

# MAJURO ATOLL WASTE COMPANY

## DEVELOPMENT VISION 2008



WASTE MATERIAL WASHED OUT OF MAJURO LANDFILL IN APRIL 2007 AS A  
RESULT OF A SEAWALL FAILURE

“WORKING TOWARDS A CLEANER ENVIRONMENT  
THROUGH COOPERATIVE EFFORTS”

## **INTRODUCTION & BACKGROUND**

In March of 2007 the **Government of the Republic of the Marshall Islands** created the **Majuro Atoll Waste Company** with the idea of having it operate as the Government's arm to handle Solid Waste Activities as a private enterprise, operating with a management plan and operating as efficiently as possible, firstly on Majuro, but with the hope of expansion throughout the entire republic in the coming years. Through our developing public awareness program, we are aiming at not only reducing the amount of material entering the waste stream, but intend on creating a recycling environment that will be the envy of other developing nations. We recognize the need to reduce the waste stream in order to maximize the lifespan of our landfill while creating land that can be used for public areas, parks etc. Through cooperative efforts, MAWC will stand and get the Marshall Islands on the right track. MAWC works closely with the Ministry of Public Works, MICS and many other groups on the challenging issues of solid waste in the republic.

- The RMI needs to be a clean & attractive place, the RMI needs to encourage tourism.
- The RMI needs to encourage and expand foreign investment.
- The RMI needs to increase world interest in who we are and what we have to offer and what we can and have accomplished.
- With the establishment of MAWC, the RMI is moving in the right direction to address its solid waste issues today and in the future.

### **"Working towards a cleaner environment through cooperative efforts"**

...is MAWC's new motto emphasizing the need for "cooperative effort" which will result in the Marshall Islands becoming a cleaner more attractive place for all. Through our cooperative efforts, we hope to instill the interest and involvement of the community at all levels. Building ownership with the community will result in more cooperative efforts. MAWC is working closely with the Marshall Islands Conservation Society, The Ministry of Education and the Ministry of Health, developing a public awareness program that will be aimed at increasing community involvement and enlisting cooperative efforts from all groups wishing to participate.



THE MAWC CREW



JAPANESE VOLUNTEERS ON A "MOTTANAI" CLEAN-UP



US SERVICEMEN FROM USS PELELIU ASSISTING WITH DUMPSTER REBUILD

As can be seen in the photos above & below, there is a great amount of help available. People are willing to "pitch-in" and help. MAWC is taking the lead with the creation of a public awareness program that will coordinate & schedule clean-up efforts. Working with RMIEPA, MOE, MOH, OEPPC, EPPSO, MICS, JOVC and CMI we can achieve great things across the country.



STUDENTS FROM WOJA SCHOOL-BATTERY DRIVE

### **ESTABLISHMENT OF MAJURO ATOLL WASTE COMPANY**

With the establishment of the Majuro Atoll Waste Company, the Government took on the responsibility to recognize the waste problems at hand, and made the commitment to support MAWC in its new important role as a public service provider.

With the establishment of MAWC, a Board of Directors was chosen and a General Manager was hired. The Board and the Manager work closely with the Ministry of Public Works on identifying issues and working out solutions for them. The Board is "thinking big" and wants to make the Majuro/RMI Waste Management System a model for other developing nations to learn from. MAWC is severely hindered by its limited operating budget. The RMI must increase funding to allow for permanent operations at a higher level than is currently funded.

**MAWC's first and foremost responsibility is that of Landfill Management.**



**MAJURO LANDFILL ENTRANCE OCTOBER 2006**



**MAJURO LANDFILL & RECYCLING CENTER ENTRANCE OCTOBER 2007**

Prior to March of 2007, the landfill was not managed very well. There was no plan in place for its operation, no plan for recycling, no plan for maximizing the sites life, no environmental management plan, no

development plan and a complete lack of direction all contributed to the problems with the operation.

