98	
• Install the units	P Peters	< 1 mth after receipt	
• Monitor weekly to ensure proper performance Continue the weekly monitoring for two months following installation	P Peters	after installation	
Water consumption monitoring program			
• Prepare the forms that will be used to collect data from the property s 3 meters	T Rex	12/1/97	
• Train all members of the maintenance staff on how to properly read the meters enter the information on the forms and calculate the property s weekly water consumption	T Rex	12/15/97	
• Begin collecting the water consumption monitoring program	Maint staff	1/1/98 - onw	
• On the first day of each month calculate the total water consumption and collect total guest night figures for the previous month Calculate IG/GN value for the previous month Provide the IG/GN figure to the Green Team	P Peters	2/1/98 - onw	

Appendix IV

Personal Action Plan - Housekeeping staff		
Action	**By whom**	**Date**
Guest room preparation checklist • If the guests have left their a/c running, leave the guest room door closed during room preparation If the door must be left open, turn the air conditioner off • Do not replace the trash can liners (plastic bags) unless these are soiled or otherwise unacceptable for further use • Report all malfunctioning equipment to the hotel operator -- contact the maintenance department directly only if the need for repair is urgent Pay particular attention to water leaks in toilets, faucets and shower heads, excessively high flows from faucets or shower heads, sticking toilet flush handles, sink and bathtub stoppers which don't work or don't fit properly, damaged windows or louvers, scalding hot water, malfunctioning air conditioners • Collect all recyclable items placed in the guest room green recycling containers Recyclable item consist of ◦ clear, green, and amber glass bottles ◦ plastic beverage bottles ◦ aluminum beverage cans ◦ metal cans ◦ newspaper ◦ white paper • At the end of your shift, place all collected recyclables in the appropriate recycling bins located by the laundry room • Before leaving the guest room ◦ turn off all lights, televisions and radios ◦ turn the a/c unit to the low cool" setting if the guests have left the a/c running ◦ if the a/c is left on, make sure that all windows and louvers are properly closed, ◦ ensure that faucets and toilets are not running	All house-keeping staff	Start on 12/01/97
Towel and linen reuse program • • •		

Appendix V

Sample water and electricity monitoring forms

Water - Monitoring form				
Meter number		Month and year		Reading units
Day	By	Meter reading	Consumption	Comments or corrective action
			⇦ Insert here the last meter reading of the previous month	
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
Total monthly consumption				

Number of guest nights for the month = _____

Water consumption index = (monthly water consumption) / (number of guest nights)
=

Example of a partially completed water monitoring form

Water « Monitoring form				
Meter number 34,524,356		Month and year December 1997		Reading units Thousand imperial gallons
Day	By	Meter reading	Consumption	Comments or corrective action
		15,234 600	⇦ Insert here the last meter reading of the previous month	
1	PGM	15,256 700	15,256 700 - 15,234 600 = 22 100	
2	PGM	15,278 300	15,278 300 - 15,256 700 = 21 600	
3	PGM	15,302 500	24 200	
4	PGM	15 322 200	19 700	
5	PGM	15,342 700	20 500	
etc				
25	PGM	15 768 700	21 800	
26	PGM	15 791 600	22 900	
27	PGM	15 880 900	89 300	Because of jump in water consumption, maintenance began inspection of water distribution system
28	PGM	15,976 400	95 500	Discovered leak in property's main distribution line Leak was fixed at 10 30 PM
29	PGM	16 006 200	29 800	
30	PGM	16,027 500	21 300	
31	PGM	16 050 300	22 800	
Total monthly consumption			16 050 300 - 15 234 600 = 815 700 thousand imperial gallons	

Number of guest nights for the month = 3 077 GN (obtained from front desk records)

Water consumption index = (815 700 Imperial gallons) / (3 077 GN)
= 265 1 Imperial gallons/GN

Electricity - Monitoring form				
Meter number		Month and year		Multiplier
Day	By	Meter reading	Change in meter reading	Comments or corrective action
			⇦ Insert here the last meter reading of the previous month	
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
Total change in meter reading for the month				

Total monthly electricity consumption = total change in meter reading x multiplier = _____ kWh
Number of guest nights for the month = _____

Electricity consumption index = (monthly elec consumption) / (number of guest nights) =

