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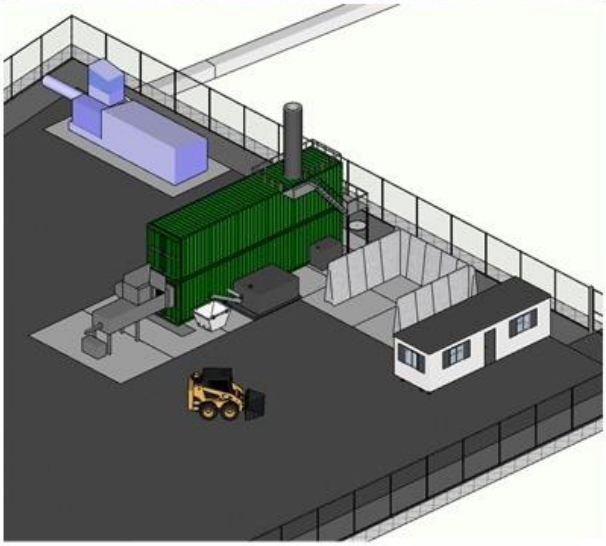
The Challenges of Waste Management on Small Remote Islands: An Ascension Island Case Study



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Executive Summary:

The challenges of dealing with waste on small islands are well documented. For many years on Ascension, human trash has been collected, taken to an open waste site, tipped out and burnt in a heap. The residue of the burnt waste (predominantly steel and aluminium cans, and glass bottles) is then landfilled. *Open burning is far from ideal – it's unsightly, inefficient and extremely 'dirty'.*

On 21st September 2015 AIG applied to Darwin Plus to develop and implement a waste management strategy for Ascension Island, build capacity for waste handling, post processing and recycling, and train local operatives for future sustainability of the waste site. The proposal was successful, and AIG were awarded £99,993 of funding. Mike Haworth was appointed as the DPLUS047 Project Manager, and the project ran from 1st April 2016 to 25th October 2018.

The Blue Marine Foundation (BLUE) were a delivery partner in the DPLUS047 project and provided a Consultant to support communications delivery and stakeholder engagement. This report is based on the BLUE Consultant's observations and discussions while on Ascension and St Helena, subsequent email exchanges with key individuals, plus desk-based research. This report provides a summary and references to the work undertaken to develop and implement the Ascension Waste Management Strategy and makes recommendations for the next steps.

A key aim of the Darwin Project was to drive a more collaborative approach to waste management and engage with the key stakeholders, including the major employing organisations; Babcock International, Composite Signals Organisation, Ministry of Defence, Sure South Atlantic, and the United States Air Force (USAF). All engaged positively except for USAF.

The Waste and Resources Action Programme (WRAP) was identified as the main project partner at the application phase and delivered key outputs including reports to inform the feasibility and development of the strategy, and a communications plan.

A key output in Year One was to collect the baseline data on the waste generated on Ascension. This required the sifting and sorting of waste collected from three of the four main settlements on the island: Georgetown, Two Boats and Travellers Hill Base. Waste generation per head is approximately 900kg/person/per year. Total annual island waste was estimated at 809 Tonnes.

The first Ascension Island – Waste Management Strategy was produced with a two phased delivery plan, the first phase to be actioned during the project lifespan:

- Construct a Household Waste Recycling Centre (HWRC) at One Boat.
- Initiate high temperature Incineration of general waste.
- Operation of the newly installed car crusher.
- Expansion of glass recycling.
- Collection of aluminium drinks cans for crushing, shipping and recycling.
- Delivery of a Communications Plan.
- Storage of other waste streams.

Phase Two is proposed to be a continuation of Phase One approaches, plus:

- Expansion of the current glass collection and the processing of the glass with an imploder.
- Introduction of mixed metal can recycling.

Paramount was the communication of the project to all audiences on Ascension. WRAP produced a detailed Communication Plan, which utilised the WRAP Recycle Now campaign entitled 'Recycle for Ascension'. This was implemented by the Project Manager, with the support of the BLUE Consultant.