MAWC has identified numerous areas of the landfill which require better management. MAWC has begun removing **Hazardous Materials & Recyclable Glass, Plastic, Metals & Green Waste** from the waste stream through careful inspections of vehicles entering the landfill site. Once our waste separation facility construction is completed, we will be able to capture the majority of hazardous & recyclable material entering the collection system, **further reducing what goes into the landfill.**

#### **THE FUTURE**

The future of the finished landfill is envisioned as becoming a park with sporting fields, possibly a sports/event stadium and a seawall walking path that would extend over 3000' up the Batkan coast, playgrounds, BBQ areas and rest room facilities would create a world class recreation & leisure area for Majuro. The MPW Engineering staff is currently developing concept plans for such a project.

#### **The daily operation of the landfill requires attention to the following areas:**

- Production of daily cover material through shoreline dredging.
- Supervision & inspection of vehicles dumping material at the site.
- Separation of Recyclables
- Processing of Green Waste
- General Clean-up of entire landfill area
- Daily compacting of landfill
- Daily covering of landfill
- Cleaning and packaging Recyclables for export
- Site Security & refusing scavenger access
- General maintenance on site, equipment and rolling stock
- Site improvement projects

MAWC is responsible for the management of the landfill which until this year was a very dangerous and scary place.

A replacement Land-fill Compactor is needed. The single Caterpillar 816 Compactor that is operating at our Land-fill is very old and worn out. Many 10's of thousands of dollars have been spent keeping the machine running and it is now in need of a transmission (\$35k) Replacing this machine is viewed as a top priority. A new compactor runs \$300k while a used one runs \$150-250k.



MAJURO LANDFILL OCTOBER 2006

Same area of landfill today!!!!!!!



MAJURO LANDFILL OCTOBER 2007

Daily maintenance, compaction & cover have transformed the landfill from a dangerous operation to one that is becoming very pleasing to the eye. A drastic reduction in odor vectors and rodents have been the result of our covering efforts. The reaction from the community on these changes has been overwhelmingly positive. This effort is having a positive effect on the reduction of Public Health issues on Majuro.

#### **OTHER INFORMATION**

- **SEAWALL**

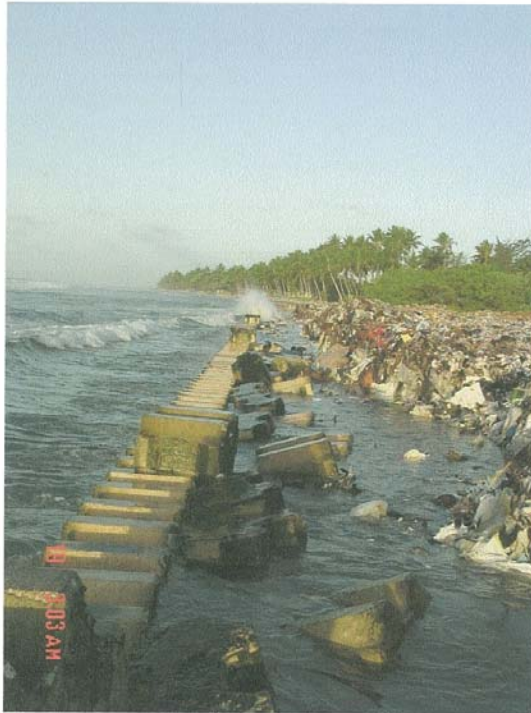
MAWC is faced with a problem that no one seems to be able to address, that is the inadequacies of the seawall that surrounds the landfill and the complete failure of the gabion basket/block seawall at



the former Batkan landfill (which was never finished) Any high tide or high wave event out of the south causes failures and wash-outs of the landfill. **Three such failures have occurred since October 2006 at a repair & clean-up cost of over \$100k.** The declaration of an Emergency regarding the seawall should be pushed for so we may tap into international assistance programs. Costs are estimated between \$1-4M. **This project is considered our #1 priority.** In order to maximize the life of the existing landfill, we need to increase the size of the landfill by constructing an extension of the existing wall farther onto the reef and then begin to move up the reef possibly 3000' to create new fill area. It is the intent of MAWC to keep the site operational for 10 years. With the new seawall in place and the area filled, a 50-75' strip could be reserved as Public Land" and be engineered into a "Beach Park" recreation area.



