



# GARBAGE AND THE GULLY

Investigating attitudes to solid waste management along the South Gully, Montego Bay, Jamaica



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**South Gully Research Project**  
**Conducted by the Jamaica Environment Trust**  
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## 1. EXECUTIVE SUMMARY

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The South Gully is located in Montego Bay, St James, Jamaica's second largest city and a popular tourist destination. The gully and its tributaries drain a significant area of the city and the surrounding hills, and have become a dumping ground for large amounts of solid waste and debris. The South Gully Research Project (SGRP) examined the factors contributing to the South Gully in Montego Bay being used as a garbage dump. Its findings are valuable in understanding attitudes to solid waste in Montego Bay and have been used to recommend solutions to its growing garbage management problem.

The SGRP focused on the communities surrounding the gully, finding that both residential and commercial activities influence the type of garbage being dumped there. The garbage found in the gully was predominantly domestic waste, specifically plastic bottles, plastic bags and Styrofoam food containers. The garbage is either dumped directly into the gully, or washes into the gully from open lots and streets by way of natural and man-made drainage channels.

Downtown Montego Bay has a longstanding flooding problem which is commonly attributed to an accumulation of garbage and debris in gullies. The design of the gully network also presents a challenge; the South Gully for example, is fed by several narrow, shallow 'channelized' tributaries, which tend to overflow their banks. The pile up of garbage in the South Gully, has also been blamed for increases in pests and disease vectors (mosquitoes, rats, flies). During heavy rainfall, much of the garbage dumped in gullies washes into the Montego Bay Harbour. This results in many tourist attractions located along its coast constantly cleaning up garbage which washes onshore. Recreational users of the coastline also frequently encounter solid waste which has washed out to sea.

Illegal dumping in the South Gully was attributed to several factors, including erratic garbage collection schedules, unwillingness of garbage trucks to service informal settlements, a lack of garbage bins in public spaces, and a lack of enforcement of the anti-litter laws and weak solid

## RECOMMENDATIONS

**Based on the research findings, this paper makes several recommendations to reduce garbage in the South Gully, and address Montego Bay's solid waste management problems:**

1. Resolution of the long-standing lack of clarity as to who is responsible for the maintenance of gullies
2. Establishment of a regular cleaning schedule for gullies
3. Increased frequency of collection in Montego Bay, and establishment of a well-publicized garbage collection schedule and map of collection routes
4. An increase in the number of bins along established garbage collection routes
5. Nuh Dutty Up Jamaica public education campaign targeted at Montego Bay
6. Enforcement of anti-dumping laws should be dramatically ramped up and accompanied by appropriate publicity, including messaging targeted at business operators
7. Revision of the NSWMA act to include specific regulations for solid waste management by commercial and industrial operations; increased fines and harsher penalties for non-compliance. Revisions should be accompanied by increased enforcement efforts.
8. Solicit media coverage of the South Gully's state each month to assess any improvements.

waste management regulations. Poor cultural attitudes to solid waste management in Montego Bay were also identified as playing a major role.

According to local authorities, millions of Jamaican dollars have been spent on cleaning the South Gully and other waterways in Montego Bay; however, there is a marked lack of consensus from survey respondents about the frequency and adequacy of these gully cleanups. Among Montego Bay's residents, businesses and government stakeholders, solid waste management in the South Gully and surrounding communities was recognised as problem, but very few people admitted to themselves dumping garbage illegally.

From all respondents there was a strong consensus on public education as a solution to Montego Bay's solid waste challenges. Other groups pointed to the need for more capital resources to tackle the problem, and greater enforcement of solid waste management legislation in the city.

## 2. INTRODUCTION

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Poor solid waste management practices are one of the most challenging environmental issues in Jamaica. An estimated 25-30% of Jamaica's waste stream is improperly disposed of (Smith, 2010)<sup>1</sup>, making its way to the coast via gullies, rivers and other waterways, and then washing out to sea as marine debris. Marine debris threatens Jamaica's tourism product, harms marine life, has negative aesthetic impacts, and affects Jamaican livelihoods, such as fishing. Carelessly discarded waste blocks drains, causing flooding, which can lead to the destruction of property and threatens human life. It also provides breeding grounds for a range of disease vectors such as rats, flies and mosquitoes.

The Clean Coasts Project (CCP) is a partnership between the Tourism Enhancement Fund (TEF) and the Jamaica Environment Trust (JET), which aims to improve solid waste management in Jamaica. The project components include environmental education for adults and children, along with the development of practical strategies for tackling poor solid waste management resulting in marine debris. CCP has placed specific emphasis on tackling the solid waste issues affecting Jamaica's major resort areas – Ocho Rios, Negril and Montego Bay. This study examines the solid waste issues in a gully in one of these areas: the South Gully in Montego Bay, St. James.

The South Gully and its tributaries drain a significant area of Montego Bay and the surrounding hills, and it has become a dumping ground for large amounts of solid waste and debris. In June 2015, as a part of CCP Phase I, a Debris Containment Boom (DCB) was installed at the mouth of the South Gully to intercept solid waste before it is washed out to sea. The DCB was designed to make the collection of this waste easier by trapping it in one place and reducing the amount of garbage entering the marine environment.

The pilot South Gully DCB project raised several questions: Why is garbage being dumped into the gully? What type of garbage is being dumped? Who are the main culprits? What are possible solutions? In Phase II of CCP, JET sought to answer these and other questions by conducting the South Gully Research Project (SGRP), the findings of which are outlined in this paper.

### 2.1 Project Scope & Objectives

The South Gully Research Project (SGRP) examined the factors contributing to the South Gully in Montego Bay being used as a garbage dump.

The specific objectives of the SGRP were:

- i. Determine the common waste disposal practices of communities and businesses located along the South Gully in Montego Bay, St James.
- ii. Assess the activities and effectiveness of agencies responsible for the maintenance and management of the South Gully and its adjacent communities.

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<sup>1</sup> Smith, I. (2010). Integrated Waste Management Strategy and Action Plan (p. 30, Rep.). Government of Jamaica/Inter-American Development Bank.

- iii. Use the research findings to influence those living and working in close proximity to the South Gully to improve their waste disposal practices.
- iv. Use the research findings to involve stakeholders in improving solid waste management infrastructure and services along the South Gully.
- v. Develop research methodologies which can be used to study similar problems in other gullies in Jamaica.

If approved, CCP Phase III will also include a public education campaign informed by the research findings of the SGRP which will aim to improve solid waste management in Montego Bay.

## **2.2 Limitations**

Although the research methods used in this study can be applied to other gullies in other Jamaican resort areas, the findings and recommendations are limited in their scope and scale. The causes and impacts of solid waste in gullies may be similar in other places, but strategies to stop garbage being dumped in gullies may vary depending on several factors, including location, users and/or socioeconomic factors.

Additionally, the study does not meet academic peer review standards due to the small sample sizes used for the social research, i.e. 201 surveys administered to residents and 39 surveys administered to business operators. Nonetheless, the findings are valuable in understanding attitudes to solid waste in Montego Bay and guiding solutions.

## **2.3 Study Area**

The South Gully is located in Montego Bay, in the parish of St James in Western Jamaica (see Figure 1). Montego Bay is Jamaica's second largest city and third largest parish capital with approximately 110,115 residents according to the 2011 Population and Housing Census (STATIN, 2011)<sup>2</sup>. Montego Bay is a tourist destination with duty-free shopping, a cruise ship terminal, several hotels and public bathing beaches. Downtown Montego Bay, Bogue, Fairview and Ironshore contain the highest densities of commercial activities, including retail stores and service industries. Residential areas are predominantly found in the hills surrounding the city centre, and include both formal and informal communities.

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<sup>2</sup> STATIN. (2011). Population and Housing Census 2011 Findings. Retrieved from Statistical Institute of Jamaica: <http://statinja.gov.jm/pressreleases/pressreleasecensus.aspx>





Figure 1: Map of Jamaica showing the location of Montego Bay

Montego Bay is within the Great River watershed which is drained by several rivers and gullies. According to Water Resources Authority (WRA) maps, the South Gully has its source in the communities located in the hills around Montego Bay (see Figure 2). The SGRP activities focused on the communities near to the gully, which included both residential and commercial areas (see Figure 3). Specific areas targeted were:

- Mount Salem
- Rosemount Meadows
- Rose Heights
- Cyril Gully
- Dome Street
- Pier One

A detailed description of the South Gully, its tributaries and surrounding communities can be found in section 3.2.

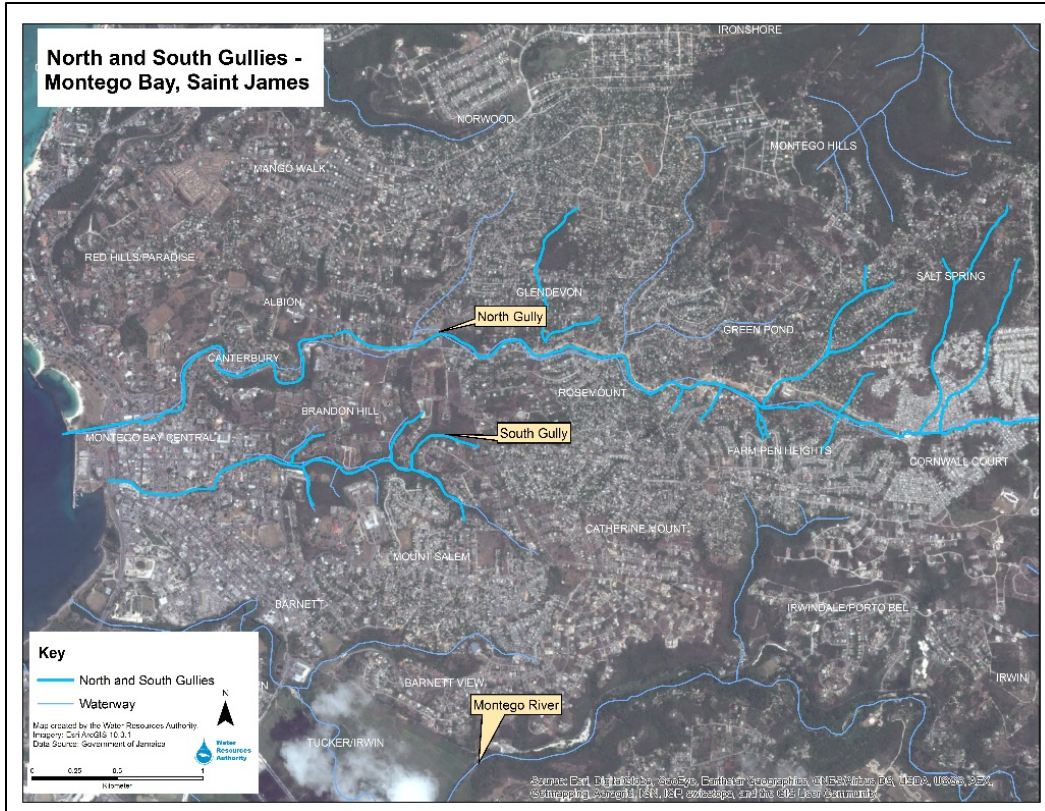


Figure 2: South Gully and surrounding drainage channels in Montego Bay

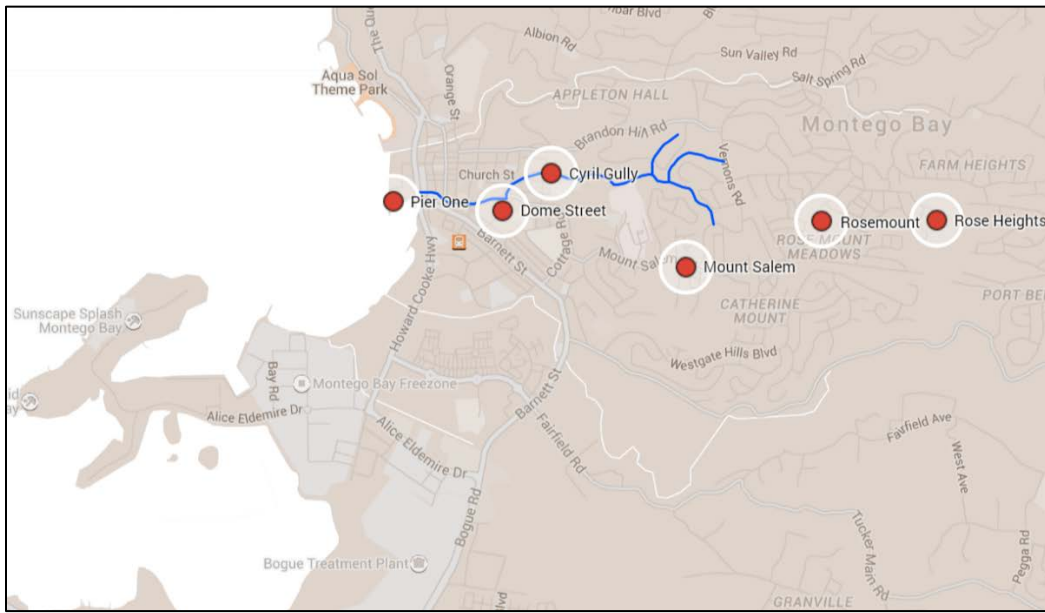


Figure 3: Map of the South Gully and surrounding communities, highlighting the areas targeted by the research

## 2.4 Methodology

The South Gully Research Project (SGRP) had two components:

- i. Background (Desktop) Study
- ii. Primary Research:
  - a. Social Research
  - b. Physical Research

Research was conducted between October 2015 and May 2016.

### ***Background Study***

The background (desktop) study sought to determine the source and extent of the South Gully, when it was constructed, the communities it passes through, and any past cleanup and/or solid waste sensitization efforts. Several organizations were contacted for information:

- University of the West Indies (UWI)
- National Solid Waste Management Authority (NSWMA)
- Western Parks and Markets Waste Management Limited (WPM)
- National Works Agency (NWA)
- Social Development Commission (SDC)
- Office of Disaster Preparedness and Emergency Management (ODPEM)
- Planning Institute of Jamaica (PIOJ)
- Montego Bay Marine Park (MBMP).

