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***Environmental Audits for Sustainable Tourism***

**Environmental Management Audit  
Sunshine Village Hotel  
Negril, Jamaica, W.I**

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**Final Report  
EAST Report No 98-237**

**February 1998**

Prepared for  
EAST Project  
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A project funded by the U S Agency for International Development

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## 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 Sunshine Village develop an EMS?

- ▶ An EMS will help Sunshine Village sustain the social and physical environment on which it depends for its survival. Tourists visit Negril to savor the beauty of its reefs, beaches and nature and to experience the warmth and kindness of its people. The day Negril 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 Sunshine Village 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 Sunshine Village’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 Sunshine Village 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 40 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) Implement an effective leak prevention program	<ul style="list-style-type: none"> <li>Reduces water consumption and wastewater generation</li> <li>Improves the operation of septic tanks and tile fields</li> </ul>	> 120 000 J\$/year	low	< 1 month
2) Install flow aerators on all faucets	<ul style="list-style-type: none"> <li>Reduces water consumption and wastewater generation</li> <li>Improves the operation of septic tanks and tile fields</li> <li>Saves energy</li> </ul>	680 J\$/year for each typical public area faucet	60 J\$ per aerator	2 to 4 weeks
3) Install flow diverters in toilet tanks	<ul style="list-style-type: none"> <li>Reduces water consumption and wastewater generation</li> <li>Improves the operation of septic tanks and tile fields</li> </ul>	3 750 J\$/year for 60% of the toilets in the complex	2,900 J\$	9 months
4) Install displacement devices in toilet tanks	<ul style="list-style-type: none"> <li>Reduces water consumption and wastewater generation</li> <li>Improves the operation of septic tanks and tile fields</li> </ul>	3 750 J\$/year for 60% of the toilets in the complex	1 200 J\$	4 months
5) Replace existing toilets with water-saving models	<ul style="list-style-type: none"> <li>Reduces water consumption and wastewater generation</li> <li>Improves the operation of septic tanks and tile fields</li> </ul>	2,840 J\$/year for a frequently used public or employee restroom toilet	4,000 J\$ per toilet	17 months
6) Use rainwater for hotel operations	<ul style="list-style-type: none"> <li>Reduces the use of NWC water</li> </ul>	19,500 J\$/year for an 8,000 ft <sup>2</sup> catchment area	unknown but probably moderate	probably < 1 year
7) Reduce the time of operation of the pool filter pump	<ul style="list-style-type: none"> <li>Reduces electricity consumption</li> <li>Extends the service life of the pump</li> </ul>	6,950 J\$/year	0 to 1,800 J\$	0 to 3 months

8) Upgrade to energy efficient lighting	<ul style="list-style-type: none"> <li>Reduces electricity consumption</li> </ul>	see table in Project 8	478 JS per energy-efficient bulb	typically 6 to 12 months
9) Implement a waste management program	<ul style="list-style-type: none"> <li>Reduces the volume of waste generated by the property</li> <li>Reduces the negative impact of the waste generated by the property</li> </ul>	unknown	moderate	probably <1 year
10) Implement a linen and towel reuse program	<ul style="list-style-type: none"> <li>Reduces the property's laundry processing costs</li> <li>Reduces the environmental impact of laundry processing operations</li> </ul>	can reduce laundry costs by up to 40%	low	immediate
11) Start a composting program	<ul style="list-style-type: none"> <li>Provides the property with a free source of fertilizer and soil conditioner</li> </ul>	unknown	low to moderate	probably <1 year

## Summary of Initiatives Already Underway

To its credit, Sunshine Village has already implemented a variety of environmental initiatives. Some of the initiatives identified by the audit team are listed below.

- ▶ Housekeepers save energy by turning off air conditioners and lights in unoccupied rooms and by shutting off guest room appliances and water heaters upon checkout.
- ▶ Housekeepers keep guest rooms cooler and reduce the load on the air-conditioning units by closing the guest room blinds during daytime.
- ▶ Housekeepers keep guest room doors closed while cleaning air-conditioned rooms. Leaving doors open would waste energy.
- ▶ The air conditioners in the guest rooms and offices are equipped with controls that allow the user a number of options for fan speed, temperature and time. However, since the operation of these controls is difficult to understand, the property is encouraged to place an instruction card by each air-conditioning unit to ensure that employees and guests know how to operate the units effectively and efficiently.
- ▶ Guest room windows are glazed to prevent the sun's rays from heating the rooms excessively, thus reducing the work load of the air-conditioning units.
- ▶ Housekeepers use very little water while cleaning the guest rooms. They only flush the toilet once and do not leave water running while they are cleaning.
- ▶ This property uses cloth rags rather than paper towels for cleaning operations. Many hotels use disposable paper towels, which are costly and increase the amount of solid waste generated by the property.
- ▶ In most cases, housekeepers collect the guest room laundry in durable cloth bags rather than disposable plastic bags.
- ▶ The cleaning products for housekeeping are purchased in bulk, reducing the hotel's costs and the generation of packaging waste.
- ▶ Yard waste is collected in old cardboard boxes and wheelbarrows instead of plastic bags.
- ▶ Public bathrooms are equipped with liquid rather than bar soap. The use of liquid soap reduces cost and the amount of solid waste generated by the property.
- ▶ Facial tissue and toilet paper in guest rooms are made of 100% recycled paper. This supports the recycling effort and also communicates the hotel's environmental concern to guests.
- ▶ All guest rooms display signs encouraging guests to protect the reef.

## **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 Sunshine Village was conducted by an interdisciplinary team in November 1997 The team members included Hugh Cresser, EAST Project Coordinator, Patricio Gonzalez Morel, Environmental Engineer, Hagler Bailly (USA), Cara Holley Montrief, Hotel Environmental Consultant, Lloyd Marsh, Senior Energy Engineer, Metrocad (Jamaica)

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

Sunshine Village Hotel is a 32-room property located on the upper floor of a popular shopping center at the west end of Negril, Jamaica. The hotel is responsible for maintaining many of the shopping center's common areas and for allocating many of the utility bills to the other shops and restaurants. The property is owned by NCB Investment, and the hotel is managed by Mr. Kenric Davis.

The hotel averages 30 employees year-round. These employees are supervised by the following managerial staff:

Front Office Manager	Wendross Tawney
Accounting Manager	Barry Gazader
Maintenance Supervisor	Delroy Harry
Housekeeping Supervisor	Sophia Muckler
Purchasing Manager	Robert Redwood

### 2.2 Occupancy Data

The occupancy information given by Sunshine Village 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	321	466
December	412	639
January 1997	439	1,231
February	363	769
March	638	1,767
April	307	583
May	255	450
June	168	335
July	280	554
August	428	860
September	242	441
October	231	462
Annual total	4,084	8,557

Based on this data, the occupancy criteria for Sunshine Village Hotel are:

Average hotel occupancy = 340 RN/month  
= 713 GN/month

Average room occupancy = (8,557 GN/year) / (4,084 RN/year)

= 2.1 GN/RN

According to the hotel's records 33% of these guests are foreign and 67% are local

## 2.3 Water Consumption and Wastewater Generation

### 2.3.1 Current water use and wastewater generation at Sunshine Village

- ▶ All of the water consumed by Sunshine Village and the shopping mall is purchased from the National Water Commission
- ▶ Since the complex is equipped with a single water meter, its occupants share the responsibility for paying the water bills. By common agreement, Sunshine Village pays for 50% of the water consumed in the complex
- All of the wastewater generated by the complex is pumped to a tile field located behind the property's parking lot

The water consumption information collected from Sunshine Village's 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	(1) Water use for the hotel and mall, IG/month	JS/month	JS/1,000 IG	GN	(2) IG/GN
November 96	419,000	82,224	196	466	450
December	282,000	55,785	198	639	221
January 97	666,000	130,670	196	1,231	271
February	668,000	131,893	197	769	434
March	607,473	119,065	196	1,767	172
April	504,615	101,158	200	583	433
May	520,220	104,240	200	450	578
June	433,187	87,083	201	335	647
July	442,418	89,297	202	554	399
August	291,868	59,468	204	860	170
September	433,187	88,401	204	441	491
October 97	338,462	70,102	207	462	366
Annual total	5,606,430	1,049,284		8,557	

- Notes
- GN = guest night
  - IG = imperial gallon
  - 1 IG = 1.20 US gallon

- (1) The water consumption of Sunshine Village is estimated to account for 50% of the total water consumption of the hotel and mall complex

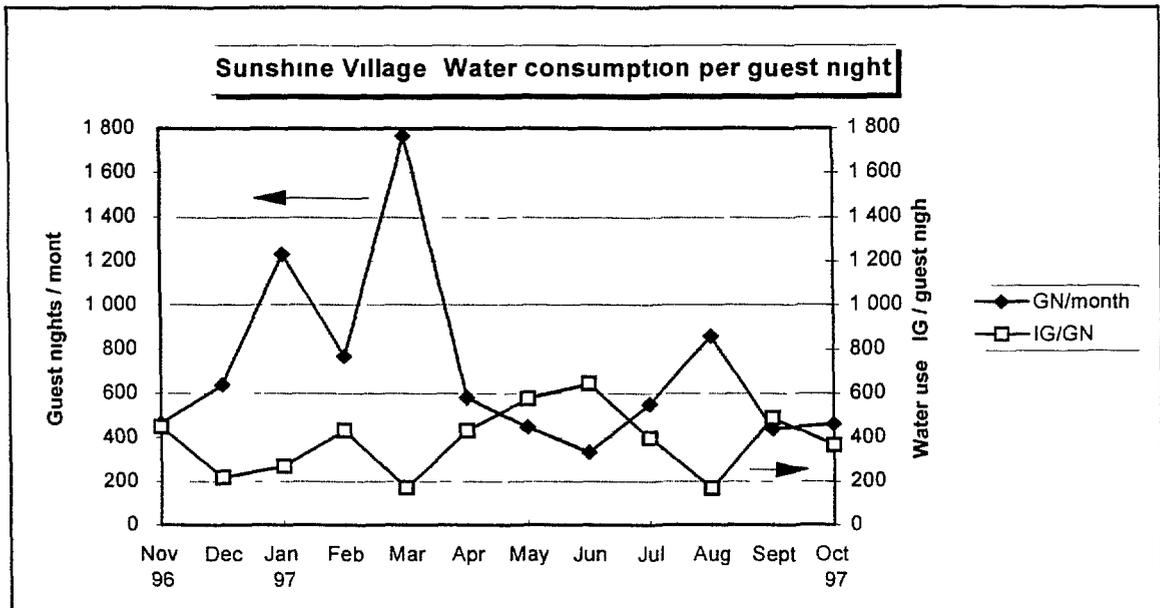
(2) Water consumption per guest night (IG/GN) figures are calculated using 50% of the total water consumption for the complex

Based on this data, the average water figures for Sunshine Village are

Current water cost = 207 IG/1,000 IG

Average water use = (5,606,000 IG/year) / (12 months/year)  
 = 467,000 IG/month  
 = 96,700 J\$/month

Av water use per GN = 50% x (5,606,000 IG/year) / (8,557 GN/year)  
 = 328 IG/GN



As shown in the graph, Sunshine Village's water consumption index (i.e., the consumption of water per guest night) varies widely during the 12 month period covered by the data. In fact the water consumption index for June (647 IG/GN) is almost 4 times greater than that for August (170 IG/GN). Although the water consumption index is expected to vary with time because of changes in weather, occupancy rates and guest type (e.g., large influx of college students for spring break), the 280% increase in water consumption per guest night experienced between August and June is excessively high.

Sunshine Village 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 Sunshine Village**

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 Sunshine Village 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 Sunshine Village achieved the water consumption of a water efficient property	
Location	Water use	Water savings	J\$ savings
Water efficient hotel	96 IG/guest night	1 985,000 IG/year	411 000 J\$/year
Sunshine Village	328 IG/guest night		

- Notes
- The savings presented in this table are based on the total annual occupancy figure calculated in Section 2.2 of this report (8,557 guest nights per year)
  - 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	Sunshine Village
4 - 50 rooms	< 96	96 - 111	111 - 128	> 128	328

After the completion of Negril's new sewer and wastewater treatment plant in mid-1999, the cost of the NWC water is expected to increase by a factor of two.

The reader should therefore keep in mind that the water conservation measures proposed in this report will have, in the near future, an even greater impact on reducing Sunshine Village's utility costs.