A section of this report highlights waste management practices on St Helena, which could have relevance to Ascension Island. St Helena's waste strategy was written in 2017, their strategy is based predominantly around managed landfill. There is some small-scale recycling of paper/cardboard and glass, which is crushed in an imploder and used as a percentage of aggregate in concrete.

The organised collection of glass bottles and jars, with the aim to then crush the glass and re-use as replacement for virgin aggregates in concrete was a key recommendation by WRAP and a target within the Ascension Island - Waste Management Strategy. During the project it was decided to remove the purchase of a glass imploder to save money. Glass collection is expanding on Ascension, but crushing and using it as aggregate remains an ambition currently.

Approximately 12% of the total weight of waste on Ascension is plastics, which is burnt. There is much published on the pros and cons of landfill verses incineration for plastics, the decision taken on Ascension was to procure a high temperature incinerator, which delivers a far more efficient burn and significantly reduces toxic omissions. A DEFRA funded project is currently in operation on St Helena to reduce, recycle and reuse some of their plastic waste and key lessons could be learned.

Conclusions:

The Darwin Project was a great success, with the key output, an Ascension Island - Waste Management Strategy being a significant step forward for the island. The incinerator and car/can crusher are in place, the Two Boat HWRC site is complete, the AIG Waste Team are upskilled, partners are on board, collection of some waste streams for recycling is under way and overall systems in place. The ending of open burning of household waste will be a positive step forward for the island.

Recyclable materials are a significant percentage of the island's waste, and the decision to initially prioritise the collection and recycling of glass bottles and jars and aluminium cans is the right one. The engagement with the EOs, residents and other stakeholders on Ascension during the creation and roll out of the Waste Management Strategy and the project overall were excellent. The key ask of the population is clear; *'put glass bottles and jars in red bins and put drink cans into the blue bins'.*

There is a risk that waste management on Ascension Island could lose its momentum following the end of the project and the departure of the Project Manager. The population on Ascension is small (<800) and therefore offers a fantastic opportunity to establish a model of small island waste management in respect to collaboration, reduction, reuse and recycling. The project has been successful in bringing the MoD and AIG far closer together, but the USAF did not engage fully, and this ideally needs to change.

Because of the high cost of shipping, any materials collected for recycling must be either: usable on the island or have a value great enough to cover the transport costs. It appears that for Ascension the crushing of glass to use on-island to replace virgin aggregate in concrete, and the collecting, crushing, baling and shipping of aluminium cans to be shipped for recycling elsewhere, offer such rewards.

Continued and increasing support from the island population is required for the strategy to fully succeed. Core to this is driving behaviour change of the residents. Key messages must be repeated and reinforced to ensure that the strategy becomes a firm part of the island culture. Digital communication has a potentially vital role to play, including regular updates on the AIG website. The core population on both Ascension and St Helena are *Saints*, which offers a fantastic opportunity to have a one waste management communications plan embedded across both islands.

Waste management is an important issue on all small populated islands and the opportunity exists for stronger collaboration, joint strategies and approaches, and potentially developing tool kits that could be tailored for individual islands. For example, Ascension and St Helena could develop a glass-concrete mix for use on both islands, develop and deliver a joint communications plan, and perhaps collaborate on joint shipment of waste for recycling.

The big challenge for small islands lies with plastic waste, as the value of recycled plastic is so low that you can't cover the costs of shipping it off the islands. Ascension's decision to burn in a high temperature incinerator is therefore a sensible one, as is the approach on St Helena of landfill. The future ambition, however, needs to go beyond incineration and landfill, and Ascension should look to learn any useful lessons from the current DEFRA plastics project on St Helena.

For remote islands (where shipping waste is so expensive) the focus must be on reducing the plastic being used, particularly single use items. The AIG Waste Management Strategy highlights the need to reduce single use plastic items, but for this to achieve the greatest success, reusable items need to be provided to replace the single use items. These will need to be funded, which could offer environmental organisations (such as BLUE) the opportunity, through the purchase and supply of reusable items (supported by a strong social marketing plan), to have a huge positive impact on the reduction in single use item consumption.