Reports on the South Gully and solid waste management strategies in Montego Bay were also reviewed.

### ***Primary Research***

#### *Social Research*

Social research was conducted to determine the knowledge, attitudes and practices of residents and business operators from the communities impacting on the South Gully. More specifically, the research sought to answer:

- Who is using the gully for waste disposal?
- What type of waste is being dumped into the gully?
- Where along the gully is garbage being dumped?
- Why do people dump in the gully?
- What would it take for people not to dump in the gully?
- What do interviewees think are the solutions?
- What are the waste disposal practices of business places along the gully?
- What is the frequency of garbage collection in the communities?
- Where is the waste perceived to go?
- What are the perceived consequences for marine life, health and tourism?

This social research was executed through surveys administered to community members and small business operators (see appendices 7.1 and 7.2), and structured interviews with larger business operators and stakeholders responsible for the gully's management and maintenance (see appendix 7.3 and appendix 7.4). A focus group was also conducted (see appendix 7.5).

Between January 19 and 22, 2016, 201 surveys were administered to residents of the communities surrounding the South Gully and its tributaries, specifically Mount Salem, Rosemount Meadows, Rose Heights, Cyril Gully and Downtown Montego Bay. The surveys were administered by three JET consultants; and on the advice of the Social Development Commission, two residents from Mount Salem also assisted. Respondents from the targeted communities were randomly selected by the research team, who approached persons gathering in public spaces such as gas stations, shops, and restaurants. In some communities, the researchers also approached residents in their homes. Thirty-nine small businesses located along the South Gully were also selected at random and surveyed. These businesses were distributed along the entire length of the gully, from Dome Street in Downtown Montego Bay, with its high density of commercial activities, to upper sections of the gully such as Mount Salem, which typically has fewer, more sparsely distributed commercial enterprises. No systematic sampling method to choose survey respondents was deemed necessary due to the limited scope of the research.

The data collected from both the residential and small business surveys was entered into a spreadsheet and analysed using a pivot table. The pivot table allowed the researchers to group the respondents' based on their demographic profile/geographic location and/or their strategies for waste disposal. The surveys also collected basic data on local solid waste management systems and infrastructure, as well as the perceptions of the respondents relating to the impact of solid waste on their communities. The surveys provided easily quantifiable results which could be analysed and presented graphically in simple charts.

Interviews were conducted with major stakeholders in the South Gully's management and maintenance between February 24 and March 21, 2016 using a structured interview schedule (see appendix 7.3). Of the eight stakeholders represented, six were government agencies, one was a non-profit non-government organization, and one was a private sector organization. Interviews targeted representatives of the Urban Development Corporation (UDC), National Works Agency (NWA), WPM Waste Management, Montego Bay Marine Park, Social Development Commission (SDC), Harbour Street Craft Market Management, Pier One and the St. James Parish Council. Interviewees all held middle or senior management positions within their organization. The names and positions of the interviewees are attached in appendix 7.4. Interviews were conducted by telephone with an average duration of 45 minutes. Interviews were used to gather background information not covered by the desktop study, and to determine the challenges experienced by organizations responsible for the management of the gully and solid waste in Montego Bay.

A focus group was conducted on March 9, 2016 with residents and business operators from Montego Bay. Although the activity suffered from poor representation from the communities surrounding the gully, it did present some insights into attitudes towards waste disposal in Montego Bay and perceived solutions.

### *Physical Research*

A physical survey of the gully was also conducted at various points to observe the types, location and quantity of solid waste being dumped. Photos were taken to record findings. The physical survey was primarily done between October 27 and 28, 2015, but monitoring of changes continued throughout the research period.

In addition, by choosing the South Gully where the DCB had been deployed as the study area, the composition and sources of the waste being dumped in the gully could be more easily assessed. The quantity and type of waste being trapped by the DCB was also analysed to further support the findings of the physical survey.

### **Community Workshop**

Upon completion of the SGRP, a workshop will be conducted in Montego Bay to present the main findings. Major stakeholders and community leaders will be invited to the workshop, which will include a bus tour of the gully and surrounding communities. Feedback on the research will be sought from the participants and will be used to inform the proposed CCP Phase III public education campaign aimed at improving solid waste management in Montego Bay.



### **3. PRESENTATION OF FINDINGS**

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#### **3.1 The State of Solid Waste Management in Jamaica**

Approximately 1kg of waste is produced per person per day in Jamaica and it is estimated that this amount increases by an average rate of 6% per year (Smith, 2010)<sup>1</sup>. The Riverton Waste Disposal Site in Kingston receives 60% of Jamaica's waste, most of which comes from eastern parishes; while the Retirement Waste Disposal Site in St. James receives the majority of waste from Western Jamaica, including Montego Bay and its environs. Eight approved dumpsites are located across the island; these are operated by the National Solid Waste Management Authority (NSWMA), the Government of Jamaica (GOJ) agency responsible for garbage collection, management and regulation. In Montego Bay, the NSWMA's regional office, WPM Waste Management, is responsible for garbage collection and management. None of the NSWMA dumpsites are sanitary landfills, all of them are inadequately managed and as of May 2016, all of them were operating without the required environmental permits. While there are efforts at plastic recycling being carried out by various firms and public/private partnerships, they have so far not been implemented at sufficient scale or convenience to significantly reduce the amount of plastic waste making its way into gullies, drains, rivers and the sea. It is also more difficult to participate in recycling in areas outside of Kingston. In May 2016, there were only two known recycling facilities in Montego Bay when compared to 13 such facilities in Kingston.

Many communities in Jamaica do not have adequate garbage collection services, particularly those located outside of urban areas. Jamaicans commonly complain that they have no good options for disposal of their waste, there are insufficient bins in public spaces and collection is either non-existent, infrequent or erratic. Many Jamaicans also believe that littering creates jobs. Enforcement of litter laws by the NSWMA is also very weak.

Unless permission is given, open burning is illegal under section 4 of the Country Fires Act (1942). The law however, is not well enforced, so individuals and businesses often do this without penalty. It is estimated that 32% of Jamaicans burn their garbage (PIOJ, 2010)<sup>3</sup>.

Over 300,000 tonnes of garbage are estimated to be dumped illegally every year (Smith, 2010)<sup>1</sup> in Jamaica. Most illegally dumped garbage ends up in drains, gullies and rivers. The composition of illegally dumped waste is varied – plastic, Styrofoam, paper and cardboard, tree and garden cuttings, medical and market waste, but also cars, appliances, and tyres.

#### **3.2 Description of South Gully and the surrounding communities**

The South Gully is one of the four main drainage channels which serve the city of Montego Bay, the other three being the North Gully, Montego River/Barnett River and Pye River. The South Gully has several tributaries which feed into the main channel. These range from small drains and rivulets, to larger drainage channels.

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<sup>3</sup> PIOJ. (2010). Jamaica Survey of Living Conditions. Planning Institute of Jamaica.



Figure 4: River running along Dome Street, Montego Bay in the 1940s

The main tributary of the South Gully is the Cyril Gully, which drains the Rosemount Meadows community and Rose Heights (see Figure 2 and Figure 3). Cyril Gully was once a naturally flowing river (see Figure 4). This is evidenced by the sediment, rock, and vegetation types still found along its course.

The topography surrounding Cyril Gully is very steep and hilly with many small tributaries, both natural and man-made also draining from other surrounding

communities (Mount Salem, Farm Heights and Brandon Hill) (see Figure 2). The Cyril Gully converges with seven other waterways under the monument on Dome Street to become the South Gully (see Figure 5 and Figure 6).

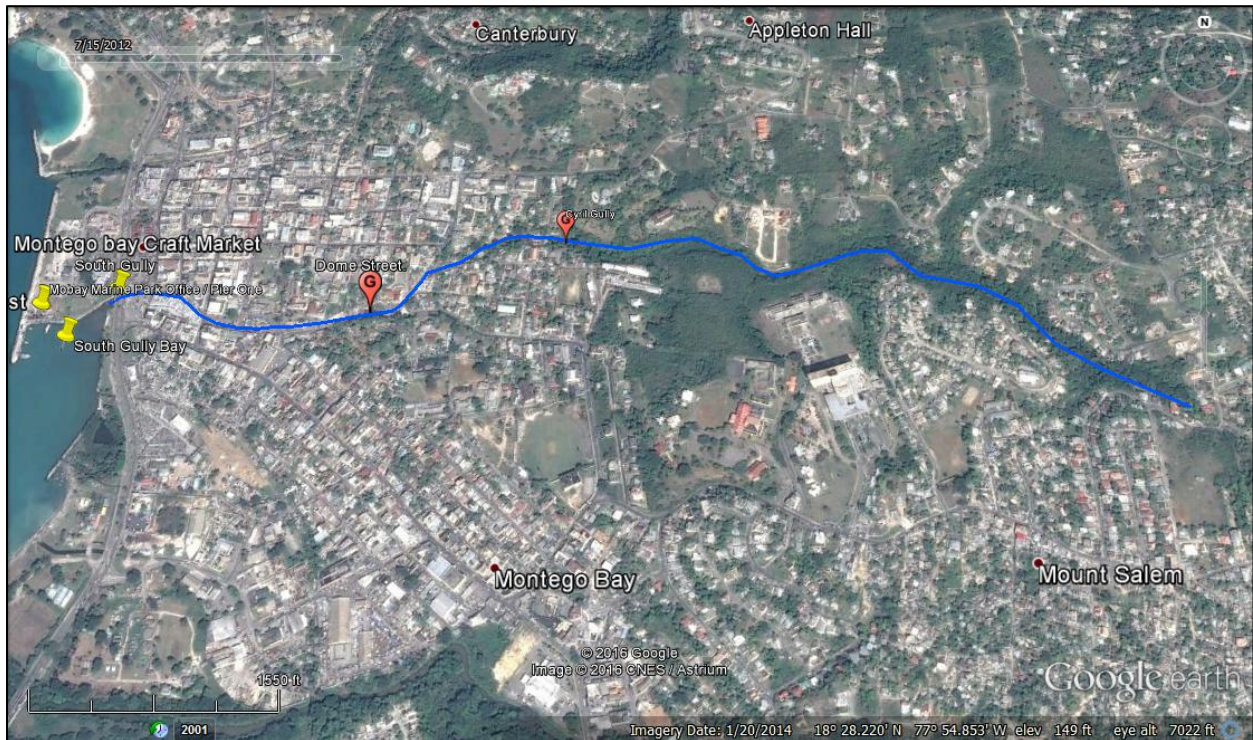


Figure 5: Satellite Image of Montego Bay highlighting the location of Dome Street and the Cyril Gully



The lower section of the South Gully was built in 2001 under the Montego Bay South Gully Drainage Improvement Project at a cost of US\$14 million. The project aimed to alleviate the long-standing problem of flooding along the Creek Street area of Montego Bay. This lower section is approximately 2000 feet or half a kilometre long, and runs from Dome Street to the sea, emptying its contents near Pier One (Jamaica Observer, 2002)<sup>4</sup>.



*Figure 6: Illustrating where seven waterways converge on Dome Street to become the South Gully*

Both residential and commercial activities impact the South Gully. Upper sections of the gully are bordered by a school, houses, and small, informal businesses. Lower sections are bordered by parking lots, roads, and larger commercial areas located in Downtown Montego Bay, including the Harbour Street Craft Market.

### **3.2.1 Composition of Garbage in the South Gully**

The Debris Containment Boom (DCB) (see Figure 7) provided an accurate picture of the types of garbage being dumped into the South Gully (see Appendix 7.6 for DCB monitoring reports). The DCB was deployed at the mouth of the gully in June 2015 and was cleared once per week by the Montego Bay Marine Park (MBMP) with assistance from fishers from the River Bay Fishing Cooperative. Garbage collected from the DCB weighed on average 100lbs – 110lbs per cleaning, although this weight does include significant amounts of water.



*Figure 7: The South Gully Debris Containment Boom (DCB)*

<sup>4</sup> Jamaica Observer. (2002, September 14). Specialised cleaning equipment for South Gully given test run. Retrieved from Jamaica Observer: [http://www.jamaicaobserver.com/westernnews/31948\\_Specialised-cleaning-equipment-for-South-Gully-given-test-run](http://www.jamaicaobserver.com/westernnews/31948_Specialised-cleaning-equipment-for-South-Gully-given-test-run)



*Figure 8: A bag full of condoms found at the mouth of the South Gully on February 1, 2016*

Solid waste collected by the DCB was predominantly comprised of plastic bottles, plastic bags and fabric; motor oil was the most observable liquid pollutant. During very heavy rainfall events, larger items including tree branches, appliances and tyres were also transported down the gully. Dead animals which had been placed in plastic bags and thrown in the gully were also removed on occasion.

A large quantity of silt was observed washing down the gully. Coupled with the movement of sediments by normal wave action and storm surge, a small “beach” formed at the mouth of the South Gully since the deployment of the DCB. MBMP reported several findings related to the types of solid waste being washed up from the gully on this “beach”, including large quantities of used condoms - typically 100 or more at a time (see Figure 8). Sometimes these were found in bags. It is suspected that the large quantities of condoms were the result of increases in prostitution activities near the gully in the vicinity of the

Harbour Street and Barnett Street intersection. Nine adult entertainment clubs were observed in close proximity to the gully.

Since deployment of the DCB, faeces found in Styrofoam boxes and plastic bags also became a major cause for concern. People appeared to defecate in these receptacles and then throw them into the gully. The receptacles then floated along the gully and were trapped by the DCB along with other debris. This posed a serious health risk for personnel clearing the debris from the DCB, who were not able to determine the content of these receptacles until they were being removed.