**SEAWALL FAILURE APRIL 19, 2007. HIGH TIDES AND A SOUTHERLY WIND CREATED 2'-3' WAVES THAT CAUSED THE WALL TO FAIL**



**Immediate replacement and expansion of this seawall is viewed as MAWC's #1 Priority**

- **SHORELINE DREDGE OR SUCTION DREDGE**

The landfill has an insatiable appetite for sand & cover material which needs to be replenished on a daily basis. Additionally, there are numerous unfinished landfill areas across the island that need to have a cap of cover material installed so as to make the areas safe and habitable. We are being directed by EPA that Suction Sand Dredging is the only way for us to continue harvesting sand. Shoreline Dredging will become outlawed in 2008. This type of equipment is going to cost in the area of \$1.8m. Having a suction dredge would also reduce the cost of new seawall construction by 40-50%.

- **TRASH PATROL**

MAWC has established an urban trash patrol truck that goes around the island cleaning the road, around dumpsters and lately has been picking up trash at the Hospital, the Jenrok area, Uliga, DUD and more. Additional requests are received daily for trash pick up all over the

island. (We need to put several other trucks on the road for this type of service as soon as possible) Additional Capital of \$90k needed for trucks and an additional \$50k for operations & staffing.

- **NEW COLLECTION DRUMS**

We have begun installing and servicing over 100 trash cans in front of take-out shops from Rita to the Airport. Collections are made on a daily basis. This effort has greatly reduced trash on the street. A dedicated collection truck is needed for this service. \$85k for a truck and \$25k for operations & staffing is needed.

- **COMMERCIAL WASTE COLLECTION SYSTEM**

In late November 2007 MAWC will begin operating a "Commercial & Gov't. Waste Collection System for fee". Trucks and dumpsters are "on the water" and will be in full service before Christmas. This service will generate badly needed revenue for the company. Trucks & bins have been purchased but a shortfall of \$30k for tax & shipping exists. This collection system will enhance the collections of waste from across the island and generate some revenue. The revenue generated is estimated between \$70-150k per year. A second collection and additional bins are needed at a cost of \$250k.

- **RECYCLING**

MAWC has begun recycling collections & separation in earnest, but to make this program a success, MAWC needs funding to purchase process equipment that will allow for the Recyclable materials to be prepared for export or processed on island. Estimates to "tool-up" with all of the recycling equipment we need are at \$1.9m.

- **WASTE COLLECTIONS**

The vast problem of waste collection; MAWC is not responsible for Waste Collection on Majuro. Waste Collection is the responsibility of the Majuro Atoll Local Government. **MAWC has spent over \$60k on repairing waste collection bins, another \$70k on a replacement roll-off truck to be in place when the MALGOV truck fails.** The island is faced with over 400 illegal dump sites from Rita to the Airport, not to mention the complete lack of a collection system for the western end of the island. To properly address the collection system in town, \$900k is needed for replacement trucks & bins and \$200k for operations. To establish a collection system for the western end of the island \$300k for Capital equipment and \$80k per year to operate are needed. MAWC has developed an alternate concept for augmenting the existing Waste Collection system: By procuring several (2-3) small (10-20 yard) rear load compactor trucks, MAWC could introduce weekly

waste collection across the island in areas that do not currently have the large dumpsters. This would greatly reduce the number of illegal dump sites across the island and help to clean up the lagoon and ocean where presently, the shorelines are constantly littered with refuse.

This type of truck costs in the \$100k range and \$30k per year to operate and maintain.

- **MAINTENANCE FACILITY**

The Majuro Atoll Waste Company has already demonstrated its ability to maintain & rebuild heavy equipment and waste collection bins. The MAWC staff includes two skilled Mechanics, a Master Welder and a Journeyman Carpenter. These key staff members along with our general labor force are capable of handling just about any task we put in front of them. It is imperative that MAWC be able to maintain its own equipment. With the investments in equipment that have been made as well as future investment in equipment, MAWC must maintain each piece of equipment to or better than the manufacturers recommended maintenance schedule to insure the life of the machinery and maximize the investment. In order to work with more productivity and to work safely we need to construct an on-site Maintenance facility. The facility would include two vehicle maintenance bays, one with a vehicle lift and engine hoist or overhead crane, a paint booth and a welding bay. Also included would be a room dedicated for tool & equipment storage and a Safety office. Costs to construct and outfit such a facility are estimated at \$400k. Long term operations of such a facility could include contracting other maintenance & repair functions from the Gov't.