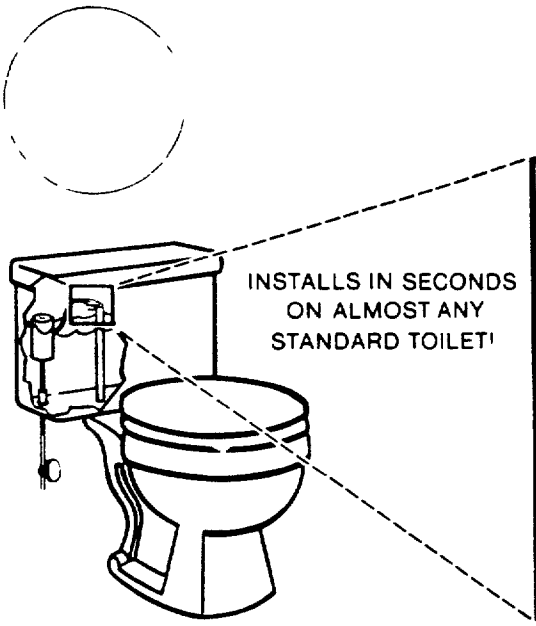
Appendix VI

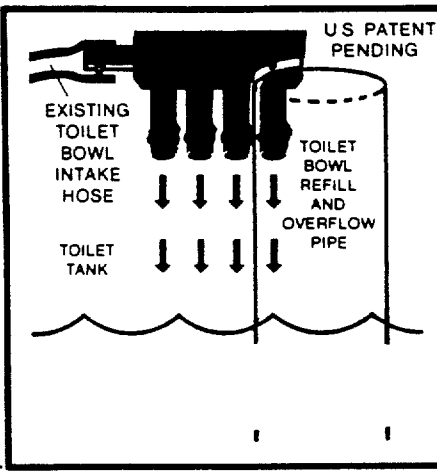
Flow diverters: Technical information

Aqua smart, inc
Every drop counts!

aquaSaver

Help Save Our Most Precious Resource!





AquaSaver
FOR STANDARD TOILETS

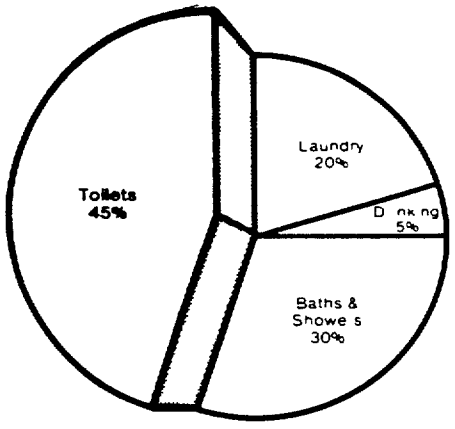
AquaSaver™ saves water by substantially reducing overflow during recovery - less water is wasted because the tank fills faster

You save on every flush the tank fills to capacity faster and your toilet operates at maximum efficiency because proper tank volume is maintained

You can save from 5 to 1 0 gallon of water per flush when an AquaSaver™ is properly installed In the position shown in the illus tration (one spout in the the toilet bowl refill/ overflow pipe three spouts outside the pipe) an average Illinois family can save up to 16 gallons of water everyday!

Based on figures supplied by the Illinois Department of Commerce and Public Affa rs

IN-HOME WATER USE



Source National Wildlife Federation

The new AquaSaver™ from Aqua Smart!™ Inc , **saves water by controlling the amount of water feeding into the toilet bowl refill/overflow pipe** Only the amount of water necessary for proper functioning goes into the bowl and the tank fills faster, reducing the amount of water used on every flush

St Louis based Industrial Testing Laboratories, Inc , ran performance tests on the device and reported a **water savings from one-half gallon to one gallon per flush, depending on toilet model and tank capacity** And, best of all toilets function properly because proper tank volume is maintained

The environmental impact of the device goes far beyond the economic savings for individual users which can be substantial since 45% of household water usage is attributed to toilets (see chart at left) Every gallon of water saved from being flushed into municipal sewage systems is a gallon of water that doesn t need to be treated, so the AquaSaver™ saves both on front-end water usage and back-end wastewater treatment

We think you will be pleasantly surprised at how much you can save after installing the AquaSaver™ in your home, apartment complex hotel/motel nursing home etc In Boston MA, you can save $135 00 per year on a family of four by using the AquaSaver™ Good Results wouldn t you say?!

New Water Saving Product!

SAVE !

Up to 6000 gallons

every year for a family of four.