### **3.2.2 Flooding**

Downtown Montego Bay has a longstanding flooding problem. Within a few months of construction of the lower section of the South Gully by the NWA in 2001, flooding resumed in Downtown Montego Bay (Williams, 2002)<sup>5</sup>. In January 2008, Radio Jamaica (RJR) reported that the NWA was scheduled to clean the North and South Gullies after torrential rains in 2007, which

<sup>5</sup> Williams, P. (2002, January 5). Garbage-blocked South Gully overflows. Retrieved from Jamaica Observer: [http://www.jamaicaobserver.com/news/19238\\_Garbage-blocked-South-Gully-overflows](http://www.jamaicaobserver.com/news/19238_Garbage-blocked-South-Gully-overflows)





*Figure 9: Garbage litters a section of Howard Cooke Boulevard in Downtown Montego Bay after heavy rainfall flooded drains*

resulted in flooding of business places (RJR News, 2008)<sup>6</sup>. In both instances it was suggested by the NWA that the flooding was caused by an accumulation of garbage and debris in the gully.

Although this frequent flooding is typically blamed on blockages caused by garbage and other debris, the design of the gully network in Montego Bay also appears to be at fault. As with the Cyril Gully upstream, the lower sections of the South Gully are also fed by several narrow, shallow 'channelized' tributaries, which tend to overflow their banks.

During the research period, Downtown Montego Bay flooded twice as a result of heavy rains and blocked waterways. Figure 10 shows a recent flooding event which took place in late February 2016. During this event, the lower section of the South Gully near Dome Street (top left) and many other sections of Downtown Montego Bay were completely flooded.

According to the Mayor of Montego Bay, Councillor Glendon Harris, these floods resulted in damages costing the city over J\$20 million (The Gleaner, 2016)<sup>7</sup>. It is worth noting that the NWA had completed a drain and gully cleaning exercise just two weeks prior to the flood event. Janel Ricketts, Community Relations Officer at NWA's Western Region, reported that this exercise was a part of a J\$10 million Zika virus drain-cleaning effort, which targeted drains, gullies and potential mosquito-breeding sites (Cummings, 2016)<sup>8</sup>.

<sup>6</sup> RJR News. (2008, January 12). Major drainage systems in Montego Bay to be cleaned. Retrieved from RJR News: <http://rjrnews.com/local/major-drainage-systems-in-montego-bay-to-be-cleaned>

<sup>7</sup> The Gleaner. (2016, March 1). St. James Weekend Flooding Damage Estimated at \$20m. Retrieved from The Gleaner: <http://jamaica-gleaner.com/article/news/20160301/st-james-weekend-flooding-damage-estimated-20m>

<sup>8</sup> Cummings, M. (2016, March 2). NWA working to clear drains in St. James. Retrieved from Jamaica Observer: <http://www.jamaicaobserver.com/news/NWA-working-to-clear-drains-in-St-James>



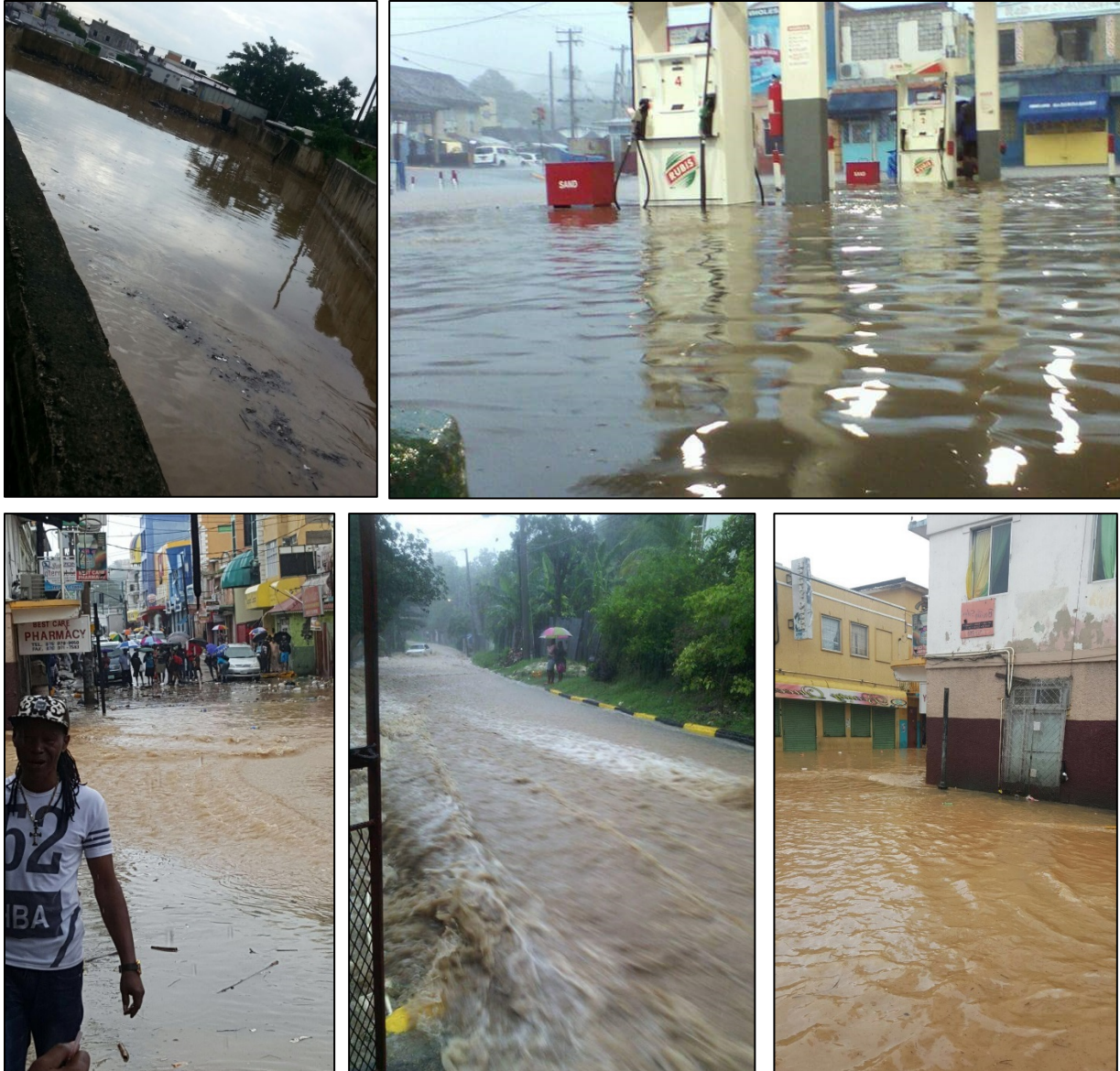


Figure 10: Flooding in Montego Bay (February 2016)

### 3.2.3 Other Impacts

Although flooding was identified as one of the more immediate and visible problems associated with garbage in the South Gully, there are several other associated negative impacts affecting Montego Bay.

The pile up of garbage in the South Gully and other parts of the town, has been blamed for increases in flies, rats, roaches and mosquitoes, all of which are disease vectors. In a 2012 Gleaner article, rat infestation in sections of Montego Bay was described as a “constant battle”



*Figure 11: Garbage in the South Gully and its tributaries provide a perfect breeding ground for pests*

for the Food Storage and Prevention of Infestation Division's Western Branch (Flemming, Pesky Rats in Montego Bay, 2012)<sup>9</sup>. In April 2016, the Jamaica Observer reported that the St. James Public Health Department was embarking on a massive rodent eradication programme, in an effort to rid the streets of Montego Bay of rat infestation (Hines, 2016)<sup>10</sup>. A total of J\$4 million had been set aside by TEF and the St James Parish Council (SJPC) to fund the initiative.

Montego Bay's garbage problem has also made its way to the coast and out to sea. Many attractions along Montego Bay's coast constantly clean up garbage to maintain their properties (see Figure 12). Visitors and locals who venture further out to sea by boat, scuba diving or snorkeling also found large quantities of garbage deposited on the seafloor and reefs all along Montego Bay's coastline. In a letter to the Gleaner published March 18, 2014 titled 'Diving at dirty Doctor's Cave,' a concerned citizen wrote: *"I'm disgusted at the filth I consistently see under the water at the beaches in Montego Bay."* (The Gleaner, 2014)<sup>11</sup>

<sup>9</sup> Fleming, B. (2012, October 12). Pesky Rats in Montego Bay. Retrieved from The Gleaner: <http://jamaica-gleaner.com/gleaner/20121012/lead/lead9.htm>

<sup>10</sup> Hines, H. (2016, April 28). Rat attack! Retrieved from Jamaica Observer: [http://www.jamaicaobserver.com/westernnews/Rat-attack--\\_59116](http://www.jamaicaobserver.com/westernnews/Rat-attack--_59116)

<sup>11</sup> The Gleaner. (2014, March 18). Diving at Dirty Doctor's Cave. Retrieved from The Gleaner: <http://jamaica-gleaner.com/gleaner/20140318/letters/letters3.html>





*Figure 12: The coastline of the Pier One Complex, a popular entertainment venue for locals and tourists, after heavy rains washed garbage out of the nearby South Gully (November 2014)*

The solid, liquid and human waste also has significant impacts on water quality and the health of the coastal ecosystem in the bay surrounding the town. According to Joshua Bailey, Research and Outreach Officer at the MBMP, the run-off that reached the sea by way of drains and gullies was often filled with garbage and nutrients, which promoted the growth of algae causing degradation of coral reefs (Flemming, MoBay Waters to Get Quality Test, 2014)<sup>12</sup>. Garbage was also often mistaken for food by marine life (especially marine mammals and sea turtles), posing risks of choking, a feeling of fullness resulting in starvation, and entanglement. Toxic chemicals

from solid (e.g. plastic) and liquid waste (e.g. sewage) can also be absorbed by fish and other marine life, contaminating the food chain.

### **3.2.4 Cleaning and Maintenance**

The illegal disposal of garbage in the South Gully has led to millions of Jamaican dollars being spent by the GOJ to clean the waterway over the past 15 years. In 2001, equipment valued at J\$24 million, was procured by the GOJ to clean up the gullies in Montego Bay, including South Gully. The equipment included a truck loader, a bucket machine, backhoe, and a pulling machine. At that time, cleanups of the sedimentation basins of the gullies (constructed to handle excess runoff and sediment) were scheduled to be done after every heavy shower of rain, and the cells of the gully (vertical traps) were scheduled to be cleaned once every two years (Jamaica Observer, 2002). In March 2010, the NWA embarked on a J\$1 million project to facilitate a major cleanup of several gullies and drains in Montego Bay, including the South Gully (NWA, 2010)<sup>13</sup>. According to the NWA, gullies in Montego Bay are cleaned several times per year, or when the need arises due to a blockage. Observations and survey responses, however, suggested that cleaning of the South Gully was done far less frequently (see section 3.4). Throughout the

<sup>12</sup> Fleming, B. (2014, June 4). MoBay Waters to Get Quality Test. Retrieved from The Gleaner: <http://jamaica-gleaner.com/gleaner/20140604/lead/lead7.html>

<sup>13</sup> NWA. (2010, March 25). NWA Undertakes One Million Dollar Drain Cleaning Effort in Montego Bay, St. James. Retrieved from National Works Agency: <http://www.nwa.gov.jm/news/nwa-undertakes-one-million-dollar-drain-cleaning-effort-montego-bay-st-james>



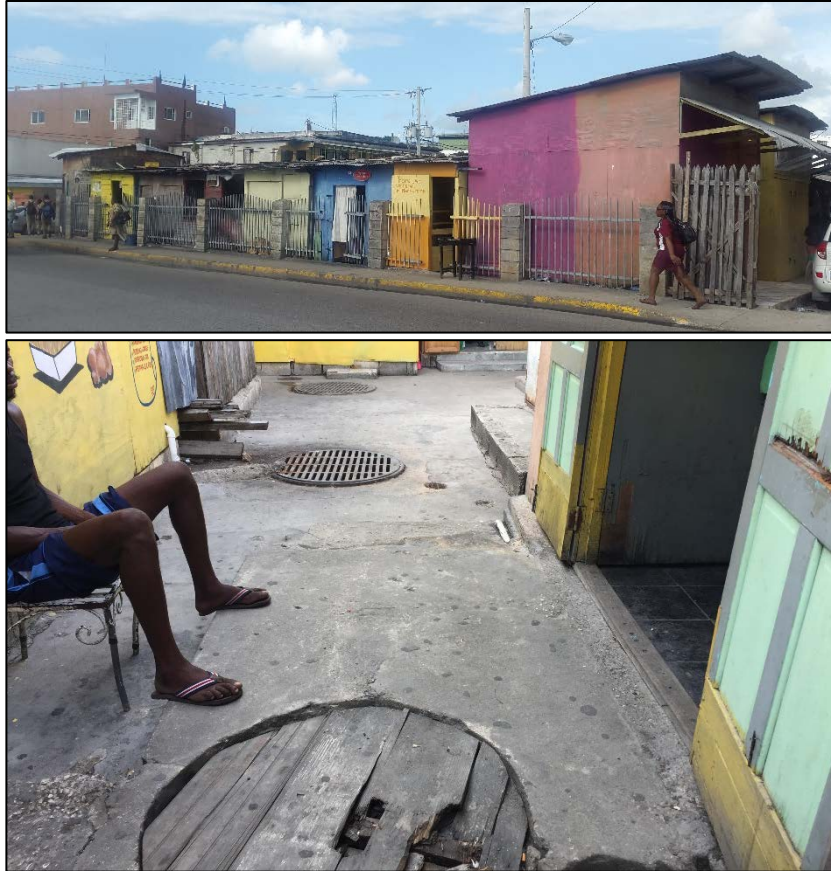
*Figure 13: Garbage in the South Gully, Montego Bay*

research period, garbage and debris was observed accumulating at several points along the gully, and only seemed to clear when heavy rainfall washed it out to sea.