## **FINANCES**

Each of the above mentioned items represent a component of the whole picture of Waste Management for Majuro.

MAWC asked for a 2008 operation budget of \$1.4 M this year and is receiving \$325k. Our Capitol request of over \$4m was not considered. Out of this \$325k, \$160k will go to pay down debt accumulated in 2007 because of seawall failures and previous MPW contracts relating to the Seawall.

MAWC's basic operation with no additional level of effort will cost \$425k annually. This will leave MAWC short by \$60k for 2008. The failure of MALGOV & MOH to become involved as partners in the company has created a large void in our finances.

MAWC is currently discussing with Government the possibility of modifications to the current sales tax base and the possibility of tariffs or

additional taxes on items that need to be recycled. Batteries, Automobiles, bottles & cans could be taxed or have a deposit system developed to enhance the MAWC cash flow and reduce the amount of these materials entering the country.

MAWC will continue to be dependent on international aid until such a time that sufficient funding by Government is provided or as we are able to generate enough revenue to cover our costs.

## **THE PLAN**

MAWC is operating with very limited funding. We have proposed changes to the local sales tax structure that would give MAWC an additional source of steady funding. Other sources of funding are possible through new taxes or import duty and tariffs on batteries, automobiles, bottles, cans, plastic materials etc. All of these possibilities are being explored by Government at the present.

Outside of taxes & tariffs, MAWC is being very creative in coming up with revenue generation. The first component is charging customers for removal of abandon or scrap vehicles. This will generate a small amount of revenue annually.

We are working towards shipping our scrap steel off island and expect to generate in the area of \$10k after expenses annually.

The sale of scrap automobile batteries is expected to generate in the area of \$7k per year.

Our commercial waste collection system will generate between \$70 and \$100k in our first year of operation. We anticipate that additional bins and trucks will be needed for this system within a few months and by adding additional accounts, the revenue will increase.

In addition, MAWC is developing a fee schedule for the Landfill for commercial customers. Prior to implementing any fees at the Landfill, we must have our Public Awareness Program developed and have the community informed. We must also have enough bins in place to allow for household waste to be collected efficiently and have an Environmental Enforcement program operational.

MAWC envisions establishing a nursery in conjunction with the green-waste processing segment. This could be expanded to include a tree

trimming service and landscaping contract service. More study of this is needed to determine its feasibility. If MAWC were able to contract tree trimming at all Government facilities, the operation would be profitable.

The purchase of a Suction Sand Dredge is viewed as being the best way for MAWC to produce revenue that will ultimately support the company's financial needs. The costs of the equipment and the associated infrastructure will cost in the area of \$1.8m. Several potential projects are coming up where the equipment could be contracted by the customer to provide fill material. The two jobs would provide enough revenue to pay for the entire dredge in less than two years time. The continued operation of the Dredge will afford MAWC the ability to produce enough cover material for the current landfill, former landfills and to make fill material available for sale to customers. Our estimates show that the operation after Capitol costs are paid will reduce our current operating expenditures by \$12-15k per year while producing excess material that has the potential of being sold for over \$1m annually. MAWC views this as the means to potentially fund our entire operation.

The procurement of a Weight Bridge or Vehicle Scale is necessary. By installing this equipment at the Landfill, we will be able to make very accurate calculations on volume of material entering the landfill as well as having the ability to place charges on each load or ton of material entering the site. A Weight Bridge is currently available on island and had a total cost of \$30k. MAWC views its purchase as critical and must move quickly to secure its purchase before the contractor sells it elsewhere.

Without a solid base of funding, we will be constantly in shortage mode while waiting for additional monies from the Gov't. Indications from the Government are that our 2009 operations budget will be increased substantially from our current level of funding.

Grants for Capitol items and large projects are being sought at present.

Funding issues aside, MAWC will continue to operate the Landfill in as an environmentally compliant means as possible. We have recently completed our Landfill & Dredge site Environmental Management Plan and it has been submitted to RMIEPA for review & comment. MAWC will continue to work with the RMIEPA towards total compliance and to initiate and implement a SAFETY FIRST program. By being compliant and operating with EPA regulations as our guide MAWC will become a model for other developing landfill & recycling operators across the world.