The big challenge to increased collaboration is that individual islands have separate governance, limited budgets and a long list of other projects that need managing and funding. Motivated individuals, in the right positions on different islands, wanting to collaborate, can make a significant positive difference, by driving joint low-cost benefits. Ultimately, however, cross island/UKOT approaches need to be driven by the UK Government, and/or NGOs with an interest across all UKOTs. The GB Oceans Coalition offers just such an opportunity.

Summary of Recommendations:

Ascension Island Government:

- Identify a waste champion: to replace Mike Haworth.
- Establish an Ascension Waste Management Forum (including USAF).
- Deliver further communications (including digital).
- Develop a business plan for the use of glass-concrete.
- Expand the collection and crushing of aluminium cans.
- Foster closer collaboration with St Helena on waste management.

Blue Marine Foundation:

- Advocate and facilitate collaboration in waste management across the South Atlantic.
- Fundraise to supply reusable items and a joint island social marketing campaign.
- Encourage and facilitate increased knowledge sharing, technology transfer and joint working.

UK Government:

- Facilitate discussions between South Atlantic UKOTs.
- Carry out a feasibility study for the joint shipments of waste.

The Author: Leigh Morris has >35 years of experience working in horticulture, conservation and the wider environmental sector, with significant expertise within education, capacity building and public engagement. Leigh led education and learning at the Royal Botanic Garden Edinburgh for 10 years and subsequently at the Royal Zoological Society of Scotland. Since January 2018 Leigh has been based on St Helena, working as a consultant for both the Blue Marine Foundation (BLUE) and St Helena Government (SHG). He has been a Trustee of the UK Marine Conservation Society (MCS) for five years and is a Council member and Vice-President of the St Helena National Trust. Leigh is not an 'expert' on waste management, but over the years he has developed a keen interest in the impact of waste on the environment, more recently with a marine focus through his work for MCS and BLUE. In this report Leigh synthesises information from a range of expert waste management sources and community stakeholders to identify the key issues for waste management on Ascension Island.

1. Introduction:

Like thousands of islands across the world, every month cargo ships and aircraft deliver the supplies the island of Ascension needs to function. Along with the goods themselves, however, the vessels carry the huge amount of glass, plastic, metal and cardboard packaging and many items which have a finite life span. The discarded packaging and consumables are not taken away again and have to be dealt with in other ways on the island (Morris 2018).

The challenges of dealing with waste on small islands are well documented (Street 2013) and are perhaps personified by the Maldives, which has an ever increasing garbage problem, as a result of the population of c.450,000 and the additional c.1.5m visitors every year (Ali 2018), who discard an estimated 860 metric tons per day (312,075 metric tons per year), of solid waste/trash (Peterson 2015). There are some excellent initiatives taking place on individual Maldivian islands to combat the waste problem (IUCN 2018), but much is simply dumped on the island of Thilafushi (Street 2013).

For many years on Ascension, human trash has been collected, taken to a waste site, tipped out and burnt in an open heap (Figures 1-3 below). The residue of the burnt waste (predominantly cans, and glass bottles) is then landfilled. This open burning removes c.90% of the total waste volume (i.e. the paper, cardboard, food waste and plastics) and so prevents any subsequent build-up of methane gas as the organic material decomposes. Open burning is far from ideal – it's unsightly, inefficient (as all the combustible material is not burnt) and extremely 'dirty', with clouds of black smoke containing noxious gases from the large amount of plastics. On Ascension, it is possible to see the black stain resulting from the burning on Google Earth (Figure 4 over page).

Figures 1-3: Taken by the Consultant July/August 2018, depicting the household waste management practices on Ascension Island, which had been in operation for many years. **Fig. 1 (top left):** Refuse trucks bring all household trash to the Two Boats waste site. **Fig. 2 (top right):** The waste is open burnt, which removes most of the organic material and reduces the overall volume by c.90% **Fig. 3** (below): The post-burn material, which consists predominantly of metal cans and glass bottles and jars, plus some plastics, cardboard, etc. remaining, which have not been burnt, due to the inefficiency of open burning.

Figures 4: Google Earth satellite image of the Two Boats waste disposal site on Ascension, showing the dark stain on the landscape (centre left of photograph) as a result of the smoke from open burning of household waste.