## 2.4 Electricity Consumption

The electricity consumption information collected by the audit team from Sunshine Village's JPSCO bills is presented in the following table and graph

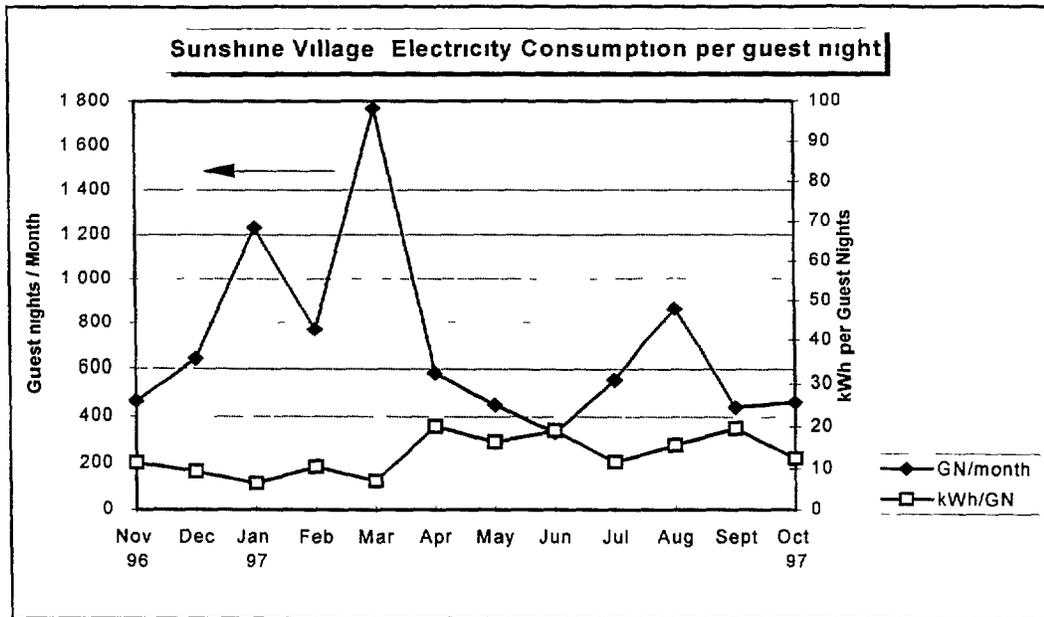
JPSCO electricity consumption figures					
Month	kWh/month	J\$/month	J\$/kWh	GN/month	kWh/GN
November 96	5,280	22,334	4.23	466	11.3
December	5,920	25,042	4.23	639	9.3
January 97	7,840	33,163	4.23	1,231	6.4
February	8,000	33,840	4.23	769	10.4
March	12,320	52,114	4.23	1,767	7.0
April	11,680	49,406	4.23	583	20.0
May	7,360	31,133	4.23	450	16.4
June	6,400	27,072	4.23	335	19.1
July	6,400	27,072	4.23	554	11.6
August	13,440	56,851	4.23	860	15.6
September	8,640	36,547	4.23	441	19.6
October 97	5,760	24,365	4.23	462	12.5
Annual total	99,040	418,939		8,557	

Based on this data the electricity consumption figures for Sunshine Village are

$$\text{Current cost of electricity} = 4.23 \text{ J\$/kWh}$$

$$\begin{aligned} \text{Average electricity consumption} &= (99,040 \text{ kWh/year}) / (12 \text{ months/year}) \\ &= 8,253 \text{ kWh/month} \\ &= 34,900 \text{ J\$/month} \end{aligned}$$

$$\begin{aligned} \text{Av electricity consumption per GN} &= (99,040 \text{ kWh/year}) / (8,557 \text{ GN/year}) \\ &= 11.6 \text{ kWh/GN} \end{aligned}$$



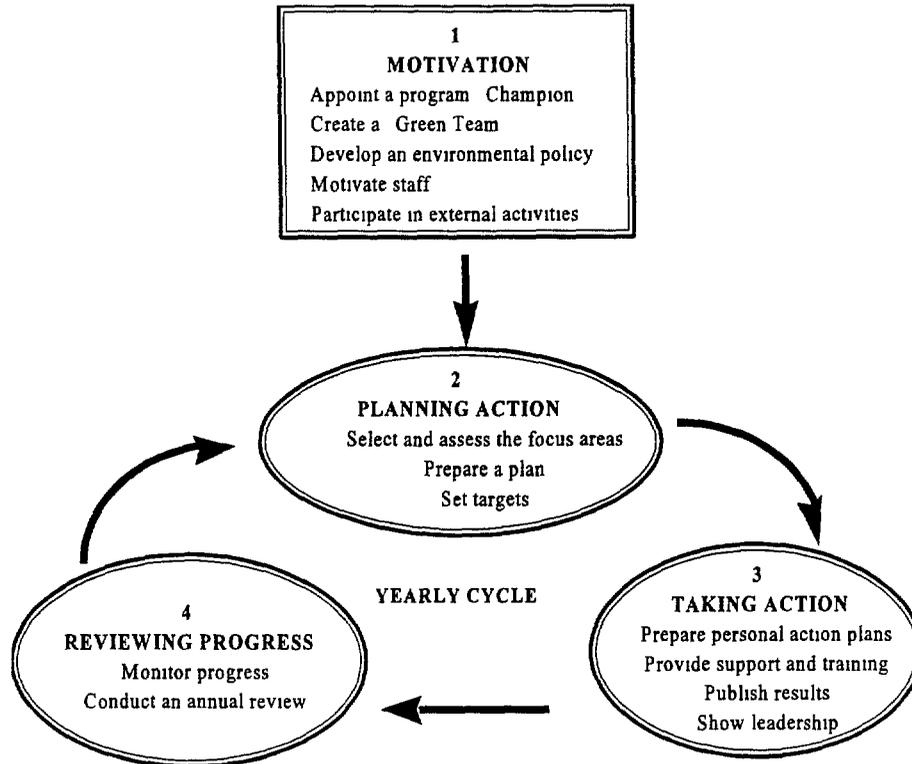
As shown in the table, Sunshine Village's electricity consumption index (i.e., the consumption of electricity per guest night) varies widely throughout the year. In fact, the electricity consumption index for April (20.0 kWh/GN) is more than 3 times greater than that of January (6.4 kWh/GN). Although the electricity consumption index is expected to vary with time because of changes in weather, occupancy rates and guest type, and because of the existence of power loads that are not affected by occupancy (e.g., pool pumps, public area lighting), the 210% increase in electricity consumption per guest night experienced between January and April is exceedingly high.

Sunshine Village should therefore try to define and control the factors responsible for the large fluctuations in the amount of electricity consumed per guest night throughout the year.

### 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 through 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

### 3.2.1 Appoint the environmental program's "Champion"

Once the hotel is ready to move ahead with its environmental program, Sunshine Village 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 Sunshine Village'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 character needed to insure 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 Sunshine Village 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 Sunshine Village**

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 insure 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.

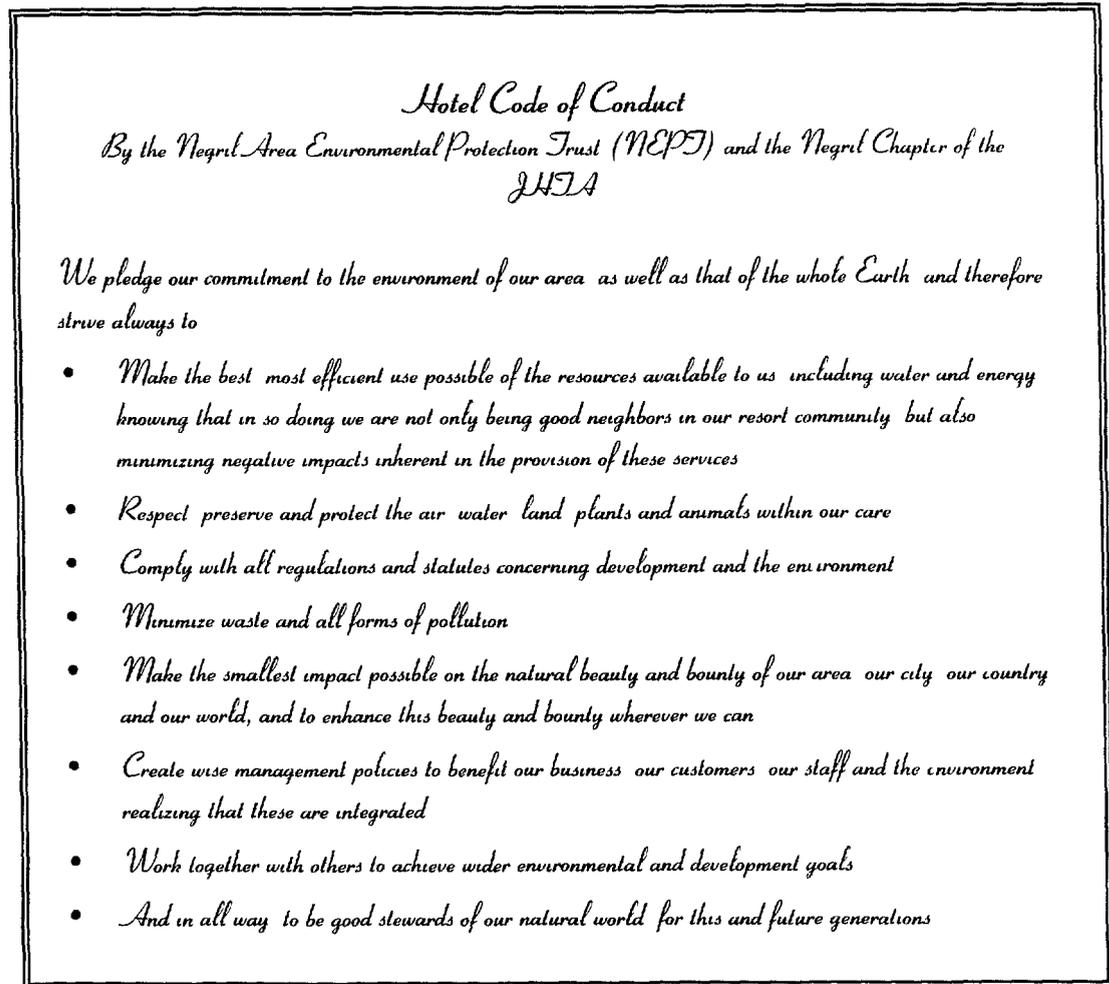
The breadth of the environmental policy adopted by the hotel will define the complexity and magnitude of the environmental management system that will be needed to put the policy’s words into actions. The property is therefore advised to develop a first policy that is appropriate to the nature and scale 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, Sunshine Village 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



### **3 2 4 Motivate the staff**

The hotel does not currently have regular staff meetings Monthly, or at least quarterly, meetings of all employees are important to establishing communication between management and employees and to building staff morale More frequent meetings of department heads will build teamwork among departments and keep everyone apprised of important issues in the hotel It is important that the hotel begin holding meetings of staff and department heads as soon as possible These meetings do not have to be lengthy -- if fact, they will typically be more effective if a brief agenda is set beforehand

Management should use these staff meetings to inform all employees of the environmental 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**

Sunshine Village'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 Negril Chapter of 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 Sunshine Village to further enhance its environmental program is by developing strong community relationships. By actively participating in local civic and environmental activities, Sunshine Village 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 Sunshine Village'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 Sunshine Village 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 Sunshine Village 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 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 forms given in Appendix III illustrate 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.

The audit team recommends that the hotel begin with back-of-house environmental improvements first. Since Sunshine Village has not yet begun a comprehensive environmental effort, it would not be wise to start its program with an initiative such as a Linens and Towels Reuse Program, which solicits guest participation. These types of programs are best implemented (the guests are more likely to willingly participate) when the guest can see that the hotel has made some efforts toward conservation.

### 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 l 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**

Sunshine Village'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 Sunshine Village 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. For instance, the audit team has found that employees at many hotels in Jamaica do not realize that fresh water is 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.

Sunshine Village 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 Sunshine Village 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. Sunshine Village needs to establish good monitoring procedures to insure that the program is working and achieving its objectives. 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 utilities metering 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 Sunshine Village 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 completed targeting and monitoring forms of the initiatives undertaken. Alternatively, management may prefer to use independent consultants if it feels that Sunshine Village 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 Sunshine Village. 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 aspect	Description and rating of the recommended action (H = high, M = moderate, L = low)		
<b>MAINTENANCE DEPARTMENT</b>			
General issues	Action's env impact = H	Cost = L	Cost effectiveness = H
<p>☉ Implement a program to 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</p> <ul style="list-style-type: none"> <li>• define its normal consumption patterns,</li> <li>• identify any unusual shifts in consumption which may indicate equipment problems (e.g., water leaks) or operational problems,</li> <li>• ensure that employees are complying with water, energy and materials conservation guidelines,</li> <li>• ensure the effectiveness of preventive maintenance operations, and,</li> <li>• evaluate the progress of the property's conservation and environmental efforts</li> </ul> <p>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 and the <b>water and electricity consumption should be calculated on a daily basis</b>. The daily monitoring of utility meters requires a minimum amount of labor.</p> <p>Only a regular and comprehensive monitoring program will allow the property to promptly detect and repair water leaks and other costly system failures. During the course of the audit a 20,000 IG/day (4,000 J\$/day) water leak went undetected for several days because the maintenance staff failed to calculate daily water consumption figures from the water meter readings.</p> <p>Samples of water and electricity monitoring forms are presented in Appendix V.</p>			
General issues	Action's env impact = H	Cost = M/H	Cost effectiveness = M
<p>☉ The maintenance department should put in place a formal preventive maintenance program which includes written maintenance schedules and tracks all maintenance activities in a log book. A preventive maintenance program will ensure that the property's equipment runs efficiently and safely, and will maximize the service life of the equipment.</p> <p>A copy of a typical preventive maintenance checklist was given to the maintenance department during the course of the audit.</p>			