MAWC will continue to modernize the Waste Collection Systems on Majuro with an emphasis on moving towards smaller collection bins

placed with increased frequency, thus collecting a higher volume of the waste stream and reducing shoreline dumping.

MAWC will continue to develop and increase its Recycling efforts. We recognize that by increasing the amount of recyclable material that we can cull from the waste stream that we will be extending the working life of the landfill at the same time. Our vision for the recycling program is as follows;

BY INCORPORATING AN EFFICIENT RECYCLING PROGRAM WITH PROPER LANDFILL MANAGEMENT, WE WILL BE REDUCING THE AMOUNT OF WASTE STREAM MATERIAL ENTERING THE LANDFILL BY 70-80%, THEREBY INCREASING THE LIFESPAN OF THE EXISTING LAND-FILL BY MANY YEARS.

## **RECYCLING**

**MAWC HAS RECENTLY BEGUN CONSTRUCTION OF A WASTE SORTING BUILDING. UNTIL SUCH A TIME THAT WE CAN AFFORD A MECHANICLE SEPERATION SYSTEM (\$1m) WE WILL SORT THE WASTE BY HAND. THIS FACILITY WILL ALLOW US TO EFFECTIVLY REDUCE THE MATERIAL THAT ENTERS THE LANDFILL BY AN ESTIMATED 80%.**

- **GREEN WASTE & ORGANIC MATTER** makes up 45-50% of our waste stream. We have been very successful on capturing approximately 70% of the green waste entering the landfill and processing it into mulch via a wood chipper. Our intent is to mix this material with other organic waste and create a marketable compost material. Additional equipment is needed for this segment of the recycling process. We have identified several pieces of equipment that will increase our productivity and make a more marketable product. They are; A Tromel Screen, A Tub Grinder and a Compost mixer. Capitol needed for this machinery is \$400k.



**GREEN WASTE BEING PROCESSED AT THE MAJURO LANDFILL**

- **SCRAP STEEL, ALUMINUM, OTHER METALS & AUTOMOBILES** make up 10-15% of our waste stream in volume. Compacting and handling equipment are needed to make the material shippable and marketable. Capital needed for this machinery is \$450k.





**SCRAP STEEL WAITING TO BE COMPACTED AND EXPORTED FOR RECYCLING**

- **PAPER & CARDBOARD PACKAGING** makes up 15-20% of the waste stream. It is not cost effective to ship this type of material off island unless specialized compaction equipment is installed. In order to break even exporting cardboard, we must be able to produce bales which weigh 1800-2000 lbs each, allowing for 20 bales to fill a 20' container. The material must be kept dry prior to baling which will require a warehouse facility in which to process & store this material. Costs associated with setting up a viable paper system are estimated at \$250k. Paper & Cardboard can be shredded and mixed with green waste for use as compost & mulch, greatly reducing processing costs while effectively removing the material from the waste stream.
  
- **PET PLASTIC, HDPE PLASTIC, STYROPHOAM & PACKAGING** makes up 10-15% of our waste stream. Our vision for the processing of the plastic components of the waste stream is as follows;
  
- **PLASTIC RECYCLING PROCESSES**
  1. Incorporate the "**BLEST**" process into our operation. The "**BLEST**" process takes PET caps, labels, Styrofoam, packaging

etc. and through a heat and pressure process **creates usable fuel in 3 grades.** (Diesel 70%, Petrol 20%, Heavy Oil 5% and 5% watery waste that can be land-filled) Costs are estimated at \$300k to install this equipment. If incorporated, we can expect to fuel our waste collection vehicles with plastic. This could equate into a cost savings of over 50k per year in fuel costs while reducing the amount of plastic material that needs to be exported. **MAWC will begin operating a small "BLEST" system on a trial basis in conjunction with the Marshall Islands Visitors Authority in December 2007.** During the trial, MAWC will conduct fuel analysis and test burn in various equipment to explore the viability of a larger unit.

- 2. HDPE can be ground into pellets and mixed with virgin plastic material to be fed into a ROTO-MOLD machine to produce any sort of molded plastic item.** We envision **ROTO-MOLD** as a means to reduce the amount of **HDPE** that is currently entering the landfill and at the same time we would **produce waste or recycling collection bins and possibly water tanks.** This would effectively remove the collected HDPE from the waste stream for many years while increasing the collection of waste and recyclables. Cost estimates for this type of machinery are \$100-150k.