The Blue Marine Foundation (BLUE) have supported a range of environmental projects on Ascension Island in recent years (BLUE 2016), which has included supporting the Ascension Island Government (AIG) Darwin Plus 047 project to produce an Ascension Island Waste Management Strategy (Haworth 2018a), to develop more sustainable, and less environmentally impactful, ways of dealing with the island's waste.

BLUE were specifically asked to provide a person to deliver communications support for the roll out of their Waste Management Strategy. To achieve this, BLUE Consultant, Leigh Morris ('The Consultant') carried out remote work to support the project from his base on St Helena during June-July 2018, and then he spent three weeks on Ascension (July/August 2018) to support communications delivery and stakeholder engagement for the new strategy.

The consultant has been based on St Helena since January 2018, where he has engaged closely with the St Helena Government Waste Management Team and collaborated with them on waste projects linked to the marine environment around St Helena. Prior to his trip to Ascension, he visited the waste management facilities (land fill site, incinerators, recycling facilities) to gain a better understand of comparable waste management issues to those on Ascension.

This report is based on the consultant's observations and discussions while on Ascension and St Helena, subsequent communication with key individuals, plus desk-based research. This report provides a summary and references to the work undertaken to develop and implement the Ascension Waste Management Strategy and makes recommendations for the next steps.

2. Ascension Waste Management - Darwin Plus Project (DPLUS047):

2.1 Application and Overall Aims:

In September 2015 Steven Brown, the Director of Operations, AIG submitted an application to Darwin Plus to develop and implement a waste management strategy for Ascension, build capacity for waste handling and train local operatives for future sustainability of the waste management (Brown 2015). The proposal to Darwin Plus was successful and AIG were awarded £99,993 of funding. Mike Haworth, previously Head of Landfill Energy Projects at Viridor Waste Management Limited, was appointed as the Project Manager, which officially commenced on 1st April 2016 and ran until 25th October 2018.

NB: The Darwin Plus website contains a specific page on the *Reduce, reuse, recycle – developing a waste management strategy for Ascension,* with links to project documents (Darwin Plus 2015).

2.2 On-Island Collaboration:

At the commencement of the project, work was carried out to identify the key stakeholders, which were identified are as:

- Major Employing Organisations (EOs).
- Island Council
- Members of the Public.

To reside on Ascension, you must be employed there, or be a dependant of someone who is. Most of the population are employed by five major EOs listed below (plus small businesses and shops – Annex A). The first four EOs listed below provide financial support to AIG in the form of an annual levy:

- **Babcock International (BI):** the resident contractor for the British Broadcasting Company (BBC), who maintain a relay antenna to broadcast the world service to Africa.
- **GCHG, Composite Signals Organisation (CSO):** Intelligence and security organisation, providing signals and information assurance to the UK government and its armed forces.
- **Ministry of Defence (MOD):** Use Ascension as a refuelling and logistical "airbridge" to support the Falkland Islands.
- **Sure South Atlantic (SSA):** Telecommunications company who provide local and international communications services from Ascension.
- **United States Air Force (USAF):** Conduct tracking of low earth orbit objects, principally rockets and missiles from the mainland US. They work in an area leased from the UK Govt. and are effectively autonomous and self-sufficient.

Prior to DPLUS047, there was little cross-island approach to waste management, with waste collections being managed separately by AIG, MOD and USAF, and completely separate waste management systems and infrastructure for UK and USA residents (Haworth 2017). A key aim of the project, therefore, was to drive a more collaborative approach to waste management on Ascension.

Four of the EOs (BI, CSO, MOD and SSA) were supportive of the project and engaged positively. The USAF expressed an interest in the project and its outcomes for purposes of mutual benefit, however, during the information gathering stage, they would not allow their waste to be sampled due to operational security, which prevented any assessment of their waste arisings to be made. In addition, they elected not to take part in any centralised waste management solution and stated that they will continue to manage their own waste management activities (Haworth 2017).