A survey of local newspaper articles suggested a disagreement between the SJPC and the NWA regarding who is responsible for the cleaning and maintenance of the gullies in Montego Bay. In several newspaper articles, the SJPC insisted it was not responsible for the cleanliness and maintenance of major gullies and that these waterways were the responsibility of the NWA. The NWA accepted responsibility for the management of the gully; but maintained they were not responsible for the removal and disposal of the solid waste. They explained that they would collect domestic waste if it was present when they performed their regular gully maintenance activities, even though it was not a part of their mandate. They did this because if the material was to be left at the cleanup site and not transported away in a timely manner, any garbage they collected would soon re-enter the waterway.

Informal business operators also posed an additional challenge. In September 2014, the Gleaner reported that the NWA had filed a request to the SJPC to have vendors along the gully removed. The NWA claimed the presence of the vendors' stalls along the gully was thwarting their efforts to clean and conduct maintenance activities. The 2014 article also reported that the NWA had been experiencing access issues for the previous eight years, hampering maintenance and cleaning. The Deputy Mayor of Montego Bay, Michael Troupe, recommended that an assessment be done to determine how many vendors sell their goods in the area near the gully, so that





*Figure 14: Vending at the Old Shoe Market along Harbour Street (top); shops at the Old Shoe Market block easy access to manholes leading to the South Gully (bottom) (May 2016)*

appropriate action could be taken (Thomas, 2014)<sup>14</sup>. During the research period vendors were observed still blocking access points to the South Gully. In May 2016, at a site referred to as the Old Shoe Market on Harbour Street, a large contingent of vendors was observed operating businesses from seemingly well-established structures. These structures appeared to be blocking easy access to several large manholes at the site which lead to the South Gully (See Figure 14).

### 3.3 Source of Garbage in the South Gully

The WPM and SJPC representatives interviewed all stated that the bulk of the garbage dumped in the gully was domestic waste originating from both formal and informal settlements along its banks. According to Sharon Williams, Community Relations Officer at WPM, residential areas in Montego Bay received garbage collection once per week, but this is insufficient. Ms. Williams felt twice per week collection would be ideal. Financial constraints and insufficient garbage collection trucks at WPM were blamed for the lack of frequency. Ms. Williams maintained, however, that although infrequent collection did create solid waste management challenges in Montego Bay, the problem was exacerbated by the poor garbage disposal practices of residents. This view was supported by focus group participants, who said that even where regular garbage collection did exist, many residents “can’t wait for a truck to come back in one week’s time so they dump the garbage illegally.”

<sup>14</sup> Thomas, C. (2014, September 16). Vendors Hamper NWA Cleaning of MoBay South Gully. Retrieved from The Gleaner: <http://jamaica-gleaner.com/article/news/20140916/vendors-hamper-nwa-cleaning-mobay-south-gully>



The erratic garbage pick-up schedule was also blamed for illegal dumping. Most residents were typically not at home when garbage trucks came to collect, and this created a challenge. According to one focus group participant “garbage trucks don’t follow a regular schedule...you never know when they are going to come...if you are not at home and don’t arrange for someone to put out the garbage (for collection), you miss the truck and it’s another week or two before it comes again.” It was felt that if residents knew when the garbage trucks were coming, they would be able to ask a neighbour or domestic helpers to put out the garbage on schedule. Storage was also identified as part of the problem; one participant in the focus group explained that most householders did not have secured garbage storage containers at their gate. If garbage was left unattended/unsecured, it was spread by stray animals or homeless people.

Informal settlements were also perceived to be a big part of Montego Bay’s solid waste problem. Focus group participants also shared this view. Many respondents placed the blame on informal communities located in the hills of Montego Bay as the main sources of the garbage being found in the South Gully. They claimed that informal/squatter settlements did not receive garbage collection at all. Several members of the focus group claimed that residents from informal settlements dumped their garbage in open lots which were thought to be on garbage collection routes. In addition, residents were also said to transport garbage in plastic bags from their homes, to throw them “at” skips or informal dumps in public spaces. These bags of garbage often missed their target and broke open, scattering their contents. This proliferation of mini dumps was also said to be a major contributing factor to the garbage problem in Montego Bay. “Garbage begets garbage,” said one focus group participant. Once there was a pile of garbage, however small, more garbage would continue to be added.

When the WPM and NSWMA were queried about the claim that informal settlements do not get garbage collection, both agencies maintained that there was no policy in place preventing their agency from collecting garbage in informal settlements. They conceded however, that there were challenges to regular garbage collection in these communities.

Rose Heights, an informal community located in the hills overlooking Rosemount Meadows, was one of the communities identified several times during the research as one of the major problem areas contributing to garbage in the South Gully. Infrequent garbage collection has resulted in some residents from Rose Heights illegally dumping garbage in the gully and in open lots in neighbouring Rosemount Meadows. The garbage in these open lots was then spread by stray animals and homeless people searching for food; and thereafter washed into drains and gullies. When questioned specifically about the garbage collection in Rose Heights, WPM admitted that the steep terrain and narrowness of the roads created access issues for garbage trucks. WPM also suggested that the crime and volatility associated with the community might also discourage their garbage collection crews from servicing the area. It was not clear whether this was also the case in other informal settlements adjacent to the South Gully.

Residential areas however, were not the only observed sources of garbage in the South Gully. According to the MBMP, commuters and commercial activities use the South Gully for waste disposal. The survey team observed significant quantities garbage associated with commercial

activities in Downtown Montego Bay (see Figure 15). Many commercial operators also appeared to be relying on public bins to get rid of their garbage. On several occasions during the research study public bins in Montego Bay's commercial centre were observed overflowing due to the sheer quantity of waste they contained. Some businesses were also observed to leave unsecured garbage in front of their shops at the end of the day.

In Jamaica, it is a commonly held belief that commercial operations are required by law to have a licensed waste haulage contractor remove their garbage. During our research, JET met with the NSWMA to determine the section of the NSWMA act which speaks explicitly to this law. It was discovered that there is no explicit provision in the act to this effect, i.e. there is no law requiring businesses to contract a licensed waste haulage contractor to remove their garbage. Commercial operations are only required by law to ensure their garbage is not dumped illegally. This means that under the act, as long as a business operator places their waste in a container in an area they perceive to receive regular collection (like a public garbage bin), they are compliant with the law. A small business in Montego Bay could therefore place their garbage in an overflowing skip or bin on a main road and still be considered compliant with the law. The deficiencies of the NSWMA act to regulate solid waste management in commercial areas became increasingly apparent during the course of the study.



*Figure 15: Garbage left in front of a Downtown Montego Bay business at the end of the day*

Additionally, focus group participants said there were very few bins in public spaces in Downtown Montego Bay's commercial areas, and that those that existed were "broken and overflowing". WPM maintained, however, that garbage was collected twice per day in the commercial areas of Montego Bay. If this is in fact the case, it appears it is inadequate for the quantity of waste being generated on a daily basis. The business operators surveyed also claimed that the problem was compounded by Montego Bay residents who, in the absence of regular collection in the communities, also dumped their domestic waste in commercial areas.

In addition, the composition of the garbage trapped by the DCB indicated that informal business operations taking place along the gully bank also contributed to the problem. MBMP reported that motor oil slicks originating from garages, used condoms from prostitution and adult entertainment

venues, and food packaging from cook shops (which could also be discarded by patrons) were commonly observed coming from the South Gully when the DCB was being cleared.

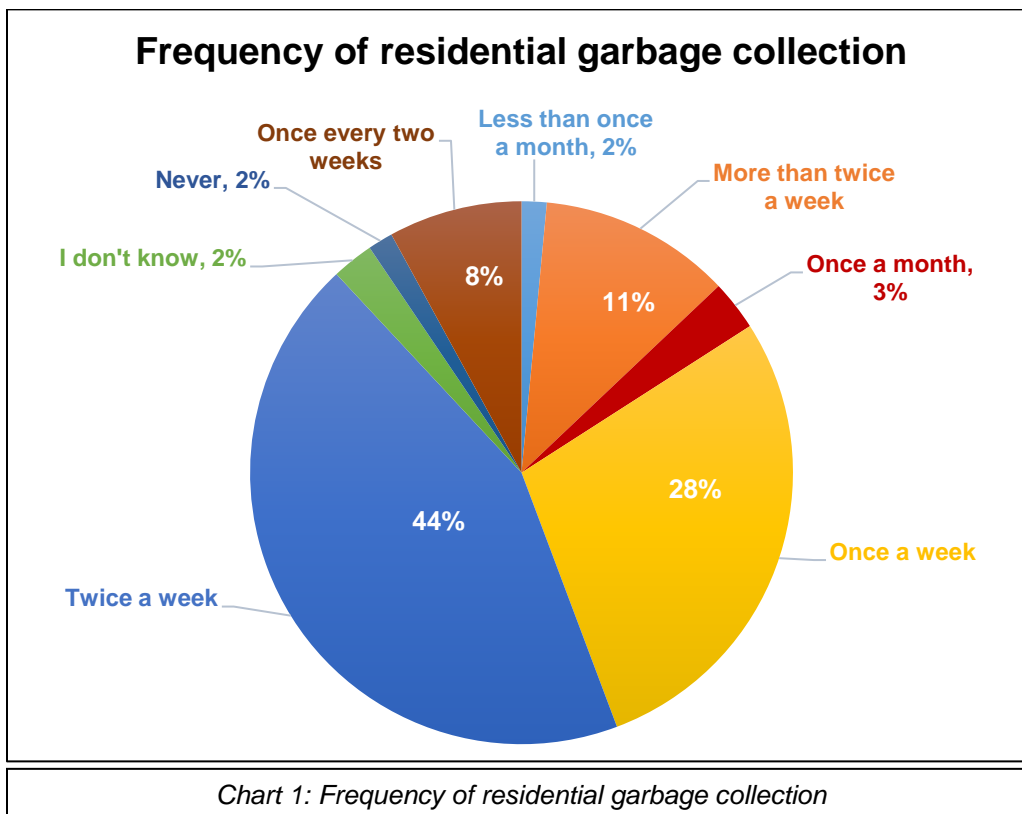
In short, large quantities of garbage from various sources are continuously dumped into the South Gully, maintenance and cleaning was inadequate and the drainage infrastructure was observed to be poor.

### 3.4 Knowledge, Attitudes and Practices

#### 3.4.1 Residents

A survey was administered in January 2016 to 201 people living in close proximity to the South Gully and its tributaries to assess their knowledge, attitudes and practices in relation to the gully and solid waste management in general.

There were no notable differences observed in responses to the survey based on demographic factors such as age, sex, education level attained or which community respondents lived in. Eighty-five percent (85%) of respondents claimed that they containerized their garbage for collection by the garbage truck, and 61% of respondents reported that their garbage was made up mostly of food wrappers and containers. Seventy-one percent (71%) of respondents received garbage collection at least once a week (see Chart 1).



In response to questions about the management of their garbage in public spaces, 62% of respondents claimed to keep their garbage until they found a bin, and 48% said they placed it in the nearest bin. The survey demonstrated, however, that bins and skips were generally thought to be more than 100 feet away in any given location. Very few respondents admitted to throwing their garbage on a pile (11%) or in the street (13%) when in public spaces.

Thirty-five percent (35%) of respondents were able to identify a drain, gully or river close to their community and 57% were aware that it was a part of the South Gully. Respondents were all aware that garbage was being dumped in the drain, gully or river. Sixty-seven percent (67%) of respondents said that household waste (food containers, food waste, yard scraps etc.) was the most common item of garbage seen to be dumped in the gully.

Respondents gave conflicting responses when asked where the garbage in the South Gully was coming from. When asked to react to the statement “Garbage in the South Gully comes from my community,” respondents were split in their answers - 35% agreed that it came from within their community and 34% disagreed. On the other hand, when asked to react to the statement “Garbage in the South Gully comes from outside my community,” 73% of respondents agreed that to be the case. Only 8% of respondents admitted that they personally had dumped garbage in the gully. Respondents were also mostly unsure what time of day dumping in the gully took place (67%).

Forty-eight percent (48%) of respondents did not know if or when the gully in their community was cleaned; 26% said the gully in their community was cleaned once per year or less. It should be noted that the survey responses conflict with the NWA and WPM statements about the frequency of their gully cleaning activities.

Sixty-three percent (63%) of respondents knew that the garbage in gullies was washed out to sea whenever it rained. Forty percent (40%) of respondents thought that garbage in gullies was either being burnt or removed by the government.

Most respondents recognised that garbage in gullies was bad for the environment (70%), public health (60%), their community (72%) and tourism (65%) (see Chart 2). Focus group participants also explicitly mentioned tourist attractions as being at risk from solid waste and recognised the associated risk of flooding. “The people causing the problem are not the ones that get flooded out,” said one focus group member, “so they don’t care.”

In summary, survey respondents in general received weekly garbage collection, and did not admit to any poor solid waste management practices such as littering or dumping garbage in gullies. They acknowledged that there was garbage in the South Gully coming from households, but said that the offenders were mostly from outside their community. Respondents also maintained that the gullies were not being cleaned regularly and much of the garbage washed out to sea. They were also aware that garbage in gullies had negative impacts on their environment, health, economy and communities.