Env aspect	Description and rating of the recommended action (H = high, M = moderate, L = low)		
General issues	Action's env impact = H	Cost = L	Cost effectiveness = H
<p>⊗ Management should define a procedure that will allow employees to report maintenance issues to the maintenance department in a rapid and effective manner. Examples of effective maintenance request procedures include</p> <ul style="list-style-type: none"> <li>• filling out maintenance request forms which are submitted to the department supervisor or the maintenance department</li> <li>• transmitting the maintenance requests to a central operator (possibly the hotel's telephone operator) who is then responsible for filling out the request forms and transferring them to the maintenance department</li> </ul> <p>To ensure accountability and success the maintenance requests and the maintenance department's actions must be documented and filed in a maintenance log book</p>			
Water use	Action's env impact = H	Cost = see specific actions	Cost effectiveness = see specific actions
<p>⊗ Water consumption at Sunshine Village Hotel (328 gallons per guest night) is greater than the industry average for a water efficient property (96 gallons per guest night). Given the high cost of NWC water (207 J\$/1,000 gallons), it is in this property's best interest to engage in an aggressive water conservation program</p>			
Water use	Action's env impact = H	Cost = L	Cost effectiveness = H
<p>⊗ Promptly fix all leaks in faucets, toilets and pipes and ensure that all plumbing fixtures are in proper working order. The audit team found several creeping toilets while inspecting the property, suggesting that Sunshine Village should improve its leak detection, reporting and repair program in addition to implementing a preventive maintenance program</p> <p>Since a single dripping tap can waste up to 10,000 IG/year (2,000 J\$/year) and an overflowing toilet can easily lose 720 IG/day (145 J\$/day), Sunshine Village could greatly benefit from improving its maintenance operations</p> <p><b>This recommendation is analyzed in Project 1</b></p>			
Water use	Action's env impact = M	Cost = L	Cost effectiveness = H
<p>⊗ Install faucet aerators wherever possible. Many faucets in Sunshine Village's guest bathrooms, kitchenettes, public restrooms and employee changing rooms are not equipped with flow aerators. The absence of these low-cost water-saving devices contributes to the excessive consumption of water at Sunshine Village</p> <p>The use of flow aerators is particularly important in places where taps are used frequently or are left running for long periods of time</p> <p><b>This recommendation is detailed in Project 2</b></p>			

Env aspect	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
<p>☉ In addition to installing flow aerators the high 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 can be adjusted to reduce the water pressure acting on the faucets and thereby reduce the maximum flow output of the faucets.</p> <p>Sunshine Village should use this technique to regulate the output of its older faucets which cannot accommodate flow aerators and which cannot be economically replaced by new faucets.</p>			
Water use	Action's env impact = M	Cost = M	Cost effectiveness = M
<p>Sunshine Village and the shop owners should consider installing 'hands free' faucets (spring loaded or infrared) in the mall's public bathrooms. During two visits to the mall's public bathrooms the auditors discovered 3 faucets that had not been properly shut off or not shut off at all.</p> <p>Since a running faucet can easily waste 120 IG/hour until it is detected and shut off installing "hands free" faucets in unsupervised public toilets should significantly reduce the volume of water used by the complex.</p>			
Water use	Action's env impact = M	Cost = M	Cost effectiveness = M
<p>Water pressure at Sunshine Village is generally low (20 psi during daytime to 60 psi during the middle of the night) and affects the quality of the guest room showers. Guest bathrooms are equipped with conventional shower heads that are designed to operate at pressures of 60 to 80 psi and therefore perform poorly under the pressure conditions that prevail at Sunshine Village. Depending on location and time of the day these shower heads produce a trickle of water which ranges from 0.4 to 1.0 IG/min. The quality of the showers is often so poor that it may encourage guests to take baths. Since baths consume on average 4 times more water than showers Sunshine Village should ensure that its guest room shower heads perform properly.</p> <p>Sunshine Village should consider installing in its guest rooms low-flow shower heads which are specifically designed for low pressure conditions. A properly selected low-flow shower head consumes 1.0 to 2.0 IG/min while providing a shower that "feels good". The cost of a low-flow shower head ranges from 300 to 850 J\$.</p>			

Env aspect	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
<p>⊗ Install low-flow shower heads in the employee bathrooms</p> <p>The two employee showers are not equipped with shower heads and consume more than 20 IG/minute. Given the high output of these showers and the fact that most employees shower before returning home, it is in Sunshine Village's best interest to install low-flow shower heads in employee bathrooms.</p> <p>If Sunshine Village is concerned about theft problems, it should consider purchasing theft-proof shower heads. Several manufacturers sell theft-proof models, the theft-proof feature generally increases the cost of the shower head by less than 50 J\$.</p>			
Water use	Action's env impact = L	Cost = L	Cost effectiveness = H
<p>⊗ Ensure that all guest bathroom and kitchenette sinks are equipped with stoppers which seal properly. The lack of properly fitting stoppers forces guests to use running faucets when shaving, washing clothes, washing dishes, etc. Only 3 of the 8 guest bathrooms and kitchenette sinks inspected by the audit team had properly working stoppers.</p> <p>⊗ 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. All of the tub stoppers inspected by the audit team were in proper working order.</p> <p>⊗ Since baths consume on average 4 times more water than showers, Sunshine Village may want to discourage guests from taking baths. In such a case, Sunshine Village should remove all tub stoppers or dismantle all tub stopper mechanisms.</p>			

Env aspect	Description and rating of the recommended action (H = high, M = moderate, L = low)		
Water use	Action's env impact = M	Cost = L	Cost effectiveness = M
<p>Install flow diverters in the water tanks of conventional toilets (i.e. toilets that are equipped with large water tanks and therefore use between 3.3 to 4.2 IG per flush). Flow diverters fit at the end of the hose that feeds water to the toilet bowl's refill pipe, and divert to the water tank part of the flow that would otherwise drain to the toilet bowl.</p> <p>Flow diverters can therefore be used to</p> <ol style="list-style-type: none"> <li>1) regulate the amount of water used to refill the toilet bowl,</li> <li>2) set a suitable water level in the toilet bowl (very often the water level in the toilet bowl is unnecessarily high), and</li> <li>3) avoid overfilling the toilet bowl (once the water reaches the maximum allowable level in the bowl, all additional water added to the bowl is automatically discharged from the toilet).</li> </ol> <p>Flow diverters can be easily installed on most conventional toilets and can save from 0.4 to 0.8 IG per flush.</p> <p><b>This recommendation is analyzed in Project 3</b></p>			
Water use	Action's env impact = M	Cost = L	Cost effectiveness = M/H
<ul style="list-style-type: none"> <li>▶ Install displacement devices in the water tanks of conventional toilets (i.e. toilets that are equipped with large tanks and therefore use between 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).</li> <li>⊙ Adjust float valves to achieve a consistent and reasonable water depth in all toilet 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.</li> </ul> <p><b>This recommendation is analyzed in Project 4</b></p>			
Water use	Action's env impact = M	Cost = L/M	Cost effectiveness = L/M
<ul style="list-style-type: none"> <li>• 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).</li> <li>• Replace conventional toilets with 1.3 IG/flush toilets in frequently used public or employee restrooms.</li> </ul> <p><b>This recommendation is analyzed in Project 5</b></p>			

Env aspect	Description and rating of the recommended action (H = high, M = moderate, L = low)		
Water use	Action's env impact = H	Cost = M	Cost effectiveness = M
	<p>☉ Management should consider collecting the rainwater which falls on the property's rooftops. Collected rainwater could be used to irrigate the grounds, fill up the pool after backwashing the sand filter, and clean walkways and other paved surfaces.</p> <p><b>This recommendation is analyzed in Project 6</b></p>		
Energy use	Action's env impact = M	Cost = L	Cost effectiveness = M
	<p>Although pool and Jacuzzi filter pumps are generally operated continuously, experience shows that water quality can be maintained by running the filter pumps for only 12 to 16 hours per day. Sunshine Village should therefore consider shutting off its pool pump and, possibly, its Jacuzzi pump at night in order to save energy and increase the service life of the pumps.</p> <p><b>This recommendation is analyzed in Project 7</b></p>		
Energy use Lighting	Action's env impact = M	Cost = M	Cost effectiveness = M
	<p>There is a large number of incandescent bulbs used around the property. Wherever possible, Sunshine Village 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 (&gt; 8 hours per day).</p> <p><b>This recommendation is analyzed in Project 8</b></p>		
Energy use Lighting	Action's env impact = M	Cost = L/M	Cost effectiveness = M
	<p>Lights are often left on in the equipment room, pool pump room, employee bathrooms, and storage areas. The hotel should consider installing timers or occupancy sensors in these areas to reduce the operating time of these lights.</p> <ul style="list-style-type: none"> <li>• A timer is operated just like a switch, but it turns the lights on for a specified period of time (generally 15 to 30 minutes) and automatically turns them off at the end of the allotted time. Some timer models will flash the lights or produce a sound to warn anyone present that the lights are about to go off. If someone is still in the room, he or she can simply reset the timer to keep the lights on.</li> <li>• An occupancy sensor automatically turns the lights on whenever someone enters the room, leaves them on for a specified period of time, and turns them off if no one is detected in the room at the end of the allotted time.</li> </ul> <p>Timers and occupancy sensors are inexpensive and pay for themselves fairly quickly.</p>		

Env aspect	Description and rating of the recommended action (H = high, M = moderate, L = low)		
Energy use Lighting	Action's env impact = M	Cost = L	Cost effectiveness = H
	<p>☉ Turn the lights off in all areas which receive enough natural light during daytime. Examples of areas which do not require artificial lighting during the day include the switch room and the back-of-house corridors.</p>		
Energy use Lighting	Action's env impact = M	Cost = L	Cost effectiveness = H
	<p>☉ 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 use from two 60 W bulbs up to two 100 W bulbs.</p> <p>Consider that installing two 100 W bulbs instead of two 60 W bulbs in a guest bathroom increases Sunshine Village's energy bill by 270 J\$ over the life of the bulbs (2 x 800 hours). Since the cost of the additional energy consumption is equivalent to the cost of eleven 60 W bulbs, Sunshine Village's management should ensure that an adequate stock of low to medium wattage bulbs is kept on hand at all times.</p>		
Energy use Lighting	Action's env impact = M	Cost = L	Cost effectiveness = H
	<p>☉ 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 bathrooms.</p> <p>Dusty or dirty bulbs give 1/3 less light and therefore waste approximately 1/3 of the energy consumed. For example, a clean 40 W bulb produces as much light as a dirty 60 W bulb and saves 75 J\$ worth of electricity over the life of the bulb.</p>		
Energy use Air-conditioning	Action's env impact = M	Cost = L/M	Cost effectiveness = M/H
	<p>☉ Many of the property's doors and louvered windows are loose and allow large volumes of hot and humid air to seep into air-conditioned areas and guest rooms. The maintenance staff should install durable weather stripping on the louvers and doors in order to reduce the heat gain in air-conditioned areas and the energy consumed by the air conditioners.</p>		

Env aspect	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 = H
<p>⊙ The audit team found that many of the air filters in Sunshine Village's air-conditioning units were extremely dirty. Air filters are thin foam pads or meshes which are fitted directly over the evaporator coils. They must be periodically cleaned (approximately once a month) in order to preserve an unobstructed flow of air to the evaporator coils and prevent the growth of fungi or other organisms in the accumulated dust. A clogged filter forces the fan motor to work harder, reduces the efficiency of the air conditioning unit and may affect the air quality in the guest room.</p> <p>To clean the air filters, follow the following steps:</p> <ul style="list-style-type: none"> <li>• remove the filter from the unit,</li> <li>• wash it with a mild detergent,</li> <li>• rinse it clean,</li> <li>• shake out excess water, and</li> <li>• air dry before re-inserting it in the air conditioning unit.</li> </ul>			
Energy use Air-conditioning	Action's env impact = M	Cost = L	Cost effectiveness = H
<p>⊙ The hotel should use the timer feature of the air-conditioners in offices and work areas to ensure these units are not left on at night. They currently operate all night, wasting energy for at least 12 hours each day. If the timers do not work properly, management should make one employee responsible for turning the units off at the end of each day.</p> <p>Most of Sunshine Village's air-conditioning units have a rated output of 4.5 kW and can be assumed to have an average output of 2.0 kW. If one such unit is left needlessly operating overnight (12 hours) of a period of one year, it will waste 8,800 kWh of energy and add 37,000 J\$ to the property's electricity bill.</p>			
Energy use Air-conditioning	Action's env impact = M	Cost = H	Cost effectiveness = M
<p>In order to reduce the use of air-conditioning in guest rooms, Sunshine Village should consider implementing the following measures:</p> <ul style="list-style-type: none"> <li>• Insulate the roofs of the guest rooms. The existing roof structure (a single layer of dark and loose wooden shingles) transmits a significant amount of heat inside the rooms.</li> <li>• Add ceiling fans in all guest rooms and encourage guests to use them. Currently, most guests at Sunshine Village are forced to constantly rely on air-conditioning because the natural draft through guest room windows is generally not sufficient to keep the room reasonably cool (even during nighttime).</li> <li>• Cover with glass or plexiglass the open louvers that are located under the crown of the roof at each end of the guest bedrooms. This recommendation should be implemented in particular in all guest rooms that are exposed to the steady sea breezes.</li> </ul>			

Env aspect	Description and rating of the recommended action (H = high, M = moderate, L = low)		
Energy use Refrigeration	Action's env impact = M	Cost = L/M	Cost effectiveness = M
	<ul style="list-style-type: none"> <li>• Provide maintenance to the guest room refrigerators In some of these units the seals are in poor condition and the doors do not shut properly</li> <li>• Periodically dust off the refrigerator coils to keep them operating efficiently</li> </ul>		
Solid waste generation	Action's env impact = H	Cost = M	Cost effectiveness = M
	<p>☉ Sunshine Village should implement a hotel-wide recycling program to segregate glass plastics, metal, cardboard, paper, and green waste from its general waste stream</p> <p><b>This recommendation is analyzed in Project 9</b></p>		