2.3 Collecting Baseline Data:

A key task in Year One of the project was to collect the baseline data on the waste generated annually on Ascension Island. This process was led by Mike Haworth who, with his team, carried out (Mar-Aug 2017) the sifting and sorting of waste collected from three of the four main settlements on the island: Georgetown, Two Boats and Travellers Hill Base. Full details of how this was carried out are contained within the DPLUS047 Year 1 report (Haworth 2017). A summary of the breakdown of the annual waste on Ascension is depicted in Figure 5 (below).

NB: No composition analysis was able to be conducted on USAF waste (i.e. the fourth main settlement), thus the composition of USAF waste was estimated based on the waste collected from the MOD rounds (WRAP 2017). Waste generation per head is approximately 900kg/person/per year. Total waste for is estimated at AIG 225 T, MOD 158 T and USAF 427T, a total of 809T (WRAP 2017).

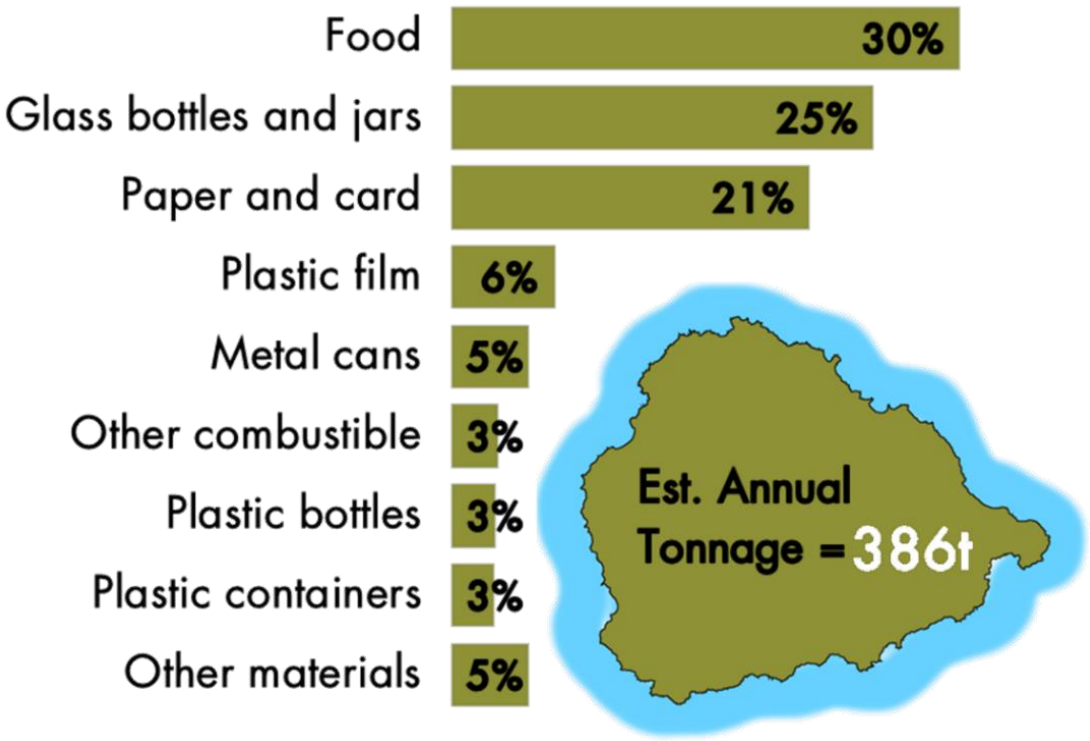


Figure 5: Breakdown of the types and overall quantity of annual waste produced/collected on Ascension Island by AIG and MOD. NB: This does not include USAF waste, estimated to be 427 t/yr, giving a total island waste of >800 t/yr (WRAP 2017).