## Residential Survey: Does garbage harm the community, public health, the environment and tourism?

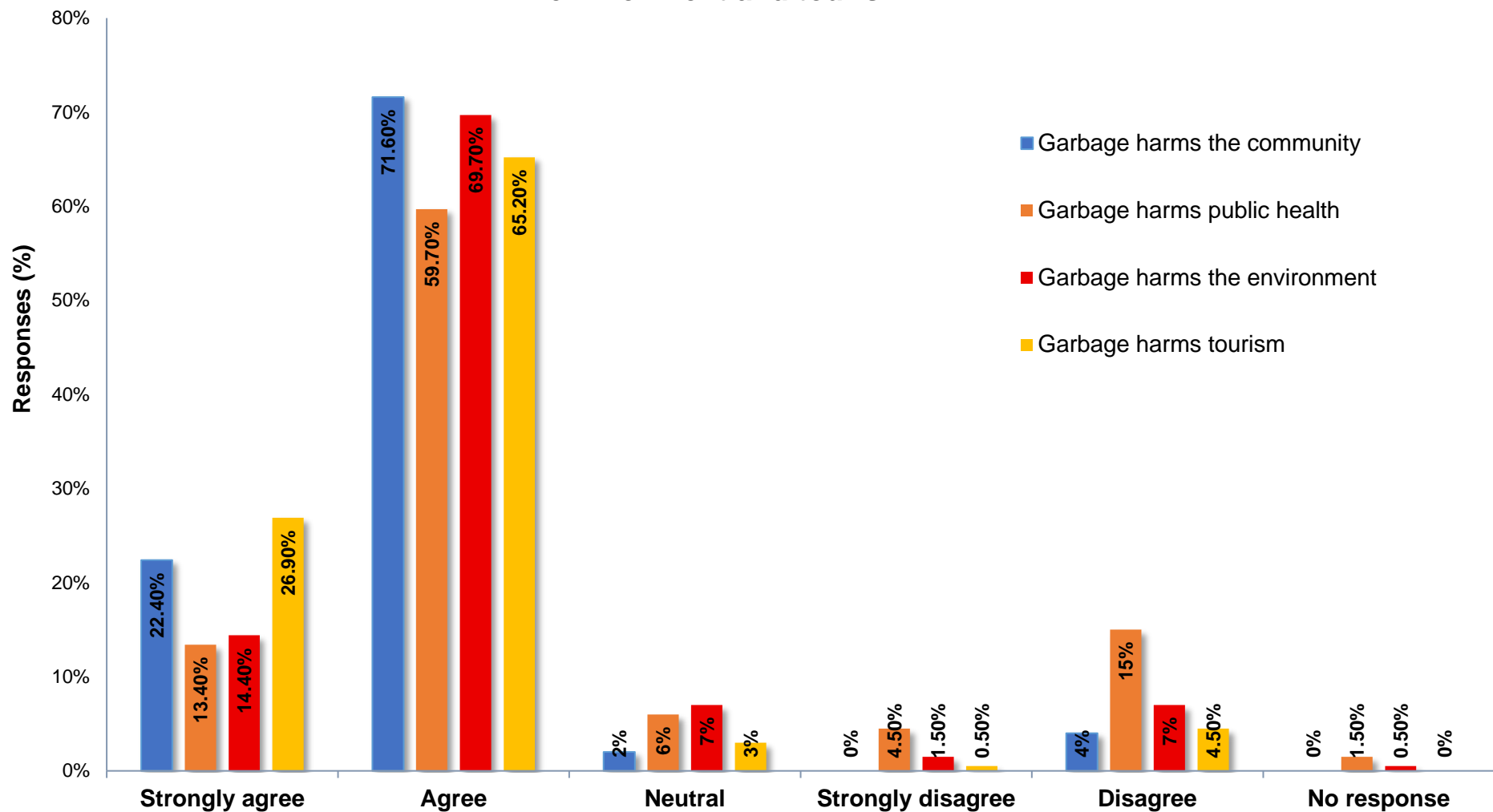


Chart 2: Residential Survey: Does Garbage harm the community, public health, the environment and tourism?

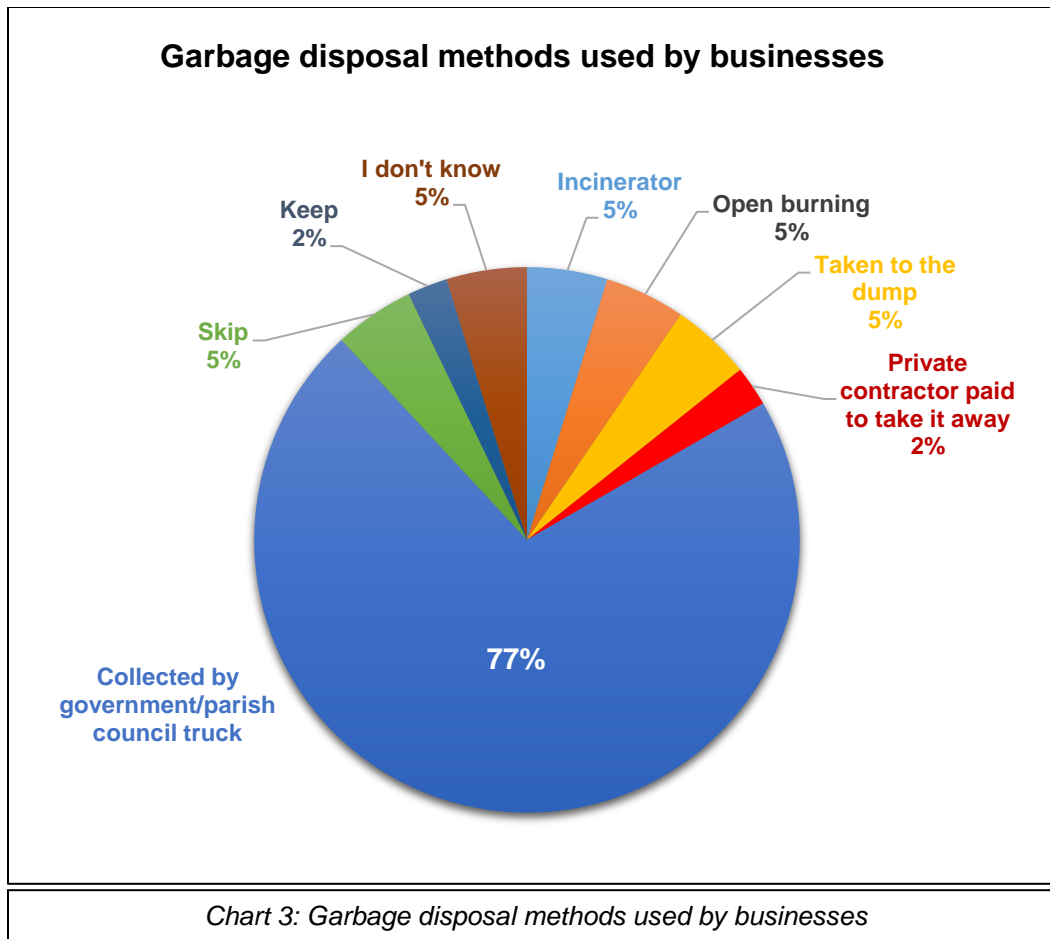
### **3.4.2 Businesses**

In January 2016, a survey was administered to 39 business persons with operations located close to the South Gully. The survey assessed their knowledge, attitudes and practices relating to the gully and solid waste management in general.

Seventy-seven percent (77%) of business operators said that the community their business was located in was clean and that the residents and business operators in those areas did a good job of managing their garbage. Sixty-nine percent (69%) of business operators stated that they stored their garbage by containerizing it, and the same percentage said their waste was mostly made up of food wrappers and containers. Seventy-seven percent (77%) of respondents stated that their garbage was collected by the government/parish council (see Chart 3) and agreed that strategy for managing waste was typical for businesses in their area. Eighty-eight percent (88%) of businesses had their garbage collected at least twice a week. In contrast to the government stakeholders interviewed, business operators did not feel that the agencies responsible for garbage collection were effective.

Some of the participants in the focus group identified themselves as business operators. They explained that it was common practice for business places in the same location to share skips. These skips were then cleared by the government/parish council trucks or private contractors. For example, at the Montego Bay Marine Park's offices at Pier One, garbage cleared from the DCB is collected by the WPM, but garbage generated by their own operations was taken away by a Minott Services who are contracted by their landlord, Pier One.





Business operators were able to identify the closest drain/gully/river to be less than 50 feet away and were aware that it was a part of the South Gully. They were also aware that garbage was being dumped in the drain/gully/river. Seventy-seven percent (77%) of the respondents felt that the garbage in the gullies came from outside their community. Only 16% of respondents admitted that their business dumped garbage in the gully.

Fifty-nine percent (59%) of business operators said that household waste (food containers, food waste, yard scraps etc.) was the most common type of garbage being dumped in the gully, but they were not sure what time of day the dumping was happening. More than half of the business operators (61%) did not know if or when the gully in their area was cleaned; twenty-eight percent (28%) said the gully in their community was cleaned once per year or less. Again, this conflicts with reports received from the WPM and NWA.

Seventy-seven percent (77%) of respondents knew that the garbage in gullies washes out to sea when it rains. Most recognised that garbage was bad for the environment (64%), public health (56%), their community (72%), their business (77%) and tourism (65%) (see Chart 4).

In summary, for the most part businesses claimed to be doing a good job of managing their waste, containerizing it and receiving regular collection. They pointed the finger at householders as being responsible for most of the waste that is being dumped in the gullies, which they also maintained was coming from outside the community where their businesses were located. They also acknowledged that garbage in the gullies has several negative impacts, including that it was bad for business.

### Business Survey: Does garbage harm businesses, communities, public health, the environment and tourism?

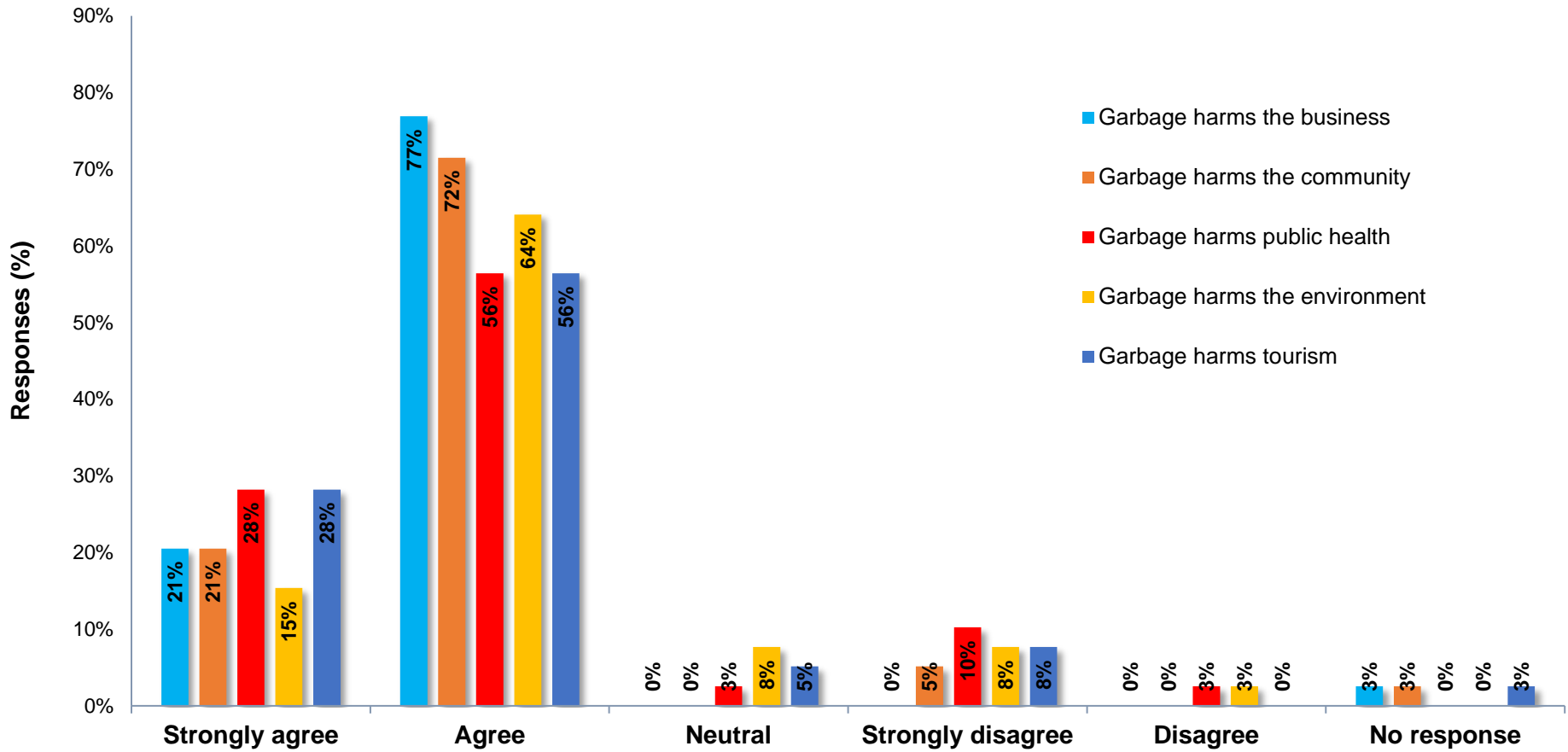


Chart 4: Business Survey: Does Garbage Harm the Community, Public Health, Environment and Tourism?

### 3.4.3 Government Stakeholders

Interviews were conducted with six government agencies which were identified as major stakeholders in the South Gully's maintenance (see section 2.4 for details of the interview methodology).

In general, the view held by the majority of government stakeholders interviewed was that the agencies responsible for garbage management in Montego Bay worked together effectively and there was adequate resource sharing and cooperation among the agencies. It should be noted however, that the WPM and NWA did not give any comment as to their own effectiveness. The representative from the NWA also went on to say that it did not appear that the agencies were very effective, based on the pile up of garbage in the city.

The agencies did unanimously agree, that there was a severe lack of facilities for garbage disposal in Montego Bay, particularly in the informal settlements and in the business areas of the city. Bins, skips and regular, reliable garbage collection were all identified as inadequate. Regular garbage collection was said to be the major issue, particularly in the town centre. These commercial areas were described as being busy 24 hours per day. The WPM maintained that they did not have the resources to increase the frequency of collection needed to keep the streets and drains clear of garbage. According to the SJPC: "there is no down time for the authorities to organize their resources and do a proper cleanup of these areas." WPM also pointed out that according to the World Health Organization's standards, waste should be collected from residential areas a minimum of two times per week; but due to resource constraints, they currently only managed to do so once per week in most areas.