SAVE 16 GALLONS OF WATER EVERY DAY

aquasmart, inc. every drop counts™

aquaSaver™

INSTALLS IN SECONDS ON ALMOST ANY STANDARD TOILET

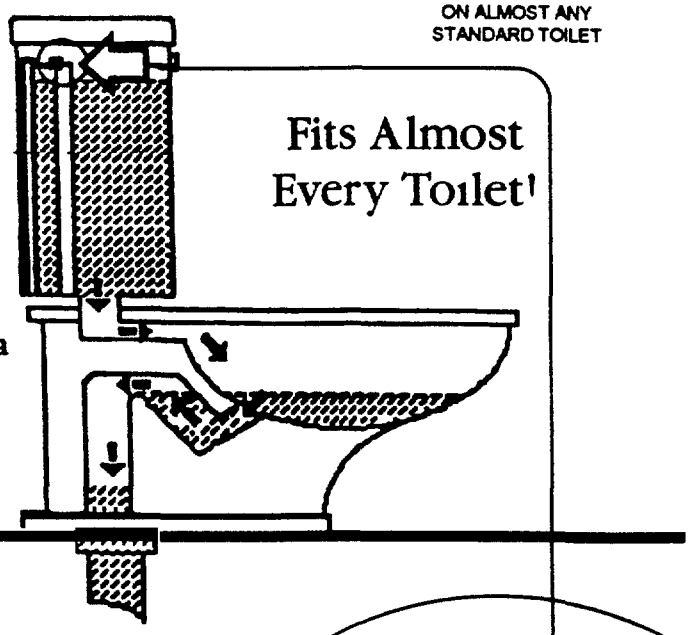
How It Works

The Problem

As the toilet refills, some of the water is directed into the overflow pipe refilling the bowl

The bowl will continue to fill until the tank is full Most toilet bowls will take water beyond the amount required to have a satisfactory surface area and even overfill

Overfilling results in not just more water than you need in the bowl, but water and money pouring down the drain until the tank is full



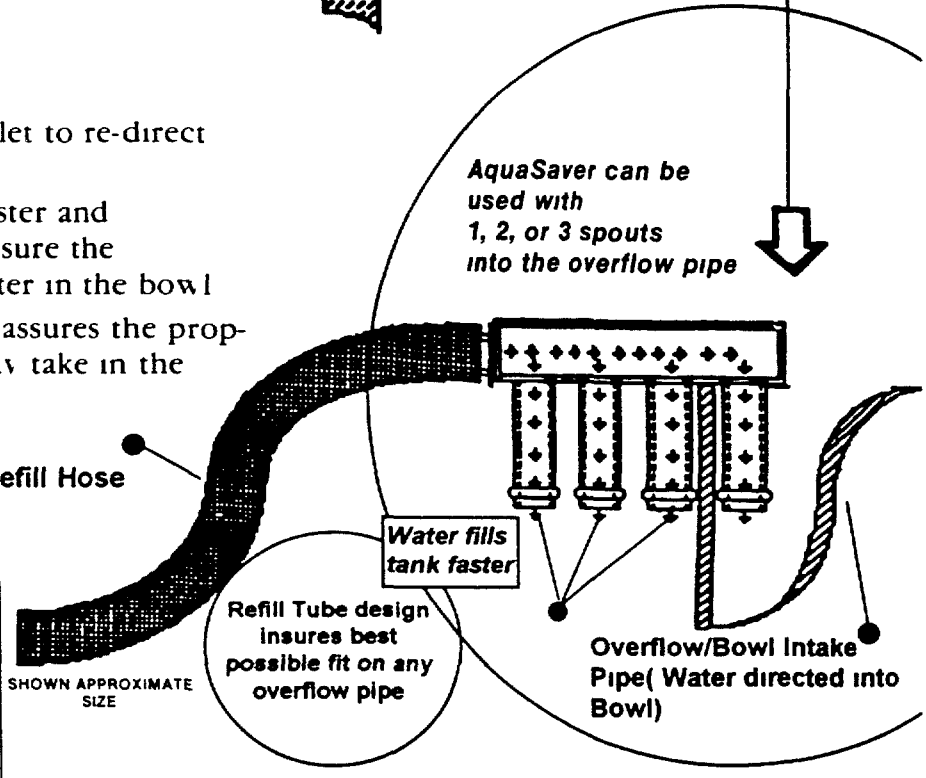
The Solution

The AquaSaver allows the toilet to re-direct this incoming water

This allows the tank to fill faster and because it can be adjusted will assure the minimum effective amount of water in the bowl