Env aspect	Description and rating of the recommended action (H = high, M = moderate, L = low)		
<b>FRONT OFFICE AND PURCHASING DEPARTMENT</b>			
Solid waste generation	Action's env impact = H	Cost = L	Cost effectiveness = N/A
<p>☉ The hotel should 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 By using recycled paper products Sunshine Village will help foster the market for recycled products in Jamaica and convey its concern for the environment to its guests</p>			
Solid waste generation	Action's env impact = L	Cost = M/H	Cost effectiveness = L
<p>The hotel should consider converting to a computerized reservation and accounting system This conversion will reduce paper waste and will provide the front office with a more reliable cost-tracking system</p>			

Env aspect	Description and rating of the recommended action (H = high, M = moderate, L = low)	
<b>GUEST ROOMS AND HOUSEKEEPING</b>		
General issues	Action's env impact = M	Cost = L
<p>Cost effectiveness = H</p> <p>☉ Create a checklist, or personal action plan for housekeepers to ensure they are aware of and comply with the conservation measures adopted by Sunshine Village. Examples of items that should be included in this checklist include</p> <ul style="list-style-type: none"> <li>• Turn the a/c off (or lower the a/c setting) when entering the room</li> <li>• Make sure the a/c units are not obstructed by drapes or furniture</li> <li>• Before leaving the guest room, turn off all lights, televisions and radios, ensure that faucets and toilets are not running, close all louvers and windows (if the a/c is left on or if the room is cool)</li> <li>• Check for and report malfunctioning equipment and fixtures. 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</li> <li>• Do not replace the trash can liners (plastic bags) unless these are soiled or otherwise unacceptable for further use</li> <li>• Collect and separate all recyclable items left in guest rooms</li> <li>• Remove used soaps and amenities only at checkout</li> </ul> <p>A sample "Personal action plan" for housekeepers is provided in Appendix IV</p>		
Water use / energy use	Action's env impact = M	Cost = L
<p>Cost effectiveness = H</p> <p>☉ Let guests decide if they want to replace their linens and towels every day. International and Jamaican (JHTA) experience has revealed that this measure can reduce the laundry load by up to 40%.</p> <p>By reducing the amount of dirty laundry produced, Sunshine Village Hotel will be able to directly lower its laundry costs. This property's laundry is currently processed by a local business at a cost of 13.5 J\$/lb, last March Sunshine Village spent more than 60,000 J\$ to process 4,650 lb of laundry.</p> <p><b>This recommendation is analyzed in Project 10</b></p>		
Water use / energy use	Action's env impact = M	Cost = L
<p>Cost effectiveness = H</p> <p>☉ Currently, Sunshine Village washes its guest bedspreads after every checkout. This practice</p> <ol style="list-style-type: none"> <li>1) increases this property's laundry costs, and</li> <li>2) increases the wear and tear on the bedspreads forcing Sunshine Village to replace them more frequently.</li> </ol> <p>Since many hotels wash their bedspreads only once per month, and more often only if needed, Sunshine Village should consider modifying its current practices.</p>		

Env aspect	Description and rating of the recommended action (H = high, M = moderate, L = low)		
Energy use	Action's env impact = M	Cost = L	Cost effectiveness = H
<p>☉ Many guests leave the air-conditioners running and lights on after leaving their rooms. Sunshine Village 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. Attractive energy and water conservation signs can be readily purchased from the CHA or other similar organizations.</p> <p>Other actions that can be taken by Sunshine Village to reduce the energy consumed by its a/c units include:</p> <ul style="list-style-type: none"> <li>• When entering a guest room, housekeepers should turn the a/c units off or, if this is unacceptable to the guests, adjust the a/c thermostat to a "low cool" setting.</li> <li>• If the room is cool or if the air-conditioner is on, housekeepers should keep the guest room door closed during guest room preparation. This practice 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.</li> <li>• Investigate the possibility of controlling the operation of the a/c units with infrared sensors and magnetic door switches.</li> </ul>			
Solid waste generation	Action's env impact = M	Cost = L	Cost effectiveness = H
<p>☉ The housekeepers currently throw away the used soap bars that are removed from guest rooms at checkout. In order to save money and reduce waste, these soap bars should be collected and reused around the property, or given to staff or charities. Soap bars can be used in employee bathrooms and used (either as bars or as home-made liquid soap) to carry out a variety of cleaning operations, such as washing walkways. Small pieces of soap, which cannot be conveniently reused, can be collected, melted down (using a small amount of water and low heat), and cast in a suitable mold to produce a large and functional bar of soap.</p>			
Solid waste generation	Action's env impact = M	Cost = L	Cost effectiveness = H
<p>☉ Sunshine Village should ensure that housekeepers have enough canvas bags to collect the laundry from guest rooms. Because of a shortage of canvas bags, housekeepers are often forced to use disposable plastic bags to carry out this task. Since disposable plastic bags cost money and increase the volume of solid waste generated by Sunshine Village, their use should be avoided whenever possible.</p> <p>Several hotels use their old bed sheets to make their own laundry bags.</p>			

Env aspect	Description and rating of the recommended action (H = high, M = moderate, L = low)		
Solid waste generation	Action's env impact = M	Cost = L/M	Cost effectiveness = M/H
	<ul style="list-style-type: none"> <li>• The large trash cans used in the guest room kitchenettes should be replaced with smaller trash cans. These cans are much too large for the amount of trash produced by the guests and require the use of enormous and probably expensive plastic liners.</li> </ul> <p>Smaller trash cans would be less cumbersome and would use smaller, cheaper and less wasteful plastic liners.</p> <ul style="list-style-type: none"> <li>⊙ Ensure that housekeepers replace the trash can liners only if these are soiled or otherwise unacceptable for further use. The auditors noted that several housekeepers routinely remove and discard the plastic liners even if they contain a small amount of "clean" dry waste. Whenever possible, housekeepers should empty the trash cans into a collection bag or a reusable container instead of pulling out the liner along with its contents.</li> </ul>		

Env aspect	Description and rating of the recommended action (H = high, M = moderate, L = low)		
<b>BAR</b>			
Solid waste generation	Action's env impact = L	Cost = L	Cost effectiveness = M
Buy reusable coasters to replace the paper napkins that are currently used as coasters Cork or cardboard coasters are more effective since they don't disintegrate when wet generate less waste and save money in the long run			
Solid waste generation	Action's env impact = M	Cost = L	Cost effectiveness = H
<ul style="list-style-type: none"> <li>☉ Discontinue the practice of supplying guests with new plastic cups for each drink they order at the bar If a guest orders the same beverage twice offer to refill the cup as an alternative to giving a new cup This measure will reduce the amount of trash produced by the pool bar and save the property money</li> </ul>			
Solid waste generation	Action's env impact = L	Cost = L	Cost effectiveness = H
<ul style="list-style-type: none"> <li>☉ Do not give straws out automatically with drinks Place a straw dispenser on the bar or ask guests if they need a straw before serving the drinks</li> </ul>			

Env aspect	Description and rating of the recommended action (H = high, M = moderate, L = low)		
<b>POOL AND GROUNDS</b>			
Water use	Action's env impact = M	Cost = L	Cost effectiveness = H
<p>☉ Currently the pool caretaker backwashes the pool filter every one or two days without taking into consideration the filter pressure</p> <p>Backwashing the sand filter too frequently wastes water and does not necessarily improve the performance on the sand filter. Generally, the frequency of backwash operations should be based on filter pressure as opposed to a fixed scheduled. Sand filters operate best when they are slightly dirty; the impurities contained in the filter help capture particles from the pool water as it passes through the layer of sand.</p> <p>According to manufacturer guidelines, pool filters should generally be backwashed only when the filter pressure rises by 6 to 10 psi over the clean filter pressure (i.e., the pressure generated in a recently backwashed filter). The clean filter pressure at Sunshine Village is approximately 10 psi, therefore the system should not be backwashed until the filter pressure reaches at least 16 psi. It was observed that after 48 hours of constant operation, the filter pressure rises to approximately 15 psi.</p>			
Water use	Action's env impact = M	Cost = L/M	Cost effectiveness = M
<p>All hoses should be equipped with spray nozzles to prevent hoses from running continuously when not in use.</p>			
Solid waste generation	Action's env impact = H	Cost = M	Cost effectiveness = M
<p>☉ Sunshine Village should start a composting program for its yard waste and some of its paper waste. The principal benefits of a composting program are:</p> <ol style="list-style-type: none"> <li>1) Composting will reduce the volume of garbage sent by this property to the local dump.</li> <li>2) Composting will allow the property to reduce the frequency and cost of garbage collection. Currently, Sunshine Village pays 195,000 J\$ per year to have its garbage hauled away every day. Since most putrescible materials can be sent to a compost pile, starting a composting program will eliminate the odor problems that are generally associated with storing garbage for longer than one day.</li> <li>3) Composting will provide Sunshine Village with an ample supply of soil conditioner for its gardens and green areas.</li> </ol> <p><b>Information on composting operations is provided in Project 11</b></p>			

## 5. Detailed Analysis of Selected Recommendations

### Project I: Implement an effective leak prevention program

#### Summary of results and benefits

- Reduces the amount of water consumed by the complex by more than 1,200,000 IG/year
- ▶ Saves the property at least 120,000 J\$/year
- ▶ Reduces the volume of wastewater discharged to the property's septic tanks and tile fields, thereby improving the performance of the on-site wastewater disposal systems

#### Current situation

- ▶ Many of Sunshine Village's plumbing fixtures, and in particular its toilets, are poorly maintained and waste a significant amounts of water. In fact, 5 of the 20 toilets inspected by the audit team had leaks

Some of the major leaks detected at Sunshine Village are presented in the following table

Location	Type of problem	Measured leak
Toilet in room 22	Creeping flapper valve	200 IG/day
Toilet in Sunshine Village's employee bathroom	Float valve is set too high and water drains off through the water tank's overflow pipe. The flat board which covers the tank pushes the float valve down and increases the magnitude of the leak	1,340 IG/day
Toilet in women's public bathroom (by the bank)	Float valve is set too high and water drains off through the water tank's overflow pipe	1 800 IG/day

These three toilets alone lose 3,340 IG each day and account for more than 20% of the average amount of water consumed each day by the complex

- ▶ Since the auditors inspected fewer than 50% of the toilets in this complex, it can be safely assumed that by implementing an effective detection and repair program the complex could reduce its water consumption by at least 100,000 IG/month

#### Recommendations

Sunshine Village should implement an effective leak detection, reporting and repair program and a comprehensive preventive maintenance program for its plumbing fixtures. In order to be effective,

these programs will need to benefit from the support of management and the collaboration of all employees

All staff members -- and in particular housekeepers -- 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 maintenance requests and conduct a regular and effective preventive maintenance program. The preventive maintenance program should include 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 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 damaged stopper mechanism and replace leaking stoppers
- Check for broken toilet flush 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 water of more than 0.5 IG/min

The cost of these maintenance operations is generally minimal and, as shown above, the resulting savings can be significant.

## Project 2: Install flow aerators on all faucets

### Summary of results and benefits

- ▶ Reduces water consumption and wastewater generation by 6,600 IG/year, corresponding to savings of 680 J\$/year for each flow aerator installed on a typical faucet
- ▶ Saves energy and money by reducing the use of hot water from faucets
- ▶ Improves the performance of the on-site wastewater disposal systems
- ▶ The payback period of this water conservation measure is typically 2 to 4 weeks

#### Current situation

- ▶ Most faucets in guest rooms, back-of-house areas and public areas are not equipped with flow aerators. In fact, only 7 of the 20 faucets inspected in guest rooms, public restrooms and employee bathrooms were equipped with these water-saving devices

The effectiveness of using aerators at Sunshine Village can be illustrated by the following measurements taken in two guest rooms

- Maximum output of kitchenette faucet with an aerator (room 14) 0.8 IG/min
- Maximum output of kitchenette faucet without an aerator (room 6) 1.7 IG/min
- Savings achieved by the faucet aerator 0.9 IG/min

- ▶ Sunshine Village pays for 50% of the water consumed in the complex

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 0.4 to 2.1 IG/min. 0.4, 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. The flow generated by an aerator varies with water pressure and, in most instances, its actual output is well below its maximum rated output.

The use of flow aerators is particularly important on faucets that are used frequently (e.g., public and employee restrooms), are left running for long periods of time, or have exceedingly high outputs. Flow aerators also save energy by reducing the amount of hot water drawn from faucets.