A lack of resources was repeatedly identified by government stakeholders as being one of the main contributing factors to inadequate solid waste management in Montego Bay. WPM said that replacing or repairing damaged facilities and equipment was very slow due to low levels of funding within their agency. WPM explained there were times when garbage trucks went out of service due to mechanical and structural damage, typically due to bad road conditions and vandalism. They stated that the downtime for these trucks could be prolonged, as it was very challenging to acquire the necessary funds to source parts and effect repairs. They said this was also the case when they needed to replace damaged skips and garbage bins.

All government stakeholders were knowledgeable about the location and importance of the South Gully. They said that the inadequate garbage collection and facilities in Montego Bay resulted in a significant amount of garbage being dumped in the gullies, particularly the South Gully. They identified the garbage in the South Gully as mainly comprising of domestic and household items which was typically washed down from communities in the hills during heavy rains.

Government stakeholders were of the general opinion that Montego Bay had a longstanding culture of poor solid waste management habits, particularly the dumping of garbage in gullies and drains. Montego Bay citizens were described as commonly discarding their waste in public areas "without any regard for where the garbage goes." Anthony Knight, Parish Manager of the NWA



explained that although this was not a new practice, in the past it was not cause for concern because garbage was typically biodegradable (paper bags, cardboard boxes, crocus material), and had fewer negative impacts. Over the past few decades, however, the introduction and rise in popularity of plastic shopping bags (or “lada” bags as they are called in Montego Bay) and plastic beverage bottles has changed the composition of the waste stream. Garbage in Montego Bay, and in Jamaica as a whole, has become increasingly non-biodegradable. Solid waste management practices have unfortunately not evolved with the types of waste being generated, leading to the observed negative impacts.

Efforts by agencies responsible for solid waste management in Montego Bay to meet with various stakeholders to educate them about proper garbage disposal practices were described as limited in their effectiveness. People who attended such meetings were identified as typically being those affected by illegal dumping, rather than those who were responsible. It was felt that public education campaigns needed to be accompanied by greater enforcement; but existing fines were thought to be insufficient to act as a deterrent to littering and illegal dumping.

### 3.5 Perceived Solutions

<b>Table 1: Perceived solutions to poor solid waste management in Montego Bay, St. James</b>	
<b>Research Instrument</b>	<b>Top Proposed Solutions</b>
Residential Survey	<ol style="list-style-type: none"> <li>1. Education</li> <li>2. Improved garbage management infrastructure (bins)</li> <li>3. Increased frequency of garbage collection</li> </ol>
Commercial Survey	<ol style="list-style-type: none"> <li>1. Education</li> <li>2. Improved garbage management infrastructure (bins)</li> <li>3. Increased frequency of garbage collection</li> </ol>
Stakeholder Interviews	<ol style="list-style-type: none"> <li>1. Education</li> <li>2. Increased frequency of garbage collection</li> <li>3. Increased enforcement of anti-litter/anti-dumping laws</li> </ol>
Focus Group	<ol style="list-style-type: none"> <li>1. Increased enforcement of anti-litter/anti-dumping laws, with an emphasis on fines for breaches</li> </ol>

Table 1 outlines the most commonly proposed solutions from research subjects targeted by the SGRP. Education was the number one proposed solution to the problem of poor solid waste management in Montego Bay. The focus group participants, however, were adamant that only increased enforcement and fines would solve Montego Bay's garbage problem.

Government stakeholders offered the most comprehensive description of their proposed solutions; they too maintained that public education to improve cultural attitudes towards waste was key. Other solutions they proposed included increasing the capital and human resources needed to manage Montego Bay's waste, i.e. more garbage trucks, collection equipment, application of appropriate technology, more bins and skips, and more environmental wardens, enforcement officers, and inspectors. Sharon Williams, Community Relations Officer at the WPM, stated that the removal of illegal vendors and homeless people from the streets of Montego Bay could also do much to improve the city's garbage problem. Carolyn Brown-James, Field Supervisor at the SDC highlighted the need to improve communication among all major stakeholders in garbage management in Montego Bay and by extension the South Gully (government agencies, community groups, businesses and industries). Brown-James felt that these groups should be working together towards identifying practical solutions to the garbage issues. In the absence of this cooperation, they identified enforcement as the next step to achieving compliance.

#### **4. DISCUSSION**

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All interview subjects, survey respondents and focus group participants agreed that there was a solid waste management problem in the South Gully and environs, but very few claimed any responsibility. Most survey respondents, and all focus group participants stated that they were themselves practicing good solid waste management, their community was a clean community and that businesses did a good job of managing their garbage. Very few people admitted to dumping garbage illegally, but recognised that there was significant quantities of garbage in the gully. They claimed this garbage was being dumped in the gully by "other people" – other community members and outsiders.

Most residents and businesses were receiving garbage collection from either WPM or private contractors. The problem was the frequency and predictability of the WPM garbage collection service. Due to what was often described as erratic garbage collection, garbage was being dumped wherever was easiest (open lots and gullies). Focus group participants also felt that garbage trucks were reluctant to go into informal settlements, although this could not be confirmed by the WPM. Several members of the focus group claimed that in the absence of collection, residents from informal settlements dumped their garbage in open lots or threw bags of garbage "at" skips in public spaces. It is also felt that once there was a pile of garbage somewhere, more garbage would be added, compounding the problem.

Inadequate numbers of bins in public spaces, poor cultural attitudes to solid waste and lack of sufficient and effective enforcement of anti-dumping/litter laws were all identified as important factors. Poor policing of solid waste management in Montego Bay's commercial areas was a

particular problem. Among residents and businesses there was a strong consensus on public education as a solution. Focus group participants were also adamant that greater enforcement was needed to complement any public education campaign.

Amongst government stakeholders, opinions were divided. Some agencies thought that they were working effectively together, while others pointed to the evident solid waste problem in Montego Bay and the South Gully. There was a marked lack of consensus among government agencies and residents and business about the frequency and adequacy of collection and cleaning of the gullies. Government agencies claimed to be cleaning gullies far more frequently than was perceived by Montego Bay's residents and business owners. The SJPC indicated that they cleaned the gullies three to four times per year and that the NWA cleaned it "once or twice" per year. On the other hand, the NWA said that they cleaned the gullies "several times" per year and also "when the need arises". WPM stated that they cleaned the gullies also "as needed". Some clarification on the definition of "when the need arises" and "as needed" should be established, because according to the respondents of the residential and business surveys, the South Gully was cleaned only once per year if at all. All government stakeholders felt that increased levels of resources was what is needed to tackle Montego Bay's solid waste management issues.

It should also be noted, that the problems of poor solid waste management by citizens, the public and private sector in Montego Bay, were observed to be exacerbated by an absence of rational city planning and drainage design.

## 5. RECOMMENDATIONS

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1. Resolution of the long-standing lack of clarity as to who is responsible for the maintenance of gullies in Montego Bay and throughout Jamaica.
2. Establishment of a regular cleaning schedule for gullies which is published in newspapers and online.
3. Increased frequency of collection in Montego Bay, and establishment of a well-publicized garbage collection schedule and map of collection routes
4. Roll out of a significant quantity of bins along established garbage collection routes. Skips might be appropriate in some places (at the entrance to informal settlements for example) but it should be recognized that they take much longer to clear. Lightweight, plastic bins, with holes punched in the sides and bottom to discourage theft, are most effective in urban areas where frequent garbage collection takes place. Private sector support should be sought to finance the bins.
5. The Nuh Dutty Up Jamaica Campaign should develop educational products targeted at Montego Bay based on the main findings of the SGRP.
6. Enforcement of anti-dumping laws should be dramatically ramped up in Montego Bay. This enforcement should be accompanied by appropriate publicity, including messaging targeted at business operators promoting good solid waste management practices.
7. Revision of the NSWMA act to include specific regulations for solid waste management by commercial and industrial operations; increase fines and impose harsher penalties for non-compliance. Revisions should be accompanied by increased enforcement efforts.
8. Efforts should be made to interest the Western Mirror in publishing photographs of the South Gully each month to assess any improvements.



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## 7. APPENDICES

### 7.1 Residential Survey



**CLEAN COASTS PROJECT  
GULLY RESEARCH PROJECT – SOUTH GULLY, MONTEGO BAY  
THE IMPACT OF GARBAGE ON THE MARINE ENVIRONMENT  
2015 - 2016  
SURVEY QUESTIONNAIRE – RESIDENTIAL (INDIVIDUAL)**

*Thank you for participating in this survey, which is being conducted as a part of the Clean Coasts Project being delivered by the Jamaica Environment Trust with the support of the Tourism Enhancement Fund. Our aim is to find out how garbage ends up in the South Gully and how to prevent this garbage from reaching the sea. Your responses will be held in the strictest confidence. Placing your name on the questionnaire is not required.*

#### **SECTION 1: DEMOGRAPHICS**

**DATE:** (DD/MM/YY) \_\_\_\_\_ **TIME:** \_\_\_\_\_

**LOCATION:** (COMMUNITY) \_\_\_\_\_

**NAME:** \_\_\_\_\_ **TELEPHONE:** \_\_\_\_\_ (OPTIONAL)

**AGE:** (YEARS)  16 – 20  21 – 35  36 – 50  51 – 65  Over 65

**SEX:**  Male  Female

**HIGHEST LEVEL OF EDUCATION ACHIEVED:**

Primary  Secondary  Tertiary  Postgraduate

**EMPLOYMENT:**  Unemployed  Self-Employed  Employed (Private Sector/Corporate)

Employed (Public Sector/ Government)  Other (please specify) \_\_\_\_\_

#### **SECTION 2: HOW IS GARBAGE MANAGED?**

**1. How do you dispose of your garbage at home? (tick all that apply)**

- Burning
- Composting
- Recycling
- Put it in a bin (or other container) at my gate to be collected by the garbage truck
- Take it to the dump
- Other (please specify): \_\_\_\_\_

**2. What is your garbage mostly made up of? (tick one)**

- Fruit and vegetable peelings
- Food waste (bones, meat scraps, dairy, oils, etc.)

- Food wrappers/containers (glass bottles, plastic bottles, Styrofoam, cans, plastic bags, plastic wrappers, etc.)
- Yard waste (tree trimmings, leaves, etc.)
- Other (please specify): \_\_\_\_\_

**3. How often is garbage collected in your community? (tick one)**

- More than twice per week
- Twice per week
- Once per week
- Once every two weeks
- Once per month
- Less than once per month

**4. Where is the closest public garbage bin? (tick one)**

*A public garbage bin would be one that is not owned by a resident, i.e. not the one at their gate or their neighbour's gate*

- < 10 feet away
- 10 – 50 feet away
- 50 – 100 feet away
- > 100 feet away
- I don't know

**5. Where is the closest garbage skip? (tick one)**

- < 10 feet away
- 10 – 50 feet away
- 51 – 100 feet away
- > 100 feet away
- I don't know

**6. How do you dispose of your garbage when you are in public spaces? (tick all that apply)**

*A public space would include any area outside of the home or workplace/school*

- Put it in the closest bin
- Put it in a pile of garbage (not a bin) on the side of the road
- Keep it until I find a bin to put it in
- Throw it in the street
- Throw it in a drain/gully
- Other (please specify): \_\_\_\_\_

**SECTION 3: GULLIES AND GARBAGE**

**7. Where is the closest drain/gully/river?**

- < 50 feet away
- 51 – 100 feet away
- > 100 feet away
- I don't know

**8. Is this drain/gully/river a part of the South Gully?**

- Yes
- No

I don't know

**9. Is garbage being dumped in the drain/gully/river?**

- Yes  
 No  
 I am not sure

**10. How often do community members dump garbage in the drain/gully/river?**

- Never  
 Rarely  
 Sometimes  
 Often  
 Always

**11. What type of garbage is mostly dumped in the drain/gully/river?**

- Household waste (food containers, yard waste, food scraps)  
 Commercial waste (generated by local businesses)  
 Industrial waste (generated by factories, industries)  
 Other (please specify): \_\_\_\_\_

**12. Have you witnessed persons from outside your community dumping garbage in the drain/gully/river?**

- Yes (go to question 10)  
 No (go to question 12)

**13. How do people from outside your community transport the garbage to the drain/gully/river?**

- By foot (including with a wheelbarrow or similar method)  
 On a bicycle/motorcycle  
 In a car  
 In a van  
 In a truck  
 I don't know  
 Other (please specify): \_\_\_\_\_

**14. What time of day is garbage dumped in the gully?**

- During the day  
 At night  
 Both day and night  
 I don't know

**15. Where does the garbage that is dumped in the drain/gully/river go? (tick all that apply)**

- It is cleaned up by the community  
 It is cleaned up by (a) local business(es)  
 It is cleaned up by the government  
 It washes out to sea  
 It breaks down naturally  
 I don't know  
 Other (please specify): \_\_\_\_\_



**16. How often is the gully cleaned?**

- More than once a month
- Once a month
- Every 2 – 3 months
- Every 4 – 6 months
- Once per year
- Less than once per year
- I don't know

<b>SECTION 4: ATTITUDES TO THE GARBAGE AND THE GULLY</b>					
<b>Indicate to what extent you agree or disagree with the following statements</b>	<b>Strongly agree</b>	<b>Agree</b>	<b>Neither agree nor disagree</b>	<b>Disagree</b>	<b>Strongly disagree</b>
17. My community is a clean community					
18. Garbage in the South Gully comes from my community					
19. Garbage in the South Gully comes from outside my community					
20. The residents in my community do a good job managing their garbage					
21. The businesses in my community do a good job managing their garbage					
22. Garbage in the South Gully has a negative impact on my health					
23. Garbage in the South Gully has a negative impact on the environment					
24. Garbage in gullies is bad for the community					
25. Garbage in gullies is bad for tourism					

**26. Rank in order of effectiveness the ways we can get people to better manage their garbage?**

- Education
- Enforcement/fines
- More bins/skips
- More frequent collections
- Cash Incentives
- Recycling

**Any other suggestions:**

## 7.2 Small Business Survey



**CLEAN COASTS PROJECT  
GULLY RESEARCH PROJECT – SOUTH GULLY, MONTEGO BAY  
THE IMPACT OF GARBAGE ON THE MARINE ENVIRONMENT  
2015 - 2016  
SURVEY QUESTIONNAIRE – COMMERCIAL (SMALL BUSINESSES)**

*Thank you for participating in this survey, which is being conducted as a part of the Clean Coasts Project being delivered by the Jamaica Environment Trust with the support of the Tourism Enhancement Fund. Our aim is to find out how garbage ends up in the South Gully and how to prevent it from reaching the sea. Your responses will be held in the strictest confidence. Placing your name on the questionnaire is not required.*

### **SECTION 1: BUSINESS PROFILE**

**DATE:** (DD/MM/YY) \_\_\_\_\_ **TIME:** \_\_\_\_\_  
**LOCATION:** (COMMUNITY) \_\_\_\_\_  
**NAME OF BUSINESS:** \_\_\_\_\_  
**TYPE OF BUSINESS:** \_\_\_\_\_  
**NAME OF RESPONDENT:** \_\_\_\_\_ **TELEPHONE:** \_\_\_\_\_ (OPTIONAL)  
**RESPONDENT'S POSITION:** \_\_\_\_\_

### **SECTION 2: HOW IS GARBAGE MANAGED?**

**1. How is the garbage generated by the business contained? (tick all that apply)**

- Bin or other small to medium sized container
- Skip
- Pile (not put in a container)
- Sheltered area which can be closed (shed, room, etc.)
- Other (please specify): \_\_\_\_\_

**2. How do you get rid of the garbage generated by the business? (tick all that apply)**

- Incinerator/Concrete burn box
- Open burning (in a drum or in the open)
- Taken to the dump by an employee or the business owner
- Private contractor is paid to take it away
- Collected by government/parish council truck
- Other (please specify): \_\_\_\_\_

**3. What is your garbage mostly made up of? (tick one)**

- Fruit and vegetable peelings
- Food waste (bones, meat scraps, dairy, cooking oils, etc.)