**HDPE STOCKPILE AT MAJURO LANDFILL**

3. PET bottles can be ground up and used as a road base or exported for recycling. This material is not cost effective to export. Grinding machinery needed costs \$45k. If export is decided as the disposal means, a compactor in the 1800-2400lb range will be needed with a cost of \$40k.



**Stockpiled PET Bottles at the Majuro Landfill**

- **GLASS BOTTLES & JARS** that make up 5-7% of the waste stream will be ground or "pulverized" on site and the material utilized in road base, pipe base, asphalt, decorative concrete. Exportation of glass is not viable because of the low market world price and for the high cost of shipping. A glass "Pulverisor" or crushing machine is needed at a cost of \$45k.



**Stockpiled glass bottles at the Majuro Landfill**

- **WHITE GOODS & ELECTRONICS** make up 5-7% of our waste stream. These items can be separated and sold to various scrap markets. White goods consist of sheet steel, aluminum, motors, copper and Electronic devices can have the wiring, PC boards, and batteries, plastic separated and sold to each respective market. A proper sorting & reduction facility will be required and we estimate the facility with necessary equipment will cost \$80k.



**COMPUTER MONITORS & OTHER ELECTRONIC DEVICES AWAITING EXPORT**

- **WOOD WASTE & CONSTRUCTION DEBRIS** makes up 5% of the waste stream. This material is currently land filled. By including a TUB GRINDER as a component of our recycling equipment, we can grind this material and mix with the Green waste to create compost & mulch. Cost of a Tub Grinder is \$300k.
- **LEAD ACID BATTERIES** make up 1% of the waste stream. MAWC is currently stockpiling them and will export to S. Korea for recycling. This type of battery export will pay for itself and generate a small profit. RMI EPA has instructed us to construct a containment wall and cover for this material with a cost of \$25k.
- **WASTE OIL, CHEMICALS & HAZARDOUS MATERIAL** makes up an additional 2-5% of our waste stream. Waste oil, chemicals & paint can be incinerated or distilled locally reducing the very costly need for export. A distiller for solvents & paint costs \$50k and a Waste Oil Incinerator costs \$50k. Both are viewed as necessary items for the site. Other Hazardous materials that require off site processing will be costly and we must insure that the waste generator be charged for the service. RMI EPA has instructed us that a covered containment area be constructed for this material with a cost of \$25k and an additional \$10k for a storage tank.

**RECYCLING WILL NEVER PAY FOR ITSELF COMPLETELY; WE WILL NEED TO SUBSIDIZE RECYCLING THROUGH OTHER REVENUE GENERATING FUNCTIONS.**

**OTHER ITEMS:**

- **THE WASTE COLLECTION SYSTEM ON MAJURO** is failing. We must provide for the replacement of collection bins & trucks for not only the existing collection system, but allow for expansion to cover the south-western end of Majuro where there is currently no waste collection system. In addition, we must address the outlying Majuro Atoll Islands. Ejit Island is one of the largest contributors to lagoon dumping in Majuro. Cost estimates to provide adequate waste collections equipment for Majuro alone are \$1.2M and \$300k for operations. Several types of equipment are required. We will move away from the 20-30 yard bins and replace them with 2-6 yard front load dumpsters. In areas where the front load dumpsters are not an option we will collect cans using rear load conventional garbage trucks. If we are to move towards collections from the outlying islands, a work boat and loader would be needed as dedicated equipment with a cost of \$380k. An additional \$60k would be needed for operations.
- **HAZMAT RESPONSE TEAM & EQUIPMENT.** Majuro does not have a HAZMAT Response team. MAWC could outfit and train a group of our employees to be such a team. **A team that could respond to HAZMAT incidents in the RMI and perform evaluations, incident clean-up operations and assist the Fire, Police & Health services with coordination and proper response and handling of any HAZMAT requiring an emergency response.** Equipment & training are estimated at \$300k.
- **A MEDICAL WASTE DISPOSAL FACILITY** is badly needed on Majuro. The Ministry of Health has recently spent over \$800k on the purchase of a new Medical Waste Incinerator but has not produced an Operations & Maintenance & Training program. Nor has a proper facility been constructed. **Our concern is that the equipment will arrive and fall into disrepair and we will be back to the current situation of a huge backlog of un-refrigerated medical waste being inefficiently burned in open burn bins and the ash being buried in an area susceptible to shoreline erosion.** MAWC proposes to construct a proper building (already designed) and **operate the facility for MOH for cost + 15%. This would effectively relieve MOH of a huge problem that has been**

an issue for many years. Let MOH work on Health, let MAWC work on Waste.