Installation of the AquaSaver assures the property owner that the toilet will only take in the proper amount of water

For more information contact your distributor



INSTALLATION INSTRUCTIONS (See inside pictures)

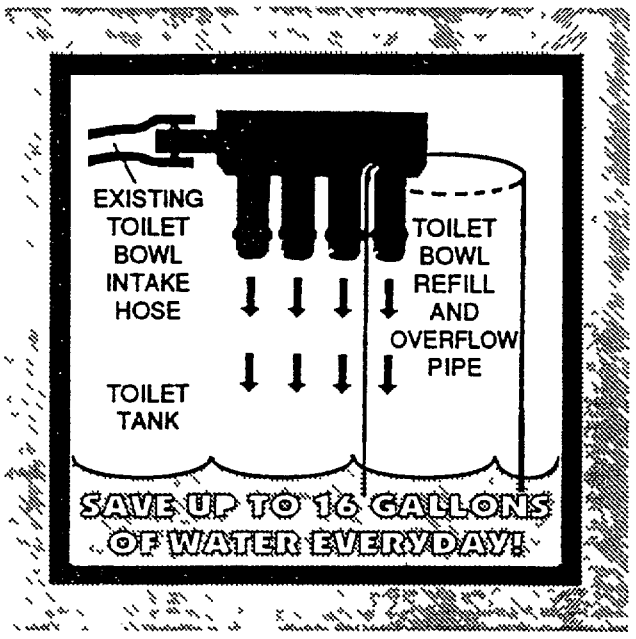
1 Detach existing toilet bowl refill hose from the refill/overflow pipe If there is a clip remove it - if there is a cap on the refill pipe remove it.
2. Insert **AquaSaver** into end of hose.
3 Place **AquaSaver** onto the bowl refill/overflow pipe so that any one spout is **inside** the pipe and the remaining three spouts are **outside** the pipe.
4 After flushing the water level in the bowl may or may not be a little lower than before. If you prefer more water in the bowl adjust **AquaSaver** by placing two spouts into the pipe

QUESTIONS THAT YOU MIGHT HAVE

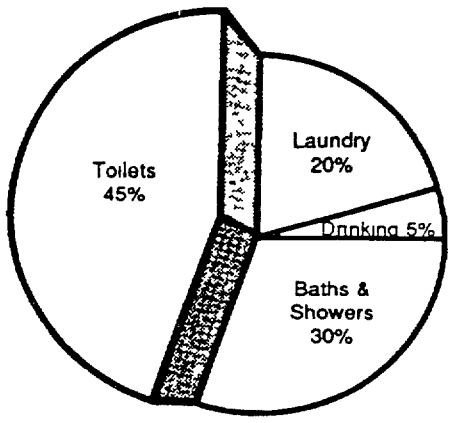
1 Do all installations take only a few seconds? And are all stools easy to install in?
A. Yes in most cases However some refill pipes are not a plastic or metal pipe but rather are cast into the tank. In those cases the walls of the refill are too thick for the **AquaSaver** to fit onto - merely fit a hose (available at hardware stores) onto one of the spouts of the **AquaSaver** & place it (the hose) into the refill pipe The important thing is One spout in & three out.
B On the Mansfield toilet the refill tube and the flapper are one unit and when the toilet is flushed they both lift up Again the **AquaSaver** will need to be fitted with a hose on one spout.
C Kohler and Crane each have an expensive model where the refill pipe is built into the ballcock and the **AquaSaver** will not work
D Some toilet refill pipes have a cap on them that you can remove by twisting upward
E. You can install the **AquaSaver** any of these ways just keep in mind that you can cut hoses to length needed to position **AquaSaver** so one spout fitted with a hose goes into the refill pipe and three spouts into the tank.
2 What water level should be in the toilet tank?
A Sometimes you will see the water line mark on the tank. The water level should be within one half inch from the top of the refill pipe.
3 Does the AquaSaver work with replacement Fluidmaster?
A. Yes The Fluidmaster adjusts the water level within 1/2 inch from the top of the refill pipe It is not there to save water The water level will vary with different toilets Do not adjust the Fluidmaster below the recommended 1/2 inch from the top of the refill pipe
4 What should you look for before installing the AquaSaver?
A Make sure the water level is turned on all the way
B Check water level in the tank - again 1/2 inch from the top of the refill pipe (These things will reduce flush quality - repeat flushings defeat the purpose of the **AquaSaver**)
5 Does the AquaSaver work with the brick, the plastic bag or the water dam?
A. No The quality of the flush has been significantly reduced if used in correlation with these devices When using the **AquaSaver** you get a quality flush, and most importantly you save
6 Does the AquaSaver work on the new 1.6 gallon tank?
A Yes but not recommended There is very little savings and the 1 6 gallon toilets are having problems with their quality flush even before the installation of the **AquaSaver** We feel the **AquaSaver** will be more effective on tank sizes ranging from 3.5 to 7 gallons
7 Is the refill hose always the right size to slip onto the intake spout of the AquaSaver?
A Sometimes the refill hose is stretched or in some cases just a little larger OD If the end of the refill hose is stretched cut off about 1/2 inch and then insert into the **AquaSaver** If however the refill hose is too large OD use a short section of hose (available at hardware stores) and insert into the too large refill hose that is in place then snap **AquaSaver** into the step down size Remember you can cut and position as needed to get hoses lengths needed to accomplish the objective of one spout in the refill and three out.
8 Is the amount of water coming out of each of the four spouts equally the same in volume?
A. Yes The **AquaSaver** has been carefully engineered to achieve that objective The volume of water coming into the **AquaSaver** at the intake is exactly the same coming out each spout. Therefore it does not matter which of the four spouts is routed into the refill pipe