- Food wrappers/containers (glass bottles, plastic bottles, Styrofoam, cans, plastic bags, plastic wrappers, etc.)
- Yard waste (tree trimmings, leaves, etc.)
- Paper and cardboard
- Chemicals and oils
- Fabrics and Textiles
- Other (please specify): \_\_\_\_\_

**4. How often is the businesses garbage collected? (tick one)**

- Daily
- Two to three times per week
- Once per week
- Once every two weeks
- Once per month
- Less than once per month

**5. How do other nearby businesses commonly dispose of their garbage? (choose top 3)**

- Incinerator/Concrete burn box
- Open burning (in a drum or in the open)
- Taken to the dump by an employee or the business owner
- Private contractor is paid to take it away
- Collected by government/parish council truck
- Dumped in a drain/gully/river
- Dumped on the road
- Other (please specify): \_\_\_\_\_

**SECTION 3: GULLIES AND GARBAGE**

**6. Where is the closest drain/gully/river to the business?**

- < 50 feet away
- 51 – 100 feet away
- > 100 feet away
- I don't know

**7. Is this drain/gully/river a part of the South Gully?**

- Yes
- No
- I don't know

**8. Is garbage being dumped in the drain/gully/river?**

- Yes
- No
- I don't know

**9. How often do businesses dump garbage in the drain/gully/river?**

- Never
- Rarely

- Sometimes
- Often
- Always

**10. What type of garbage is mostly dumped the drain/gully/river?**

- Household waste (food containers, yard waste, food scraps)
- Commercial waste (generated by local businesses)
- Industrial waste (generated by factories, industries)
- Other (please specify): \_\_\_\_\_

**11. Have you witnessed persons from outside the area dumping garbage in the drain/gully/river?**

- Yes (go to question 12)
- No (go to question 13)

**12. How do people from outside your community transport the garbage to the drain/gully/river?**

- By foot (including with a wheelbarrow or similar method)
- On a bicycle/motorcycle
- In a car
- In a van
- In a truck
- I don't know
- Other (please specify): \_\_\_\_\_

**13. What time of day is garbage dumped in the gully?**

- During the day
- At night
- Both day and night
- I don't know

**14. Where does the garbage that is dumped in the drain/gully/river go? (tick all that apply)**

- It is cleaned up by the community
- It is cleaned up by (a) local business(es)
- It is cleaned up by the government
- It washes out to sea
- It breaks down naturally
- I don't know
- Other (please specify): \_\_\_\_\_



**15. How often is the gully cleaned?**

- More than once a month
- Once a month
- Every 2 – 3 months
- Every 4 – 6 months
- Once per year
- Less than once per year
- I don't know

<b>SECTION 4: ATTITUDES TO THE GARBAGE AND THE GULLY</b>					
<b>Indicate to what extent you agree or disagree with the following statements</b>	<b>Strongly agree</b>	<b>Agree</b>	<b>Neither agree nor disagree</b>	<b>Disagree</b>	<b>Strongly disagree</b>
<b>16.</b> The community where my business is located is clean					
<b>17.</b> Garbage in the South Gully comes the community where my business is located					
<b>18.</b> Garbage in the South Gully comes from outside the area					
<b>19.</b> The residents in the community where my business is located do a good job managing their garbage					
<b>20.</b> The businesses in the community where my business is located do a good job managing their garbage					
<b>21.</b> Garbage in the South Gully has a negative impact on public health					
<b>22.</b> Garbage in the South Gully has a negative impact on the environment					
<b>23.</b> Garbage in gullies is bad for the community					
<b>24.</b> Garbage in gullies is bad for business					
<b>25.</b> Garbage in gullies is bad for tourism					

**26. Rank in order of effectiveness the ways we can get businesses to better manage their garbage?**

- Education
- Enforcement/fines
- More bins/skips
- More frequent collections
- Cash Incentives
- Recycling

**Any other suggestions:**

### 7.3 Stakeholder Interview Schedule



**CLEAN COASTS PROJECT  
GULLY RESEARCH PROJECT – SOUTH GULLY, MONTEGO BAY  
THE IMPACT OF GARBAGE ON THE MARINE ENVIRONMENT  
2015 - 2016  
TALKING POINTS FOR STRUCTURED STAKEHOLDER INTERVIEWS**

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#### **BACKGROUND**

1. Name, location and contact information of organisation
2. Name and position of interviewee
3. Type of organisation and activities

#### **GARBAGE MANAGEMENT IN MONTEGO BAY**

4. Who are the groups responsible for garbage management in Montego Bay? Are they effective? How would you rate each group? What are some of the challenges they face?
5. To what extent do the groups responsible work together to improve garbage management in Montego Bay?
6. How do residents typically get rid of their garbage
7. How do industries typically get rid of their garbage
8. How do businesses typically get rid of their garbage
9. (If located in Montego Bay) How do you get rid of your garbage?
10. Are there enough bins and skips in public spaces in Montego Bay?
11. How frequently is garbage collected? In your opinion is this frequent enough? How does this vary across the city?
12. Are businesses and industries paying for their garbage to be collected?

#### **GARBAGE IN THE GULLIES**

13. What role do the gullies play in Montego Bay? Do they work well? Why or why not?
14. Do you know where the South Gully is? (If located in Montego Bay) Is the South Gully or its tributaries close by?
15. How do you think garbage is getting into the gullies, specifically the South Gully?
16. Who is mostly responsible for garbage in the gullies, specifically the South Gully? Residents? Business owners? Industries?
17. What factors are contributing to garbage being dumped in the South Gully?
18. What is type of garbage is being dumped into South Gully and its tributaries?
19. Is the South Gully cleaned? If so, by who and how often?
20. What is the impact of the garbage in the gullies, specifically the South Gully?

#### **SOLUTIONS**

21. In your opinion, what are the solutions to the garbage problems in Montego Bay?
22. What are the major challenges you can foresee to your suggestion(s)?
23. How can we stop people from dumping garbage in the gullies?

## 7.4 List of Stakeholder Interviewees

### Public Sector

- St. James Parish Council
  - *His Worship The Mayor Councillor Glendon Harris, Mayor of Montego Bay*
  - *Mr. Saad Campbell, Deputy Superintendent Roads & Works*
- Western Parks & Market (WPM)
  - *Ms. Sharnon Williams, Community Relations Officer*
- Urban Development Corporation (UDC), Montego Bay
  - *Ms. Lisa Golding, Community Integration Manager*
- Social Development Commission (SDC)
  - *Ms. Carolyn Brown-James, Field Supervisor*
- National Works Agency (NWA)
  - *Mr. Anthony Knight, Parish Manager*

### Non-Government

- Montego Bay Marine Park (MBMP)
  - *Mr. Hugh Shim, Marine Park Manager*

### Private Sector

- Pier One
  - *Mr. Jason Russell, Owner/Manager*

## 7.5 Focus Group Outline

Three themes to be discussed, with more detailed questions under each theme.

### **GARBAGE MANAGEMENT IN MONTEGO BAY**

1. How do residents, industries and businesses typically get rid of their garbage in Montego Bay?
2. Who are the groups responsible for garbage management in Montego Bay? Are they effective? How would you rate each group? What are some of the challenges they face?
3. To what extent do the groups responsible work together to improve garbage management in Montego Bay?
4. Are there enough bins and skips in public spaces in Montego Bay?
5. How frequently is garbage collected? In your opinion is this frequent enough? How does this vary across the city?

### **GARBAGE IN THE GULLIES**

Participants to be shown photos of South Gully from Research

For each ask:

- Where is this?
- How does this picture make you feel?
- Is this somewhere you would like to live



















6. What role do the gullies play in Montego Bay? Do they work well? Why or why not?
7. Do you know where the South Gully is?
8. How do you think garbage is getting into the gullies, specifically the South Gully? Who is responsible? Why is garbage dumped in the gully?
9. What is the impact of the garbage in the gullies, specifically the South Gully?

### **SOLUTIONS**

10. What are the solutions to the garbage problems in Montego Bay?
11. What are the major challenges you can foresee to your suggestion(s)?
12. How can we stop people from dumping garbage in the gullies?

## 7.6 Quarterly Monitoring Reports – South Gully Debris Containment Boom



# JAMAICA ENVIRONMENT TRUST

REPORT TO THE NATURAL RESOURCES CONSERVATION AUTHORITY/  
NATIONAL ENVIRONMENT AND PLANNING AGENCY  
AUGUST 2015

**RE: BEACH LICENSE NO L3477**

**ISSUED TO THE JAMAICA ENVIRONMENT TRUST (JET) TO CONSTRUCT 20 MOORINGS ANCHORING A DEBRIS CONTAINMENT BOOM (DCB) AT THE MOUTH OF THE SOUTH GULLY IN MONTEGO BAY TO TEST ITS EFFECTIVENESS IN REDUCING THE DISCHARGE OF FLOATING WASTE FROM GULLY TO SEA**

---

**DATE OF LICENSE: 29 APRIL 2015**

**DATE OF DEPLOYMENT OF DCB: JUNE 2-5, 2015**

**SUB CONTRACTORS: YARDIE ENVIRONMENTAL CONSERVATIONISTS, LLEWELLYN MEGGS  
MONTEGO BAY MARINE PARK, HUGH SHIM**

**FIRST QUARTERLY REPORT TO NEPA JUNE 6, 2015 – 31 JULY 2015**

### **DESCRIPTION OF CONCEPT, DESIGN, CONSTRUCTION AND DEPLOYMENT OF DCB**

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As part of JET's 2014/2015 Clean Coasts Project (CCP) Phase I funded by the Tourism Enhancement Fund (TEF,) Yardie Environmental Conservationists (YEC) were contracted to design, construct and test a Debris Containment Boom (DCB) to be moored at the mouth of the South Gully in Montego Bay, within the boundaries of the Montego Bay Marine Park (MBMP). It is well known that there is a significant discharge of solid waste from gullies into the marine environment in Jamaica, and JET sought to investigate the feasibility and cost effectiveness of DCBs in preventing or reducing these impacts.



*Montego Bay Marine Park Headquarters, Pier One, Montego Bay, St James*



The DCB was designed using cargo net, used five-litre plastic bottles taken from JET’s recycling programme, rope, lead weights and anchors made out of used tyres filled with cement. The net was 300 feet long and two feet in depth and it was constructed on site. The plastic bottle “floats” were then inserted into a sleeve made from fishing net confiscated by the MBMP.



*DCB deployment June 24, 2015 Montego Bay Marine Park, mouth of the South Gully*

The DCB was deployed June 2nd to 5th, and a steady flow of garbage was immediately seen, even in fair weather conditions. See <https://www.youtube.com/watch?v=srsggruIEqQ&feature=youtu.be> We have not yet made this short video public, as we want to see how the DCB holds up in a rain event before any premature celebration, but you will be able to view it from this link.

#### **MANAGEMENT, MONITORING AND CLEANING**

After deployment, Yardie Environmental Conservationists (YEC) Ltd. engaged the Montego Bay Marine Park (MBMP) to manage, monitor and clear the DCB. A copy of this contract is attached with an effective date of July 22<sup>nd</sup>, 2015. Please note that although the contract was not yet in place, MBMP did carry out cleaning and maintenance of the DCB in mid June and July.



*Fisher Malik Qsaim cleaning DCB*

Please note that JET's contract with YEC covered the construction period of the DCB, beginning in September 2014, before a beach license was sought from NEPA and before MBMP was contracted. A second contract with YEC covers monitoring and maintenance and runs until the end of Phase II of the Clean Coasts Project in July 2016.

#### **First Quarterly Report to NEPA 1 May 2015 – 31 July 2015**

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Cleaning was done by MBMP two weeks after deployment and following that, at two week intervals during this period, depending on the availability of personnel and the amount of garbage accumulated. MBMP used their own boat and employed fishers from the River Bay Fishing Coop. They estimate that each cleaning produces about 70 lbs of floating waste, but we believe this contains a significant amount of water. During the period under review, the DCB has been cleaned approximately three times. We have provided a Solid Waste Data form to the MBMP manager, Mr. Hugh Shim, so that a more detailed record of cleaning days and type of debris removed can be submitted with the next report. This Clean Up Data Sheet is provided as an appendix to the MBMP contract.