#### Input, assumptions and calculations

- a) Calculation of the savings achieved by installing a flow aerator on a typical public area faucet
  - ▶ Assume a typical public area faucet is operated for 20 minutes per day
  - ▶ Assume the flow of a typical faucet with no aerator is 1.7 IG/min. By installing an aerator, this flow can be reduced to less than 0.8 IG/min
  - ▶ The cost of water is 207 J\$/1,000 IG

- ▶ Since Sunshine Village pays for only half of the water bill, it will benefit from only 50% of the total savings achieved by this measure

$$\begin{aligned}
 \text{Total water savings} &= (20 \text{ min/day/faucet}) \times (1.7 \text{ IG/min} - 0.8 \text{ IG/min}) \times (365 \text{ days/year}) \\
 &= 6,600 \text{ IG/faucet/year} \\
 &= (6,600 \text{ IG/faucet/year}) \times (207 \text{ J\$/1,000 IG}) \\
 &= 1,360 \text{ J\$/faucet/year}
 \end{aligned}$$

$$\begin{aligned}
 \text{Sunshine V savings} &= 50\% \times 1,360 \text{ J\$/faucet/year} \\
 &= 680 \text{ J\$/faucet/year}
 \end{aligned}$$

b) Calculation of the implementation cost and payback period

- The cost of a faucet aerator ranges from 30 to 60 J\$

$$\text{Implementation cost} = 60 \text{ J\$/faucet}$$

$$\begin{aligned}
 \text{Payback period} &= (\text{implementation cost}) / (\text{annual savings}) \\
 &= (60 \text{ J\$/faucet}) / (680 \text{ J\$/faucet/year}) \\
 &= 1 \text{ month}
 \end{aligned}$$

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 total 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	1,650	340	2 months	> 8 years
10	3,300	680	1 month	4.4 years
20	6,600	1,360	2 weeks	2.2 years
40	13,200	2,720	8 days	1 year
60	19,800	4,080	< 6 days	< 9 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 1.7 IG/min reduced to 0.8 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 3: Install flow diverters in toilet tanks

### Summary of results and benefits

- ▶ Reduces water consumption and wastewater generation by 36,200 IG/year if flow diverters are installed in 60% of the property's toilets
- ▶ Saves the property 3,750 J\$/year in reduced water bills
- ▶ Improves the performance of the on-site wastewater disposal systems
- ▶ The payback period for this recommendation is 9 months

### Current situation

- ▶ All guest bathrooms and public restrooms are equipped with conventional toilets which consume from 3.3 to 4.2 IG per flush. None of the toilets inspected had any type of water conservation device in place.
- ▶ Since toilets may account for up to 40% of water consumption, this property should be concerned about optimizing water use in its toilets.
- ▶ The maintenance staff of Sunshine Village is responsible for the upkeep of the mall's public restrooms, and the hotel pays for 50% of the water consumed in the complex.

### 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 overflowing 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 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 savings resulting from the use of flow diverters
  - ▶ There are 32 toilets in guest rooms, 14 in public restrooms and 2 in employee restrooms
  - ▶ Assume 4 flushes per guest night in guest bathrooms, and an average of 20 flushes/day/toilet in public and employee 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 207 J\$/1,000 IG
- ▶ The hotel has an occupancy of 8 557 guest nights per year
- ▶ Since Sunshine Village pays for only half of the water bill, it will benefit from only 50% of the total savings achieved by this measure

$$\begin{aligned}
 \text{Total water savings} &= 60\% \times [(4 \text{ flushes/GN}) \times (0.4 \text{ IG/flush}) \times (8,557 \text{ GN/year}) \\
 &\quad + (20 \text{ flushes/day/toilet}) \times (16 \text{ toilets}) \times (0.4 \text{ IG/flush}) \times (365 \text{ days/yr})] \\
 &= 36,200 \text{ IG/year} \\
 &= (36,200 \text{ IG/year}) \times (207 \text{ J\$/1,000 IG}) \\
 &= 7,500 \text{ J\$/year}
 \end{aligned}$$

$$\begin{aligned}
 \text{Sunshine V savings} &= 50\% \times 7,500 \text{ J\$/year} \\
 &= 3,750 \text{ J\$/year}
 \end{aligned}$$

b) Calculation of the implementation cost and payback period

- ▶ Flow diverters cost approximately 100 J\$/unit

$$\begin{aligned}
 \text{No. of diverters purchased} &= 60\% \times (32 + 16) \\
 &= 29 \text{ units}
 \end{aligned}$$

$$\begin{aligned}
 \text{Total implementation cost} &= (100 \text{ J\$/unit}) \times (29 \text{ units}) \\
 &= 2,900 \text{ J\$}
 \end{aligned}$$

$$\begin{aligned}
 \text{Payback period} &= (2,900 \text{ J\$}) / (3,750 \text{ J\$/year}) \\
 &= 9 \text{ months}
 \end{aligned}$$

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 US\$/unit. Shipping 50 to 100 flow diverters from the US to Jamaica costs approximately 10 US\$.

## 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 36 200 IG/year if displacement devices are installed in 60% of the property's toilets
- ▶ Saves the property 3,750 JS/year in reduced water bills
- ▶ Improves the performance of the on-site wastewater disposal systems
- ▶ The payback period for this recommendation is 4 months

### Current situation

- ▶ All guest bathrooms and public restrooms are equipped with conventional toilets which consume from 3.3 to 4.2 IG per flush. None of the toilets inspected had any type of water conservation device in place.
- ▶ A total of 19 toilets were inspected during the course of the audit. In 12 of these (63%), the water depth in the toilets' water tanks was higher than necessary (the recommended water level is often indicated by a mark drawn inside the water tank). In one particular case, the water level rose 1 inch above the recommended water mark, and thus this toilet used in every flush 0.5 IG of water more than required by the manufacturer.
- ▶ The maintenance staff of Sunshine Village is responsible for the upkeep of the mall's public restrooms, and the hotel pays for 50% of the water consumed in the complex.

### Recommendations

- ▶ Whenever possible, equip all conventional toilets with displacement devices which 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 devices must be compatible with the existing toilets and not interfere with the flush mechanisms.
- ▶ 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 the savings resulting from installing displacement devices in the property's toilets

- ▶ There are approximately 32 toilets in guest rooms, 14 in public restrooms and 2 in employee restrooms
- ▶ Assume 4 flushes per guest night in guest bathrooms, and an average of 20 flushes/day/toilet in public and employee 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 207 J\$/1,000 IG
- ▶ The hotel has an occupancy of 8,557 guest nights per year
- ▶ Since Sunshine Village pays for only half of the water bill, it will benefit from only 50% of the total savings achieved by this measure

$$\begin{aligned}
 \text{Total water savings} &= 60\% \times [(4 \text{ flushes/GN}) \times (0.4 \text{ IG/flush}) \times (8,557 \text{ GN/year}) \\
 &\quad + (20 \text{ flushes/day/toilet}) \times (16 \text{ toilets}) \times (0.4 \text{ IG/flush}) \times (365 \text{ days/yr})] \\
 &= 36,200 \text{ IG/year} \\
 &= (36,200 \text{ IG/year}) \times (207 \text{ J\$/1,000 IG}) \\
 &= 7,500 \text{ J\$/year}
 \end{aligned}$$

$$\begin{aligned}
 \text{Sunshine V savings} &= 50\% \times 7,500 \text{ J\$/year} \\
 &= 3,750 \text{ J\$/year}
 \end{aligned}$$

b) Calculation of the implementation cost and payback period

- ▶ The cost of a commercial displacement device is approximately 170 J\$. Sunshine Village 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

$$\begin{aligned}
 \text{No. of displacement devices} &= 60\% \times (32 + 16) \\
 &= 29
 \end{aligned}$$

$$\begin{aligned}
 \text{Total implementation cost} &= (40 \text{ J\$/toilet}) \times (29 \text{ toilets}) \\
 &= 1,160 \text{ J\$}
 \end{aligned}$$

$$\begin{aligned}
 \text{Payback period} &= (1,160 \text{ J\$}) / (3,750 \text{ J\$/year}) \\
 &= 4 \text{ months}
 \end{aligned}$$

Comments

- ▶ Sunshine Village 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

- ▶ Installing a water-saving toilet in a frequently used public or employee restroom reduces water consumption and wastewater generation by 27,400 IG/year and saves the property 2,840 J\$/year. The payback period for this water conservation measure is 13 months.
- ▶ Improves the performance of the on-site wastewater disposal systems

### Current situation

- ▶ All of this property's toilets consume from 3.3 to 4.2 IG per flush
- ▶ The maintenance staff of Sunshine Village is responsible for the upkeep of the mall's public restrooms, and the hotel pays for 50% of the water consumed in the complex

### 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 (i.e., 1.6 US gallon/flush). Water-saving toilets have become the industry standard in many countries and are readily available in Jamaica. The cost of 1.3 IG/flush toilets is comparable to that of conventional toilets.
- ▶ For all frequently used public or employee restrooms, replace conventional toilets with 1.3 IG/flush toilets

### Input, assumptions and calculations

- a) Calculation of the savings achieved by replacing a conventional toilet with a 1.3 IG/flush toilet in frequently used public or employee restroom
- ▶ Assume that on average a toilet is flushed 30 times per day in a frequently used employee or public restroom (e.g., the mall restrooms)
  - ▶ Water-saving toilets use 1.3 IG/flush while conventional toilets use on average 3.8 IG/flush
  - ▶ The cost of water is 207 J\$/1,000 IG
  - ▶ Since Sunshine Village pays for only half of the water bill, it will benefit from only 50% of the total savings achieved by this measure

$$\begin{aligned} \text{Total water savings} &= (30 \text{ flushes/day/toilet}) \times (3.8 \text{ IG/flush} - 1.3 \text{ IG/flush}) \times 365 \text{ days/year} \\ &= 27,400 \text{ IG/year/toilet} \\ &= 5,670 \text{ J$/year/toilet} \end{aligned}$$

$$\text{Sunshine V savings} = 50\% \times 5,670 \text{ J$/year/toilet}$$

$$= 2,840 \text{ J\$/year/toilet}$$

d) Calculation of the implementation cost and payback for replacing an operational conventional toilet with a 1.3 IG/flush model in a public or employee restroom

- ▶ 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

$$\text{Implementation cost} = 4,000 \text{ J\$/toilet}$$

$$\begin{aligned} \text{Payback period} &= (4,000 \text{ J\$/toilet}) / (2,840 \text{ J\$/year/toilet}) \\ &= 17 \text{ months} \end{aligned}$$

- After the completion of Negril's sewer system and the resulting doubling of water fees, the payback period for this recommendation will be reduced to 8.5 months. 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 Negril 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: Collect and use rainwater for hotel operations

### Summary of results and benefits

- ▶ An 8,000 ft<sup>2</sup> rain catchment will reduce the purchase of NWC water by 188,000 IG/year and save the property 19 500 J\$/year

#### Current situation

On average, the Negril area receives 57 inches of rainfall per year, therefore, each ft<sup>2</sup> of rain catchment surface could theoretically collect 29 4 Imperial gallons of water per year. At the present time, Sunshine Village does not collect any rainwater.

#### Recommendations

Management should consider collecting the rainwater which falls on the property's rooftops. Since rainwater is virtually free, plentiful during at least 6 months of the year, and relatively clean, it is an ideal source of water for irrigation, filling up the pool after backwash operations, and washing walkways and other paved surfaces.

#### Input, assumptions and calculations

##### a) Calculation of the savings resulting from using collected rainwater at Sunshine Village

- ▶ The amount of water consumed by irrigation, filling up the pool and cleaning walkways and other paved surfaces is estimated as follows

Activity	Water use	Water consumption
Irrigation	225 IG/day 180 days/year	40,000 IG/year
Filling up the pool after backwash operations	550 IG/backwash cycle, 1 backwash cycle every 1 to 2 days	130,000 IG/year
Washing walkways and paved surfaces	100 IG/day 300 days/year	30 000 IG/year
Annual total		200,000 IG/year

- ▶ The cost of NWC water is 207 J\$/1,000 IG
- ▶ Assume that Sunshine Village can collect rainwater over a 8,000 ft<sup>2</sup> area (the roof of a single guest room covers approximately 450 ft<sup>2</sup>)
- ▶ Assume that 80% of the rain which falls on the catchment area is collected and stored (i.e.,

20% loss)

- ▶ Since Sunshine Village pays for only half of the water bill, it will benefit from only 50% of the total savings achieved by this measure
- ▶ The precipitation data for Negril is given in the following table

Month	1997 precipitation		30 year mean precipitation	
	mm	IG/ft <sup>2</sup>	mm	IG/ft <sup>2</sup>
Jan	58	1 19	97	1 99
Feb	134	2 74	44	0 90
Mar	15	0 31	57	1 16
Apr	67	1 37	92	1 88
May	212	4 34	164	3 35
Jun	170	3 48	158	3 23
Jul	149	3 05	160	3 26
Aug	157	3 22	175	3 57
Sep	119	2 43	155	3 16
Oct	-	-	180	3 80
Nov	-	-	80	1 64
Dec	-	-	71	1 45
Annual total		-	1 433 mm	29 4 IG/ft <sup>2</sup>

Savings from rainwater collection = 80 % x (29 4 IG/ft<sup>2</sup>/year) x 8,000 ft<sup>2</sup>  
 = 188,000 IG/year  
 = 94% of the water needs for the targetted operations

Sunshine Village savings = 50% x (188,000 IG/year) x (207 J\$/1,000 IG)  
 = 19,500 J\$/year

b) Implementation cost and payback period

- ▶ No information is available at the present time on the cost of a rain collection and storage system. The property should contact a local contractor to obtain a cost estimate for this system
- ▶ Sunshine Village is ideally suited to implement this recommendation because
  - 1) most of this property is covered by rooftops, walkways and other impervious surfaces, and
  - 2) this property is already equipped with a piping system to collect and discharge rainwater to a central storm drain

## Project 7: Reduce the time of operation of the pool filter pump

### Summary of results and benefits

- ▶ Reduces Sunshine Village's energy consumption by 1,640 kWh/year, resulting in savings of 6,950 J\$/year
- ▶ Extends the service life of the pool filter pump
- ▶ The payback period for this recommendation is 3 months

Current situation The swimming pool's filtration system is equipped with a 3/4 HP (0.6 kW) pump which operates 24 hours per day

#### Recommendations

- ▶ Experience shows that, in most cases, pool water quality can be maintained by running the filter pumps for only 12 to 16 hours per day. Sunshine Village should therefore consider shutting off its filter pump at night in order to save energy and to increase the service life of the pump. The pump can either be shut off manually or Sunshine Village may decide to purchase an automatic timer for its pool filter system.
- Sunshine Village should also consider extending this recommendation to its Jacuzzi which is equipped with a 1.5 HP pump that is also operated 24 hours per day.