WHY DOES THE AQUASAVER SAVE WATER?

The water line coming into the toilet stool comes into the water control valve (ballcock) The water control valve disperses the water to two places 1 *To refill the tank, and* 2 *To refill the toilet bowl stool* The problem with this situation is that water continues running into the bowl until the tank is full and most of this water goes down the drain therefore ***wasted*** The AquaSaver redirects this incoming water by only putting 1/4th as much into the bowl - the other 3/4ths is directed into the tank - causing the tank to fill faster



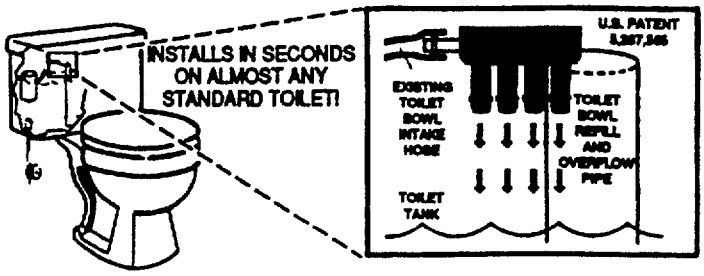
IN-HOME WATER USE



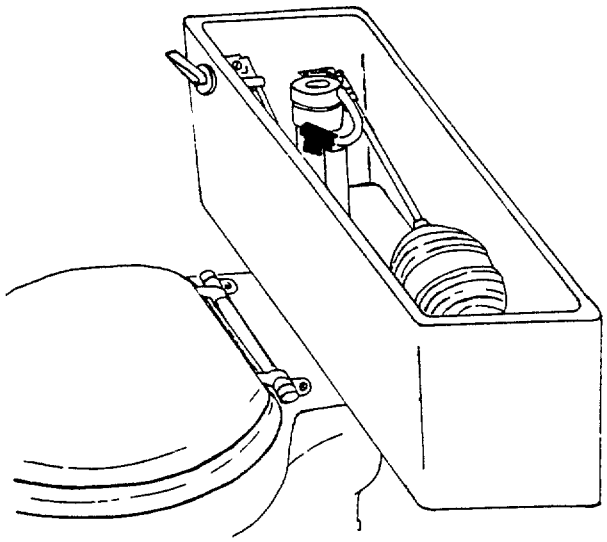
Source National Wildlife Federation

INSTALLATION ON VARIOUS TOILETS

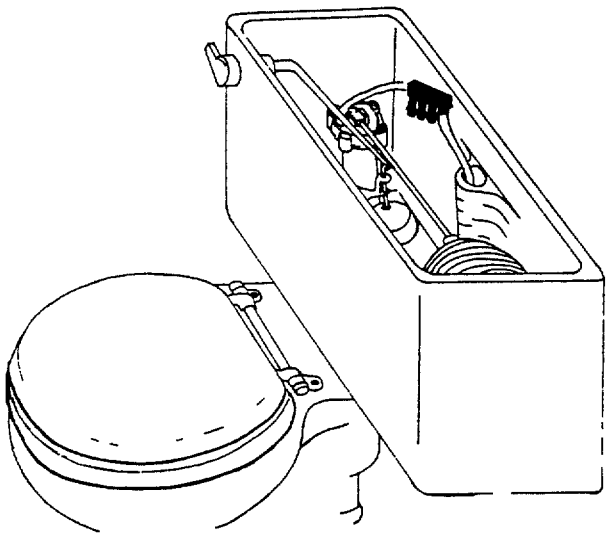
1 Normal installation



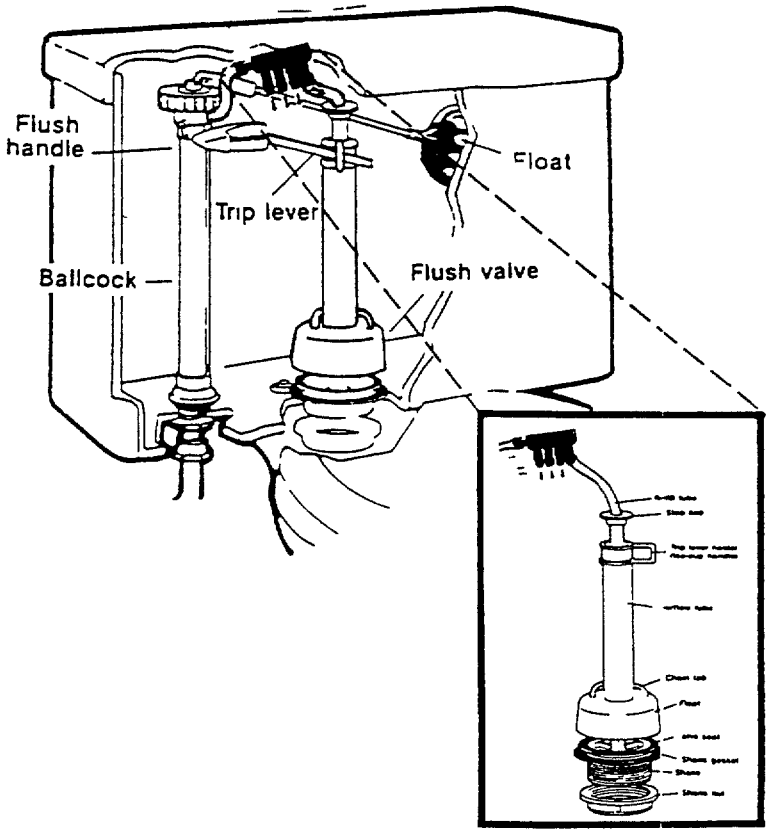