- **AN ENVIRONMENTAL COMPLIANCE & LAW ENFORCEMENT OFFICE** could easily be attached to MAWC. Utilizing MALGov, RMI-EPA, MOH & DPS staffing seconded to MAWC as a working "Task Force" could expand the current level of effort in this area substantially. By having a dedicated group assigned to Environmental Law Enforcement, additional operational funds could be generated through fines generated by citation or fees associated with special disposal permits.

**BUDGETS**

MAJURO ATOLL WASTE COMPANY RECYCLING EQUIPMENT & INFRASTRUCTURE BUDGET							
ITEM			COST	Unfunded	Funded	Source	Priority
Light Metal Bailer			18,000.00	x			1
Heavy metal Bailer			60,000.00	x			1
Automobile Bailer			300,000.00	x			3
Grapple Truck			100,000.00	x			1
Warehouse			115,000.00	x			2
Glass Pulverisor			45,000.00	x			3
Cardboard Bailer			45,000.00	x			1
Plastic to Fuel Machine			300,000.00	x			4
Roto-Mold System for HDPE			300,000.00	x			4
Plastic Perforator & Bailer			50,000.00	x			2
Tub Grinder			200,000.00	x			3
Tromel Screen			50,000.00	x			3
Waste Oil Incinerator			115,000.00				4
Three ton flat Bed Trucks (3)			84,000.00				3
Sub Total			1,782,000.00	x			
10% Spares & Maintenance			158,300.00	x			
TOTAL			1,940,300.00	x			

## **LANDFILL MANAGEMENT & EXPANSION**

The current Landfill at Jable-Batkan Majuro is filling up fast. As a result, we have identified the need to either expand up or out. We are currently going up.

Ideally, once the Recycling Segregation is in full operation we will reduce the material that is entering the landfill from an estimated 100 tons per day to an estimated 20 tons per day.

Production of daily fill-cover material is critical to the operation. We must maintain our current dredge operation until next year and then must find a means to fund the procurement of a Suction Sand Dredge.

Once cover material is in an abundant supply, we can then move towards creating working "cells" on the current site. Given the current status of the landfill we have approximately 2 years left to fill.

By creating a clay berm or retaining wall around the existing landfill, we can continue filling the site for many years. This wall is envisioned at 3-4 meters in height with a base width of 2-3 meters and a top width of 1 to 2 meters. The installation of a durable poly-liner and a leachette extraction system will be required to allow for semi-arobic-clean landfill operations on the cap portion of the landfill.

Once funding is made available to construct an expanded seawall, landfill operations can again move towards the creation of new land. Because of the limited funding available, MAWC envisions building segments of seawall 100' at a time. This will allow us to work on the project on a small scale with limited operation funding. The immediate need for seawall replacement is 500' fronting the existing site and 3500' up the n/w shoreline of Majuro to encase and protect the former landfill. The original Gambion basket seawall which encased the old landfill has completely deteriorated and refuse washes into the sea with each tide.

The new Seawall is envisioned at 3-4m high with a top width of 2m and a Base of 3-4m constructed of rip-rap coral boulders reinforced with re-bar and capped with concrete. Several methods of construction could be utilized. Open drainage ports on the seawall could allow for the discharge of rain water and Leachette into the sea. This would be no different than our current landfill operation and would be the cheapest to construct. The MAWC Board and Manager are against this type of construction and



favor constructing a fully enclosed seawall which is lined and has a leachette/rainwater extraction system. The seawall should be constructed in "cells", each having its own extraction system. The extracted fluid would be routed into a discharge pond, aerated and then re-broadcast over the landfill surface via a sprinkler system. This would aid in evaporation and will greatly increase the compaction of the landfill.