#### Input, assumptions and calculations

- ▶ Assume that the pool pump can be turned off every day from 10 PM to 8 AM
  - ▶ The pool pump's estimated power draw is 0.45 kW
  - ▶ The cost of energy is 4.23 J\$/kWh
  - ▶ An automatic timer cost less than 1,800 J\$
- a) Calculation of the savings resulting from regularly turning off the pump during nighttime

$$\begin{aligned}
 \text{Energy savings} &= 10 \text{ hr/day} \times 0.45 \text{ kW} \times (365 \text{ days/year}) \\
 &= 1,640 \text{ kWh/year} \\
 &= 6,950 \text{ J$/year}
 \end{aligned}$$

- b) Calculation of the implementation cost and payback period

$$\text{Implementation cost} = 1,800 \text{ J\$}$$

$$\begin{aligned}
 \text{Payback period} &= 1,800 \text{ J\$} / (6,950 \text{ J$/year}) \\
 &= 3 \text{ months}
 \end{aligned}$$

- ▶ If Sunshine Village decides to manually control the operation of its pool pump, the implementation cost of this recommendation would be nil

## Project 8: Upgrade to energy efficient lighting

### Summary of results and benefits

- ▶ Reduces Sunshine Village'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 in guest rooms, gardens and public areas use inefficient incandescent bulbs

Recommendations Wherever possible, replace incandescent bulbs with CF bulbs Although 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 light to produce the same amount of light, CF bulbs also last 10 times longer than 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
27 Watt bulb	replaces a ⇔	100 Watt bulb

### Input, assumptions and calculations

- a) Sample calculation of the savings achieved by replacing a single 75 Watt incandescent bulb, which burns for 12 hours per day, with a 20 Watt compact fluorescent bulb

- ▶ The cost of energy is 4.23 J\$/kWh
- ▶ The characteristics of the incandescent and CF bulbs are as follows

Cost of a 75 W incandescent bulb = 22 J\$/bulb  
 Service life of an incandescent bulb = 800 hours/bulb  
 Cost of a 20 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 75 W incandescent bulb

$$\begin{aligned} \text{Hours of operation} &= 12 \text{ hr/day/lamp} \times 365 \text{ days/year} \\ &= 4,380 \text{ hr/year/lamp} \\ \\ \text{Energy cost} &= 75 \text{ W} \times (4,380 \text{ hr/year/lamp}) \times (4.23 \text{ J\$/kWh}) \\ &= (328 \text{ kWh/year/lamp}) \times (4.23 \text{ J\$/kWh}) \\ &= 1,390 \text{ J\$/year/lamp} \\ \\ \text{Cost to replace burnt bulbs} &= [(4,380 \text{ hr/year/lamp}) / (800 \text{ hr/bulb})] \times (22 \text{ J\$/bulb}) \\ &= (5.48 \text{ bulbs/year/lamp}) \times (22 \text{ J\$/bulb}) \\ &= 120 \text{ J\$/year/lamp} \\ \\ \text{Total operating cost} &= \text{energy cost} + \text{cost to replace burnt bulbs} \\ &= 1,510 \text{ J\$/year/lamp} \end{aligned}$$

a 2) Operating cost of a single lamp equipped with a 20 W compact fluorescent bulb

$$\begin{aligned} \text{Hours of operation} &= 4,380 \text{ hr/year/lamp (same as above)} \\ \\ \text{Energy cost} &= 20 \text{ W} \times (4,380 \text{ hr/year/lamp}) \times (4.23 \text{ J\$/kWh}) \\ &= (87.6 \text{ kWh/year/lamp}) \times (4.23 \text{ J\$/kWh}) \\ &= 370 \text{ J\$/year/lamp} \\ \\ \text{Cost to replace burnt bulbs} &= [(4,380 \text{ hr/year/lamp}) / (10,000 \text{ hr/bulb})] \times 500 \text{ J\$/bulb} \\ &= (0.438 \text{ bulb/year/lamp}) \times 500 \text{ J\$/bulb} \\ &= 219 \text{ J\$/year/lamp} \\ \\ \text{Total operating cost} &= \text{energy cost} + \text{cost to replace burnt bulbs} \\ &= 589 \text{ J\$/year/lamp} \end{aligned}$$

a 3) Savings and payback period for replacing a single 75 Watt incandescent bulb with a 20 Watt compact fluorescent bulb

$$\begin{aligned} \text{Total savings} &= (\text{total operating cost for inc}) - (\text{total operating cost for CF}) \\ &= 1,510 \text{ J\$/year/lamp} - 589 \text{ J\$/year/lamp} \\ &= 921 \text{ J\$/year/lamp} \\ \\ \text{Implementation cost} &= \text{cost of a CF bulb} - \text{cost of an incandescent bulb} \\ &= 500 \text{ J\$/bulb} - 22 \text{ J\$/bulb} \\ &= 478 \text{ J\$/bulb} \\ \\ \text{Payback period} &= (\text{implementation cost}) / (\text{savings for 1 lamp}) \\ &= (478 \text{ J\$/bulb}) / (921 \text{ J\$/year/bulb}) \\ &= 0.52 \text{ years} \end{aligned}$$

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	219 JS/year	292 JS/year	366 JS/year	439 JS/year
60 W	15 W	368 JS/year	490 JS/year	613 JS/year	735 JS/year
75 W	20 W	460 JS/year	614 JS/year	767 JS/year	920 JS/year
100 W	27 W	627 JS/year	836 JS/year	1,045 JS/year	1,254 JS/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 2 years	1 6 year	1 3 year	1 1 year
60 W	15 W	1 3 years	0 98 year	0 78 year	0 65 year
75 W	20 W	1 0 year	0 78 year	0 62 year	0 52 year
100 W	27 W	0 76 year	0 57 year	0 46 year	0 38 year

Some of the specific locations where Sunshine Village could replace incandescent bulbs with compact fluorescent bulbs are listed in the following table

Location	Existing bulb type and W	Quantity of bulbs	Hours of operation
Stairway to rooms	Inc 40 W	4	24
Staff facilities	Inc 40 W	10	24
Courtyard	Inc 40 W	46	12
Employee bathrooms	Inc 40 W	3	12
Pool terrace	Inc 40 W	23	12
Pool bar	Inc 100 W	3	12

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 Negril
- Locate vendors that supply CF bulbs rated for 50 Hz instead of the 60 Hz bulbs commonly found in Jamaica Bulbs with the correct frequency rating will perform better and last longer
- 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

An effective waste management program is built around three basic principles – reduce, reuse and recycle all possible waste streams. Implementing such a program will help Sunshine Village reduce its impact on the environment by decreasing the amount of solid waste it sends to the local dump, and save money by improving its use of materials, resources and energy.

As the first step in its waste management program, Sunshine Village should conduct a waste review to examine the types and quantities of waste generated in its various operations. Once this review is complete, Sunshine Village should evaluate each type of waste and determine if it can be reduced, reused or recycled and thus eliminated from the property's general waste stream. Whatever waste cannot be reduced, reused or recycled will need to be discarded, however, by implementing an effective waste management program a typical property should be able to reduce its generation of solid waste by more than 50%.

### Reduce the generation of waste

Sunshine Village can reduce the impact and the amount of waste it produces by

- using materials efficiently and discarding them only when they are no longer fit for use,
- using durable goods which need to be discarded less frequently,
- avoiding the purchase of excessively packaged goods, and
- minimizing the use of hazardous materials and products which harm the environment

Reducing the generation of waste is obviously the first option that should be considered by Sunshine Village. This approach fosters the efficient use of resources, and reduces the volume of waste material that must be handled by employees and hauled away to the dump. The bulk of the responsibility for reducing waste generation generally lies with management and the purchasing department – they decide what is brought into the property and thereby determine what eventually leaves the property as waste.

The types of waste reduction measures include

- Avoid purchasing items that are excessively packaged (e.g., foods, beverages, amenities, chemicals, cleaning products, appliances). 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, condiments, butter, cereals, syrup, cream, juice). Bulk items are less expensive and create less packaging waste.
- Reduce or eliminate the use of disposable items such as plates, cups, tableware, paper napkins and place mats. In most cases, disposable items can be easily and cost effectively replaced with reusable items, such as durable plastic plates and cups.
- Minimize the use of straws and purchase paper straws.
- Use durable coasters instead of paper napkins which must be replaced with every drink.
- Use cloth napkins instead of disposable doilies for buffet lines, platters and bread baskets.

- Purchase reusable plastic containers to store food in refrigerators and freezers
- Use cloth cleaning rags instead of disposable paper towels
- Use cloth bags or baskets instead of plastic bags to collect and return guest laundry, towels and linens
- Eliminate the use of paper wrap or covers for guest room drinking glasses. Instead, store the drinking glasses upside-down
- Install soap dispensers in guest bathrooms, public bathrooms and employee locker rooms
- Use refillable containers for chemicals and cleaners. For example, replace aerosols with products that can be purchased in bulk and dispensed from refillable pump bottles
- Avoid using laundry, kitchen, or housekeeping detergents which contain phosphates
- Minimize the purchase and control the use of harsh or hazardous chemicals (e.g., drain cleaning agents, solvents, bleach)
- Avoid using battery-powered appliances. If necessary, purchase rechargeable or mercury-free batteries
- Instead of using disposable plastic bags, use canvas bags, wheelbarrows or yard carts to collect garden waste
- Coordinate the property's purchasing process to reduce the number of orders placed with each vendor. This will probably save money and reduce packaging waste

## **Reuse all possible items**

Whenever possible, Sunshine Village should reuse items in their original form for the same or a different purpose rather than disposing of them. If an item cannot be reused on-site, the property should investigate the possibility of selling it or giving it to employees, outsiders, charitable organizations, and local schools or businesses.

Examples of reuse actions include

- Use gray water from guest rooms to irrigate the grounds
- Serve only beverages that are packaged in reusable bottles which can be returned to the manufacturer
- Use the back side of computer and office paper for taking notes and writing internal memos
- Give preference to vendors that supply their products in returnable or refillable containers. For example, Country Bucket provides ice cream in reusable 3-gallon containers, thereby saving the property money and reducing the amount of waste it generates. Someone on the staff should be made responsible for ensuring that all returnable containers are properly sent back to the vendors
- Remove used soap bars from guest bathrooms only at checkout. The used soap bars should be collected and reused around the property or given away to staff or charities. Soap bars can be used in employee bathrooms and used (either as bars or as home-made liquid soap) to carry out a variety of cleaning operations
- Replace trash can liners only when these are soiled or unsuitable for further use
- Repair and reuse damaged furniture or donate it to interested parties
- Serve leftover food in the employee cafeteria or donate it to charities

## Recycle

Many items that cannot be reused in their original form can be sold or given away to processors for recycling. Even if the property does not directly profit from its recycling efforts, diverting items from the waste stream should allow the property to reduce the frequency and the cost of trash collection.

The items which can generally be recycled include

- green waste from kitchen and garden (this material can be composted on-site or sent to a local composting program),
- white paper, mixed paper and newspaper,
- glass bottles and jars,
- plastic bottles and containers made of PET (a plastic typically used for soft-drink and water bottles) and HDPE (a plastic typically used for milk jugs and chemical containers),
- aluminum cans and foil
- steel cans,
- 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)

At the present time, RYCO-JA, a waste oil and grease recycler, is the only company that provides regular recycling services in the Negril area. However, the EAST project, the Negril Chapter of the JHTA and the Negril Area Environmental Protection Trust (NEPT) are collaborating to organize a recycling program for the Negril area by acting as a link between interested properties and Jamaican recycling companies.

Although EAST's survey of Jamaican recycling companies is not yet complete, the companies listed below have already been identified. At the conclusion of this survey, the EAST project will provide Negril properties with an updated list of recycling companies, and details on the requirements related to the collection, sorting, quality, and packaging of the recyclable materials.

### 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 glass available at a site.

Glass recycling bins should be placed in bars, kitchens, housekeeping areas and key public areas. Each bin should be clearly labeled to define what items can be placed in it (e.g., CLEAR GLASS ONLY), and to discourage guests and staff from contaminating its contents with other materials.