The type of debris for this period was as expected – mostly Styrofoam, plastic bottles, plastic bags, drinking straws and a few cans. A blanket and large piece of carpet were also recovered, but that was unusual. Algae has accumulated on the net at a rapid rate and has had to be regularly scraped. This is something of a hurdle, as this may render the cost of maintenance over the long term prohibitive. So far, MBMP is keeping the algae at manageable levels.



***Algae build up on boom net***

There has been no major rain event during this period, so the DCB has not been tested under conditions of heavy rain or storm surge – the latter could bring floating debris onshore to be trapped on the other side of the boom.

During this quarter, there were many days of strong winds. This resulted in the lighter articles of waste blowing over the DCB and floating away. If other DCBs are to be deployed, then perhaps the surface containers need to be larger than five-litre plastic bottles, which is likely to increase costs.

At installation, there were two gaps left at each side – one approx. 20 ft. wide and the other approx. 30 ft. wide. Due to the many different currents, waste escaped at the ends. The 20 ft. gap was remedied in the second week after installation, resulting in greater capture of litter at that location and the 30 ft. gap remains to be remedied. Plastic bottles have been sent to the MBMP to get this done as part of their maintenance contract.

MBMP reports that the Pier One harbour is “noticeably cleaner and the water is clearer.”

#### **THE REQUIREMENTS OF THE BEACH LICENSE**

NEPA did a site visit during the week of July 6<sup>th</sup>, 2015 and found two minor omissions – the posting of the beach license notice on site and the absence of a letter from National Solid Waste Management Authority’s giving permission for the disposal of the waste removed from the sea.

The beach license notice (as supplied by NEPA) has now been posted.

The beach license requires the following:

- *Submission of a maintenance plan for the DCB within three months of the date of issue of the license. The plan is to include measures to be implemented for the DCB during a rain event.*

**JET’s comment:** The maintenance plan is contained in the contract with MBMP. At this point, we have no specific plans to deal with a rain event – we want to observe the functioning of the DCB before we can

formulate such a plan. In the case of storm or hurricane conditions, the DCB will be removed and stored, as outlined in the contract.

- *The solid waste collected by the DCB be disposed of at a municipal dumpsite, with the written approval of the National Solid Waste Management Authority (NSWMA).*

**JET's comment:** The waste is being disposed of in a skip owned by Pier One with the permission of the owner, and cleared by a private waste contractor. **We are not taking it to a dumpsite, so we believe this condition is unnecessary and ask that it be removed from the beach license.**

- *Submission of the contract of the responsible person/agency for removal of debris*

**JET's comment:** The two relevant contracts (JET/Yardie and Yardie/MBMP) are attached to this report.

- *Quarterly monitoring reports stating the names of those responsible for the monitoring, the volume and type of debris trapped by the DCB and the volume and type of debris which escapes the DCB.*

**JET's comment:** MBMP is responsible for monitoring the volume and type of debris trapped by the DCB and this is the first of the quarterly monitoring reports. There is no scale available so weight will have to be estimated. **Please note we have no way of monitoring waste that escapes the DCB, so we cannot meet this requirement of the license and request that it be removed.**



*Typical amount and type of waste removed from a DCB cleaning exercise*

Submitted by:

**Jamaica Environment Trust**

**August 5<sup>th</sup>, 2015**





# JAMAICA ENVIRONMENT TRUST

REPORT TO THE NATURAL RESOURCES CONSERVATION AUTHORITY/  
NATIONAL ENVIRONMENT AND PLANNING AGENCY  
NOVEMBER 2015

**RE: BEACH LICENSE NO L3477**

**ISSUED TO THE JAMAICA ENVIRONMENT TRUST (JET) TO CONSTRUCT 20 MOORINGS ANCHORING A DEBRIS CONTAINMENT BOOM (DCB) AT THE MOUTH OF THE SOUTH GULLY IN MONTEGO BAY TO TEST ITS EFFECTIVENESS IN REDUCING THE DISCHARGE OF FLOATING WASTE FROM GULLY TO THE SEA**

---

**DATE OF LICENSE: 29 APRIL 2015**

**DATE OF DEPLOYMENT OF DCB: JUNE 2-5, 2015**

**SUB CONTRACTORS: YARDIE ENVIRONMENTAL CONSERVATIONISTS, LLEWELLYN MEGGS  
MONTEGO BAY MARINE PARK, HUGH SHIM**

**SECOND QUARTERLY REPORT TO NEPA 1 AUGUST 2015 – 31 OCTOBER 2015**

## **MANAGEMENT, MONITORING AND CLEANING**

The cleaning and maintenance of the Debris Containment Boom (DCB) after its installation in June 2014 is still ongoing. Clearing and cleaning is done once per week over a period of two days, usually on Saturdays and Sundays. Since submission of the last quarterly report in August 2015, the island has experienced several heavy rainfall events, resulting in an increase in the levels of water and debris passing through the DCB. Several changes in the functionality of the DCB have been observed.

- The debris and algae that builds up in the boom is cleaned weekly. Additionally, after each heavy rainfall event the boom is cleared and inspected for damage. The shape and orientation of the boom has proved very effective in trapping the debris during normal (low) flow rates out of the gully.
- In early October 2015, the lower part of the boom was damaged after a heavy rainfall event. The ropes holding the net to the anchors became detached in some sections of the DCB. Following this, the boom was not maintaining its regular shape. This damage caused sections of the boom to move towards the shore at high tide. When the tide and water flow out of the gully returned to normal, the boom resumed its regular shape and functionality.
- Repairs were carried out to rectify this damage on October 21<sup>st</sup>, 2015





*Left to Right: DCB with its regular shape (October 12<sup>th</sup>, 2015); DCB with distorted shape due to damage of the anchoring rope, and waves pushing it towards shore; DCB severely distorted in shape because of damage to the ropes holding it to the anchors (October 20<sup>th</sup>, 2015); DCB returns to normal orientation following repairs (October 21<sup>st</sup>, 2015)*

- On October 28th, 2015, the anchor ropes holding the boom to the tires broke at various points due to storm surge associated with another heavy rainfall event. This resulted in the DCB being non-functional.
- The repairs following this damage were slightly delayed due to bad weather conditions and poor water clarity. Once conditions became favorable, repairs were carried out between October 29<sup>th</sup> and 30<sup>th</sup>, using rope and tie straps. The boom has resumed its regular function.



*The anchor rope for the boom came lose due to storm surge during a heavy rainfall event on October 28<sup>th</sup>, 2015. Since this picture was taken the boom has been repaired.*

- The maintenance team has also identified a few gaps in the floats at the top of the DCB net. These are resulting in debris floating over the net during high tide events. Additional bottles will be sourced and installed to fill these gaps.
- It is recommended that the anchor rope will need to be given more length in future DCB designs, not only to adjust for the rise of the tide, but for a rise in sea level during storm surge.

#### **Perceived changes to Biodiversity and Water Clarity**

- In August 2015 MBMP reported perceived increases in species diversity in the water surrounding the boom. Seahorses, crustaceans and other small herbivorous marine organisms had been observed feeding on the algae growing on the boom; however, due to the frequency of algae cleaning, it is not a reliable source of food. In the absence of baseline data however, no firm conclusion can be drawn.
- MBMP also observed an improvement in water clarity in August 2015. This was thought to be attributable to some filtering of the gully water emptying into the area by the algae growing on the DCB.
- Subsequently, turbid conditions and an influx of freshwater resulting from recent rainfall events have significantly reduced water clarity in the area.
- This increase in turbidity has prevented any comparative assessments of the perceived increases in biodiversity previously observed.

#### **Garbage collected**

- Garbage collected from the boom weighs on average 100lbs – 110lbs per cleaning. Garbage is weighed using a hanging scale. Debris found in the boom is predominantly comprised of plastic bottles and bags and fabric. Dead animals which have been placed in plastic bags and thrown in the gully have also been removed on occasion.
- Garbage cleared from the boom is placed in the Pier One garbage skip. The skip is cleared weekly by private contractors hired by Pier One.

#### **THE REQUIREMENTS OF THE BEACH LICENSE**

NEPA did a site visit during the week of July 6th, 2015 and found two minor omissions – the posting of the beach license on site and the absence of a letter from the National Solid Waste Management Authority (NSWMA) giving permission for the disposal of the waste removed from the sea.

1. The beach license has subsequently been posted on site - a sign illustrating the license has been erected adjacent to the front gate of the Pier One complex.
2. MBMP has followed up with Regional Operations Manager for the NSWMA in Western Jamaica, Lenroy James, but no official communication has been received.



*Beach License sign (August 21<sup>st</sup>, 2015)*

Submitted by:  
**Jamaica Environment Trust**  
**November 6<sup>th</sup>, 2015**



# JAMAICA ENVIRONMENT TRUST

REPORT TO THE NATURAL RESOURCES CONSERVATION AUTHORITY/  
NATIONAL ENVIRONMENT AND PLANNING AGENCY  
FEBRUARY 2016

**RE: BEACH LICENSE NO L3477**

**ISSUED TO THE JAMAICA ENVIRONMENT TRUST (JET) TO CONSTRUCT 20 MOORINGS ANCHORING A DEBRIS CONTAINMENT BOOM (DCB) AT THE MOUTH OF THE SOUTH GULLY IN MONTEGO BAY TO TEST ITS EFFECTIVENESS IN REDUCING THE DISCHARGE OF FLOATING WASTE FROM GULLY TO THE SEA**

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**DATE OF LICENSE: 29 APRIL 2015**

**DATE OF DEPLOYMENT OF DCB: JUNE 2-5, 2015**

**SUB CONTRACTORS: YARDIE ENVIRONMENTAL CONSERVATIONISTS, LLEWELLYN MEGGS  
MONTEGO BAY MARINE PARK, HUGH SHIM**

**THIRD QUARTERLY REPORT TO NEPA 1 NOVEMBER 2015 – 31 JANUARY 2016**

## **MANAGEMENT, MONITORING AND CLEANING**

The cleaning and maintenance of the Debris Containment Boom (DCB) by the Montego Bay Marine Park (MBMP) is still ongoing. Clearing and cleaning is done once per week over a period of two days, usually on Saturdays and Sundays. On average 100lbs of garbage is being collected per month from the boom. During the period November 1<sup>st</sup>, 2015 to January 21<sup>st</sup>, 2016 the boom remained in fairly good shape and working order. The only damage experienced during the period was the loosening of the boom's anchor ropes. This was easily repaired by reconnecting the netting to the anchors.



*The boom in early January 2016 illustrating minor damage - one section of the boom was loose*

Between January 21<sup>st</sup> and 22<sup>nd</sup>, 2016 Montego Bay experienced a severe weather event, during which the boom sustained substantial damage:

- The anchors were dragged several meters along the seafloor by a storm surge
- The ropes used to anchor the boom were also damaged during the storm surge
- The netting used to hold the bottle floats at the top of the boom was torn by floating debris, causing bottles to become loose



*Left: Damage to the boom caused by the severe weather January 21<sup>st</sup> – 22<sup>nd</sup>, 2016. Right: storm surge on January 21<sup>st</sup>, 2016 at the gate to Pier One.*

The boom was removed from the water to facilitate repairs on January 26<sup>th</sup>. They were completed and the boom was placed back in the water on February 5<sup>th</sup>.

#### **Garbage collected**

- Garbage cleared from the boom continues to be placed in the Pier One garbage skip. The skip is cleared weekly by the National Solid Waste Management Authority (NSWMA).



*NSWMA truck clears the Pier One skip on January 22<sup>nd</sup>, 2016*

- The clearing and maintenance of the boom versus the recording of data on what is being collected from the boom are now being carried out as separate tasks. The task of sorting, weighing and recording the quantities of debris collected requires two persons to complete efficiently. Mr. Malik Qasim, who clears and maintains the boom, is now being assisted by a community member or MBMP volunteer with data collection.



- 373.5lb of garbage was collected between 1<sup>st</sup> November and December 31<sup>st</sup> 2015. This was noted as an increase by Mr. Qasim, who typically clears 25lbs per week from the boom. MBMP has suggested a possible reason for this may have been an overall increase in garbage in the town associated with Christmas season activities. As a result of this increase, the boom was cleared twice per week during this period.
- Faeces being found in Styrofoam boxes and plastic bags collected from the boom have become a cause for concern. Persons appear to be defacating in these receptacles and then throwing them into the gully. The containers float along the gully and are trapped by the boom along with other debris. This poses a serious health risk for personnel clearing the debris from the boom, who are not able to determine the content of these receptacles until they are being removed.
- A large quantity of silt has washed down the gully since the time of the last report. Coupled with the movement of sediments by normal wave action and storm surge, a small “beach” has been created at the mouth of the South Gully. MBMP reported several findings related to the types of solid waste being washed up from the Gully on this “beach”, including large quantities of used condoms - typically 100 or more at a time. Sometimes these are found in bags. The most recent find of this nature was on Saturday the 6<sup>th</sup> February 2016. It is suspected that the large quantities of condoms are resulting from increases in prostitution activities near the gully in the vicinity of the Harbour Street and Barnett Street intersection. There are also nine adult entertainment clubs in close proximity to the gully.



*A bag full of condoms found at the mouth of the gully on February 1<sup>st</sup>, 2016*

- The increased incidences of used condoms and faeces been dumped in the South Gully have been reported to the UDC who is responsible for the land adjacent to the mouth of the gully. On February 6<sup>th</sup>, 2016 Lisa Golding of the UDC was given a tour of the area to see firsthand what was taking place.

Submitted by:

**Jamaica Environment Trust**

**February 12, 2016**

**South Gully Research Project**  
**Conducted by the Jamaica Environment Trust**  
**With funding from the Tourism Enhancement Fund for the Clean Coasts Project**



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