2 Install the **AquaSaver** in the down spout furthest from the intake spout If it interferes with the mechanics of flushing, place the first down spout of the **AquaSaver** in the overflow tube



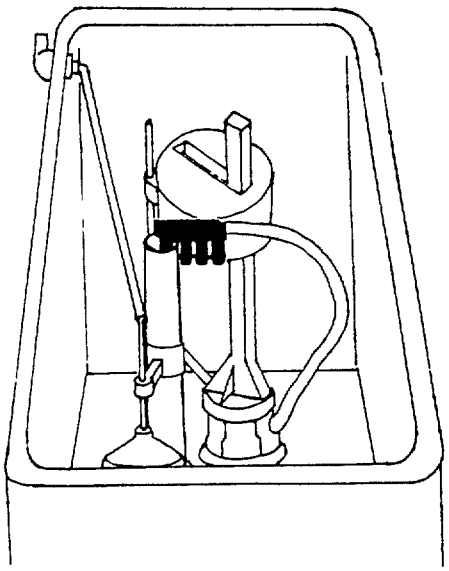
3 You may install the **AquaSaver** as shown in diagram, if neccesary



4 Mansfield toilets that have this type of overflow tube should be installed as shown in diagram



5 Fluid Master - Install as shown in diagram



Appendix VII

FERN HILL CLUB HOTEL MONTH/YEAR _____

Day	# of rooms occupied	Total number of guests	Number of foreign guests	Number of local guests
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
Total	(= A)			

B) Total rooms available each day = _____

C) Total rooms available for month = (B x Number of days in month) = _____

D) % occupancy for month = (A / C) x 100 = _____