**Plastics**

**Wysinco Environmentals, Ltd** Contact - Mrs Pat Wright, (809) 943-9800 As of October 1997 this company only collects PET bottles from schools and specific media-announced pickup points Therefore, Wysinco asks that PET bottles be donated to local schools - the schools can then trade the PET bottles for computers, videos, paint and tools Properties may also bring and sell (8 J\$/kg) the PET bottles directly to the Wysinco Recycling Plant in Spanish Town

Properly labeled PET recycling bins should be placed at key points around the property such as kitchens, bars and housekeeping areas

**Plastic/Metal Drums**

**Kemcan Development Company** Contact - Ms Usherwood, (809) 922-5270 This company recycles plastic and metal drums, and provides pickup services if it can collect 30-50 drums in a single trip Negril properties should consider using this service to dispose of any drums which cannot be returned to the suppliers Sunshine Village should coordinate with other hotels to reduce the number of drums that must be stored by each individual property and increase the frequency of Kemcan's pickup services

**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 This company is prepared to do a special project for the Negril hotels, whereby they will provide hotel stationery and guest cards made from the recycled paper collected by the hotels The cost of the paper recycling service is negotiable

**JA Pottinger & Co , Ltd** Contact - Mr Pottinger or Ms Nadine Higgins, (809) 926-8957 This company collects used paper from properties and exports it for recycling JA Pottinger provides pick-up services if it can collect a full truckload (approximately 50 large garbage bags) from a single property or a cluster of properties The fee paid is negotiable and the company is prepared to meet with EAST/ JHTA to discuss a program for the Negril area

Properly labeled paper recycling bins or containers should be placed in housekeeping areas, the front desk and offices Since paper can be recycled only if it is clean and dry, it should be collected as close to the source as possible, and special care should be taken in its collection, handling and storage to prevent contamination

Another paper recycling option is to sell it to companies such as Exotic Flowers of Montego Bay, that use large quantities of packaging materials

**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 waste kitchen oil and grease which is then used for the production of chicken feed RYCO provides free of charge covered steel drums to store 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 risk of clogging the property's tile fields) and helps Jamaica by reducing the amount of yellow grease that is imported for the production of animal feed

## Project 10: Implement a linen and towel reuse program

Sunshine Village should consider implementing a linen and towel reuse program which lets guests decide when their linens and towels should be replaced. This measure will lower the property's environmental impact and costs by reducing its consumption of laundry water, energy and chemicals. However, Sunshine Village should implement this program only after putting in place a few highly visible initiatives that clearly convey the property's environmental concerns to all its guests. Guests react more positively to a linen and towel program if they can see that the property is truly concerned with the environment, guests don't want to feel like they are making all of the sacrifices or that the hotel is simply trying to save money.

### Towel reuse

The towel reuse portion of this program is straightforward. Guests are asked to leave their towels hanging up if they wish to use them again, and put them on the floor if they would like to have them replaced. The principal concern with a towel reuse program is to ensure that housekeepers comply with the guest's requests. In many cases, housekeepers routinely replace all bathroom towels, including those that are left hanging by the guests.

### Linens reuse

The sheets portion of the program is designed in one of two ways:

- 1) 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. This approach works but gets fairly low guest participation, since even environmentally-concerned guests often forget to leave the card in the correct place.
- 2) The guest is informed that, in an effort to protect the environment, the hotel only changes sheets every two or three days. 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 a towel reuse program have reduced their laundry costs by up 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 about 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 request that they be changed more often. As indicated above, this approach results in the greatest savings.

The success of the towel and linen programs relies on the effective participation of the property's housekeepers. If this program is implemented, all housekeepers should be thoroughly trained to ensure they clearly understand their role and responsibilities.

As discussed below, programming and scheduling the linen changes can be accomplished in several ways:

- Designate certain days as "sheet changing days." With this approach, all guest room linens are changed on fixed days of the week (for example, every Tuesday and Friday) instead of every three days. Assigning fixed "sheet changing days" allows the property to easily increase housekeeping and laundry staff to handle the additional workload on those days, and avoids confusing housekeepers. On the other days of the week, housekeepers only change sheets in checkout rooms and where requested by the guests.
- Count off every three days and post a notice to inform housekeepers which days are "sheet changing days." This approach ensures that sheets are changed on the exact schedule noted on the in-room materials and still makes it relatively easy for housekeepers to know when to change the sheets. As mentioned before, on the other days of the week, housekeepers only change sheets in checkout rooms and where requested by the guests.
- Keep track of each guest room and change the sheets only after it has been occupied for three consecutive days. However, many properties find it difficult to use this approach since it requires a complex information, tracking and communication system. If applicable, this approach yields the greatest savings since it ensures that guest room linens are not changed more often than specified by the program.

Each property will have select one of these approaches and modify it as needed to incorporate it in its housekeeping and laundry operations.

Two other issues are key to the success of the linen reuse program:

- Housekeepers should replace soiled linens even when guests have not requested a change of sheets. 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 assigned to change the sheets before a new guest checks in. One way to know for sure if the sheets were changed is to leave the bedspread in a turn-down type of configuration whenever used 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.

## Project II: Implement a composting program

Composting has become an increasingly popular method for disposing of food scraps, floral waste and garden waste. The benefits of implementing a composting program include

- it reduces the cost of waste handling and disposal,
- it reduces the property's environmental impact by decreasing the volume of waste it sends to the local dump,
- it provides the property with a high-profile program which can be advantageously used for public relations and media efforts,
- it provides the property with a constant supply of high quality soil conditioner

Studies show up to 75% of the 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 items such as cuttings left from vegetable preparation, and leftovers which have not been served and cannot be reused, post-consumer scraps include all leftovers collected from guest and employee dishes.

In addition to food scraps, the following wastes can also be composted

- produce, vegetables, fruits, peels, rinds, salads,
- 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 is located close to public or work areas, this property should exclude these items from its composting program. If these items are composted, the compost pile should preferably be kept covered.

Properties often find it easier to have the composting program evolve slowly, that is, to start with garden wastes and pre-consumer food scraps from kitchen prep stations, then add other materials like paper, and finally add post-consumer food scraps.

Not everything is compostable, and some materials can actually lower the quality of the finished compost or hamper the composting process. The items that should be kept out of the compost piles include

- glass,
- metals,
- unsoiled paper (if it can be recycled),
- cardboard,
- plastics,
- aluminum foil or plastic wrap,
- batteries,
- garden waste contaminated with pesticides,
- weeds with heads/ seeds (these will reproduce quickly in the compost heap), and
- diseased plants

Contaminating the compost piles 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.

The composting site should be large enough for all phases of composting - that is, unloading materials, storing items before they are added to the compost, aerating and mixing the compost pile, storing equipment, and storing the finished compost before it can be used. If necessary, the property should also build a fence around the composting site to hide it from guest view and to prevent dogs and goats from entering the area.

Other useful precautions include

- Provide adequate drainage around the compost pile
- Promptly clean up any food spills
- Cover food waste with grass, leaves and other yard waste to minimize odor generation
- Periodically aerate the compost pile by turning it over with a pitchfork or other tool. Aeration fosters bacterial action, speeds up the decomposition process, and prevents odor generation

If the pile is properly managed and aerated, the compost should be ready for use in less than two months. Compost is classified as a soil conditioner, not a fertilizer, because its nutrient content (nitrogen, potassium and phosphorus) is not as high as that of a commercial fertilizer. However, unlike fertilizers, compost gradually releases its nutrients to the soil, increases the organic content and the water-retaining capabilities of the soil, and promotes root growth.

# 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 Sunshine Village'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
<b>WATER USE</b>	<ul style="list-style-type: none"> <li>- Use of guest room and public bathrooms</li> <li>- Housekeeping and cleaning operations</li> <li>- Garden upkeep</li> </ul>	<ul style="list-style-type: none"> <li>- Inefficient use of a valuable resource</li> </ul>	<ul style="list-style-type: none"> <li>- Reduce water consumption</li> </ul>
<b>ENERGY USE</b>	<ul style="list-style-type: none"> <li>- Operation of a/c units water heaters lights, and pool pumps</li> </ul>	<ul style="list-style-type: none"> <li>- Inefficient use of valuable and non-renewable resources</li> <li>- Generates air pollution (mainly at the power plant) greenhouse gases, acid rain</li> </ul>	<ul style="list-style-type: none"> <li>- Reduce energy consumption</li> </ul>
<b>SOLID WASTE GENERATION</b>	<ul style="list-style-type: none"> <li>- Office operations (paperwork)</li> <li>- Bar operations</li> <li>- Maintenance operations</li> <li>- Garden and beach upkeep</li> </ul>	<ul style="list-style-type: none"> <li>- Disposal of solid wastes in inadequate municipal dumps</li> <li>- Contamination of groundwater and surface water</li> <li>- Loss of raw materials</li> </ul>	<ul style="list-style-type: none"> <li>- Reduce the amount of solid waste generated by the property</li> </ul>
<b>GENERATION OF WATER POLLUTANTS</b>	<ul style="list-style-type: none"> <li>- General housekeeping and cleaning operations (excessive use of chemical cleaning and disinfecting products)</li> <li>- Maintenance operations (improper disposal of used oil and spent solvents)</li> </ul>	<ul style="list-style-type: none"> <li>- Increases pollutant load discharged to surface and groundwater</li> <li>- Reduces the effectiveness of septic tanks and wastewater treatment systems</li> </ul>	<ul style="list-style-type: none"> <li>- Reduce the pollutant load contained in the hotel's effluent</li> </ul>
<b>USE OF HAZARDOUS PRODUCTS</b>	<ul style="list-style-type: none"> <li>- General housekeeping and cleaning operations (use of bleach toxic cleaning chemicals, insecticides)</li> <li>- Maintenance operations (use of lead paint, drain clearing chemicals)</li> <li>- Grounds keeping (pesticides/insecticides)</li> </ul>	<ul style="list-style-type: none"> <li>- Exposes guests and employees to hazardous products</li> </ul>	<ul style="list-style-type: none"> <li>- Reduce the number and amount of hazardous products used on the property</li> <li>- Improve gray water handling</li> </ul>
<b>GENERATION OF AIR EMISSIONS</b>	<ul style="list-style-type: none"> <li>- Maintenance operations (e.g. release of CFC from air-conditioning units use of solvents)</li> <li>- General housekeeping and cleaning operations (use of aerosols)</li> <li>- Grounds keeping (insecticide fogging)</li> </ul>	<ul style="list-style-type: none"> <li>- Release of CFCs to the atmosphere</li> <li>- Exposes guests and employees to hazardous air pollutants</li> </ul>	<ul style="list-style-type: none"> <li>- Phase out CFC refrigerants</li> <li>- Reduce the use of solvents, insecticides, pesticides</li> </ul>
<b>DAMAGE TO THE ECOSYSTEM</b>	<ul style="list-style-type: none"> <li>- Use of fertilizer, insecticides and pesticides in the gardens</li> </ul>	<ul style="list-style-type: none"> <li>- Damages the environment and ecosystem surrounding the property</li> </ul>	<ul style="list-style-type: none"> <li>- Reduce the damage caused by the property's operations on the ecosystem</li> </ul>

## Appendix III

<b>ACTION PLAN FORM</b>			
<b>MAINTENANCE DEPARTMENT - WATER CONSERVATION ISSUES</b>			
Action	By whom	Target date	Actual date
<b>Implement a leak detection and prevention program</b>			
<ul style="list-style-type: none"> <li>• 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</li> </ul>	J Doe	12/1/97	
<ul style="list-style-type: none"> <li>• Develop the checklist forms that will be used to track the preventive maintenance work conducted by this program</li> </ul>	J Doe	1/1/98	
<ul style="list-style-type: none"> <li>• 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</li> </ul>	G Bush	1/15/98	
<ul style="list-style-type: none"> <li>• Begin the first round of inspections Repeat the cycle of inspection each month</li> </ul>	Maint staff	2/1/98 - onw	
<ul style="list-style-type: none"> <li>• After each round of inspection present summary of findings to general manager</li> </ul>	J Doe	3/1/98 - onw	
<b>Install 1 6 US gallon/flush toilets in the beach-side public restrooms</b>			
<ul style="list-style-type: none"> <li>• 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</li> </ul>	P Peters	2/1/98	
<ul style="list-style-type: none"> <li>• Contact vendor and place order for 4 units</li> </ul>	S Holmes	3/1/98	
<ul style="list-style-type: none"> <li>• Install the units</li> </ul>	P Peters	< 1 mth after receipt	
<ul style="list-style-type: none"> <li>• Monitor weekly to ensure proper performance Continue the weekly monitoring for two months following installation</li> </ul>	P Peters	after installation	
<b>Water consumption monitoring program</b>			
<ul style="list-style-type: none"> <li>• Prepare the forms that will be used to collect data from the property's 3 meters</li> </ul>	T Rex	12/1/97	
<ul style="list-style-type: none"> <li>• 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</li> </ul>	T Rex	12/15/97	
<ul style="list-style-type: none"> <li>• Begin collecting the water consumption monitoring program</li> </ul>	Mant staff	1/1/98 - onw	
<ul style="list-style-type: none"> <li>• 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</li> </ul>	P Peters	2/1/98 - onw	

## Appendix IV

Personal Action Plan - Housekeeping staff		
Action	By whom	Date
<p><b>Guest room preparation checklist</b></p> <ul style="list-style-type: none"> <li>• 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</li> <li>• Do not replace the trash can liners (plastic bags) unless these are soiled or otherwise unacceptable for further use</li> <li>• Report all malfunctioning equipment to the hotel operator -- contact the maintenance department directly only if the need for repair is urgent</li> </ul> <p>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</p> <ul style="list-style-type: none"> <li>• Collect all recyclable items placed in the guest room green recycling containers. Recyclable items consist of               <ul style="list-style-type: none"> <li>◦ clear, green, and amber glass bottles</li> <li>◦ plastic beverage bottles</li> <li>◦ aluminum beverage cans</li> <li>◦ metal cans</li> <li>◦ newspaper</li> <li>◦ white paper</li> </ul> </li> <li>• At the end of your shift, place all collected recyclables in the appropriate recycling bins located by the laundry room</li> <li>• Before leaving the guest room               <ul style="list-style-type: none"> <li>◦ turn off all lights, televisions and radios,</li> <li>◦ turn the a/c unit to the "low cool" setting if the guests have left the a/c running,</li> <li>◦ if the a/c is left on, make sure that all windows and louvers are properly closed</li> <li>◦ ensure that faucets and toilets are not running</li> </ul> </li> </ul>	<p>All house-keeping staff</p>	<p>Start on 12/01/97</p>
<p><b>Towel and linen reuse program</b></p> <ul style="list-style-type: none"> <li>•</li> <li>•</li> <li>•</li> </ul>		

## 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 = \_\_\_\_\_

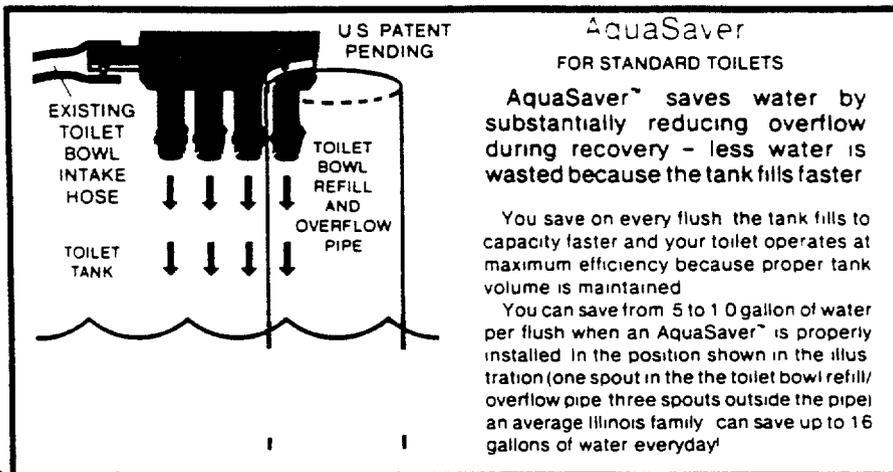
Electricity consumption index = (monthly elec consumption) / (number of guest nights) =

## Appendix VI

### Flow diverters: Technical information

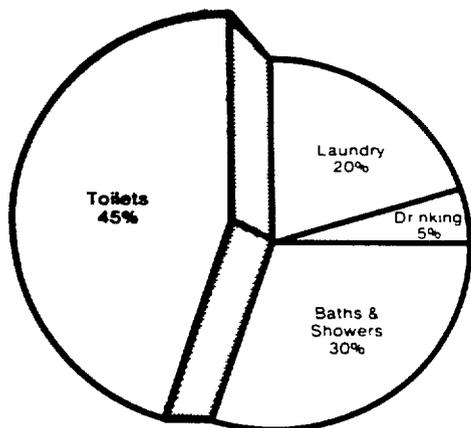
# AQUASAVER

**Help Save Our Most Precious Resource!**



Based on figures supplied by the Illinois Department of Commerce and Public Affairs.

**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!

**aqua smart, inc.**  
*Every drop counts!*™

**How It Works**

**aquaSaver**

INSTALLS IN SECONDS  
ON ALMOST ANY  
STANDARD TOILET

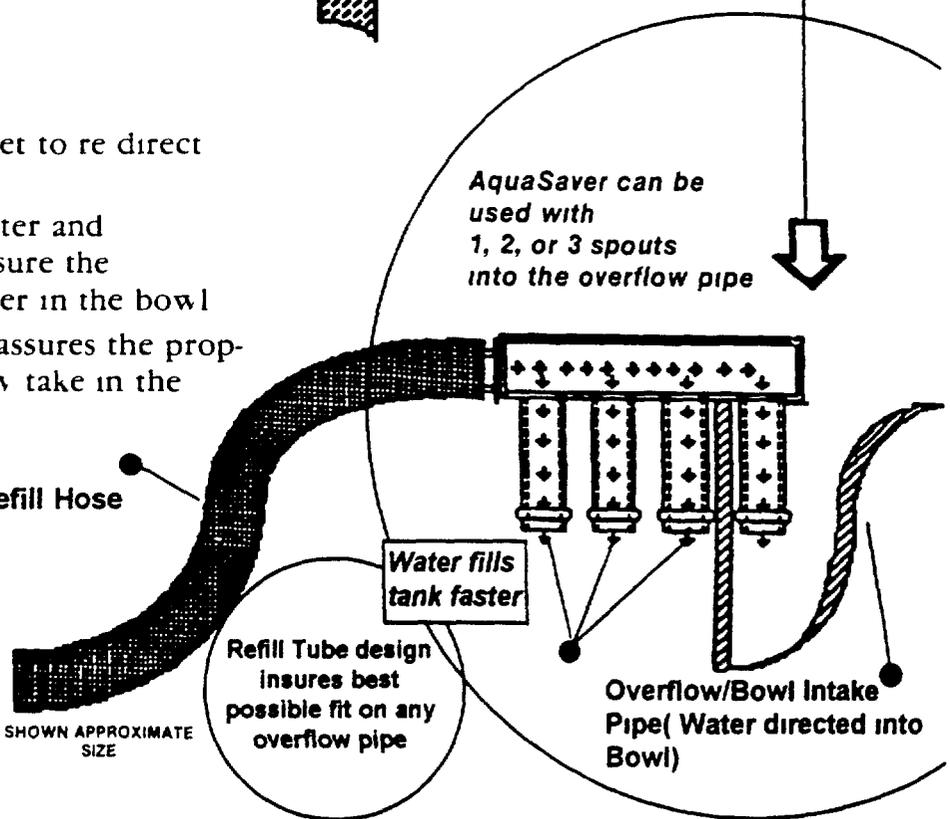
**The Problem**

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

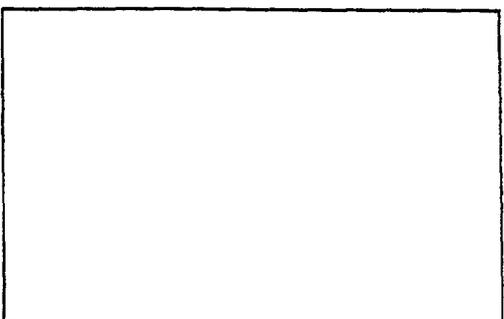


**The Solution**

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 prop-erty owner that the toilet will only take in the proper amount of water.



For more information contact your distributor



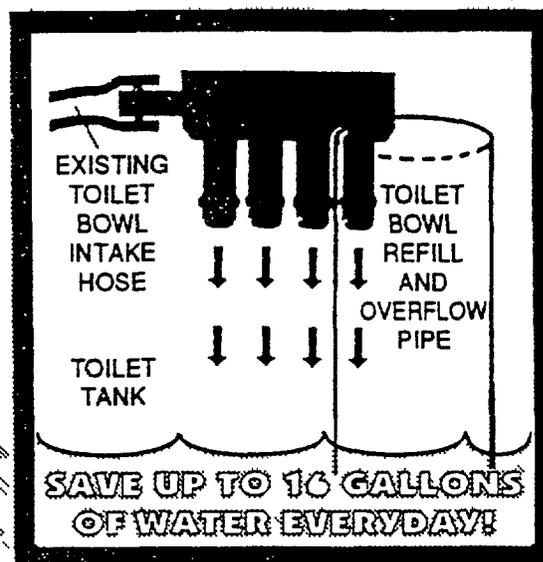
- 1 Detach existing toilet bowl refill hose from the refill/overflow pipe. If there is a clip remove it - if there is a cap on the refill pipe remove it.
- 2 Insert AquaSaver into end of hose
- 3 Place AquaSaver onto the bowl refill/overflow pipe so that any one spout is inside the pipe and the remaining 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

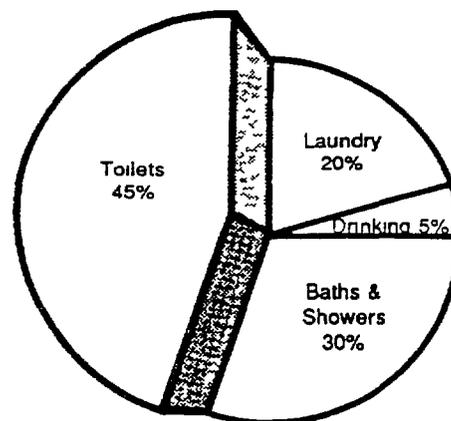
- 1 Do all installations take only a few seconds? And are all stools easy to install in?
  - A Yes in most cases. However some refill pipes are not a plastic or metal pipe but rather are cast into the tank. In those cases the walls of the refill are too thick for the AquaSaver to fit onto merely fit 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

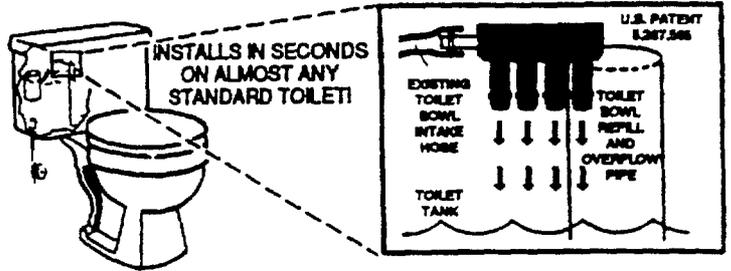


### IN-HOME WATER USE

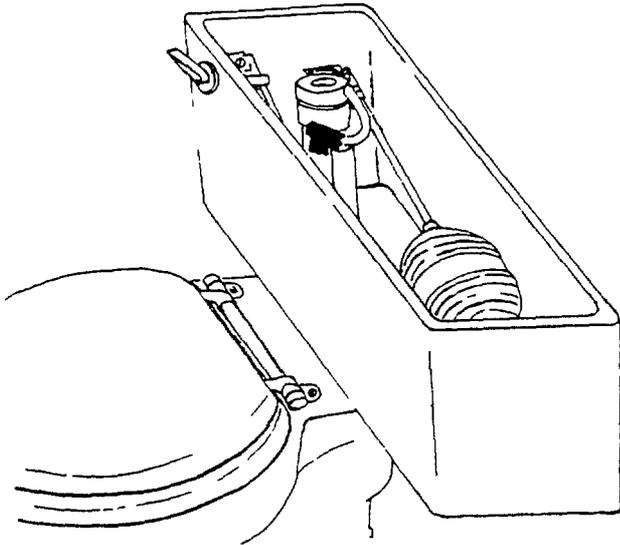


Source National Wildlife Federation

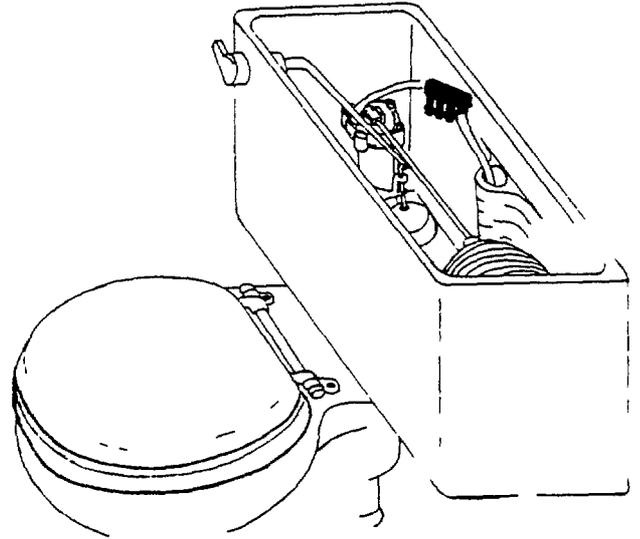
1 Normal installation



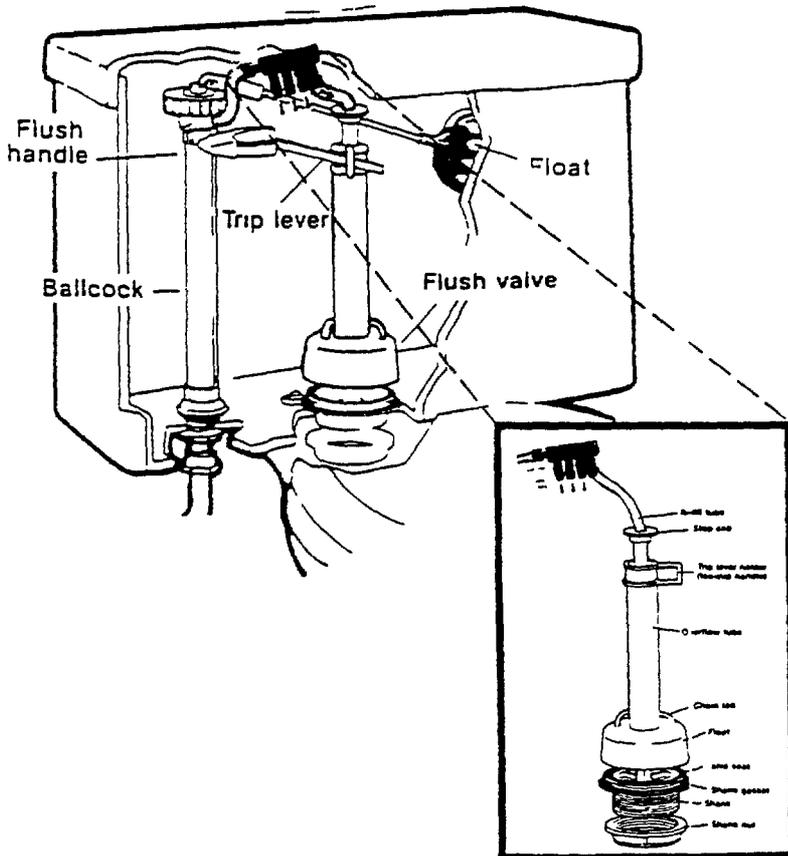
- 2 Install the AquaSaver in the down spout furthest from the intake spout. If it interferes with the mechanics of flushing, place the first down spout of the AquaSaver in the overflow tube.



- 3 You may install the AquaSaver as shown in diagram, if necessary



- 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