2.4 Project Partner – WRAP:

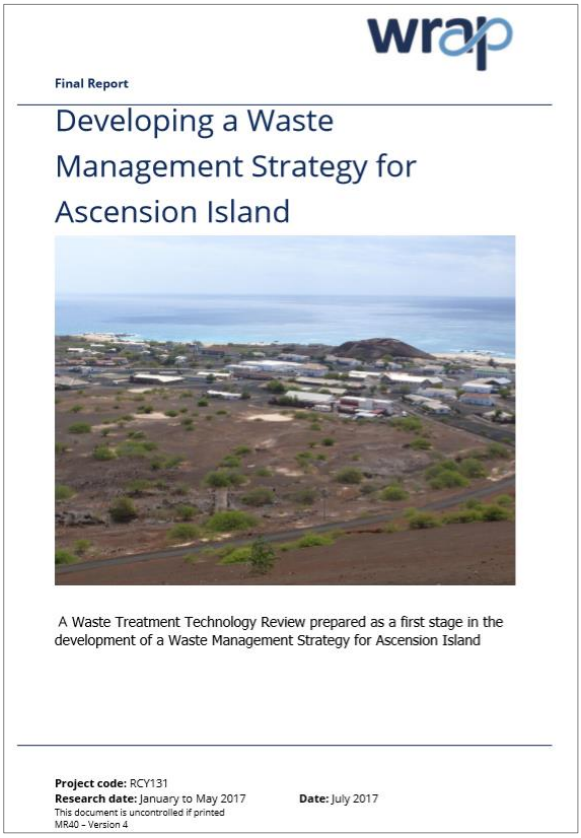
The Waste and Resources Action Programme (WRAP) was identified as the main project partner at the application phase. WRAP was set-up in 2000 to help recycling take-off in the UK and their role has broadened to becoming a key partner of governments, businesses and NGOs around the world. *'WRAP uses its expertise to create a world where we use resources sustainably'* (WRAP Global 2019).

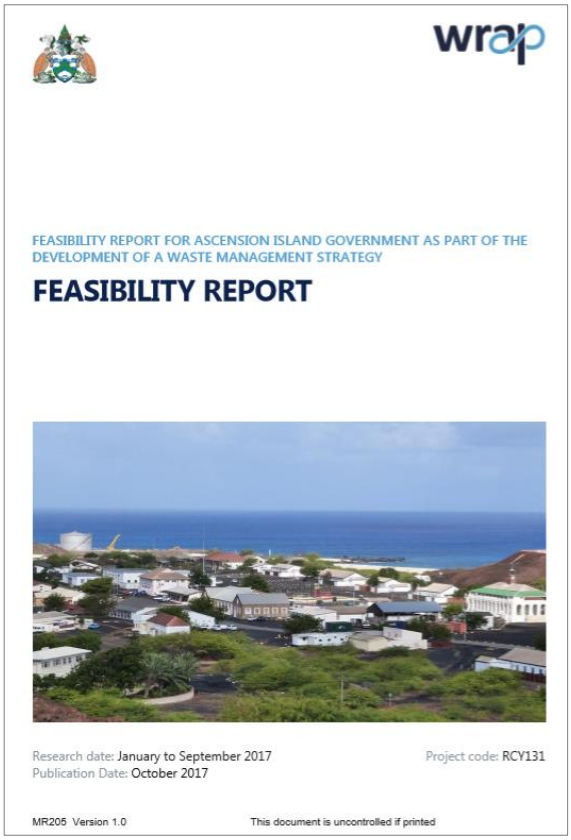
WRAP's functions within the Ascension waste project were to specifically:

- Provide support to develop the plan for sustainable recycling and waste management.
- Establish a waste wheel to examine current composition of waste, to provide a baseline of current volumes of waste disposed at the start of the project.
- Determine viability and initiate feasible recycling and reuse options for waste streams.
- Develop and enact a successful waste segregation policy, utilising WRAP's existing successful 'Recycle Now' promotional/educational campaign to engage with island residents.
- Produce a detailed Communications Plan for the Ascension waste management strategy.

WRAP produced two key (unpublished) reports within the project (Figures 6 & 7) and a subsequent Waste Management Communication Plan:

- **Developing a Waste Management Strategy for Ascension Island - a Waste Treatment Technology Review.** Prepared as a first stage in the development of a Waste Management Strategy for Ascension Island. Produced July 2017 (WRAP 2017).
- **Feasibility Report for Ascension Island Government. As part of the development of a waste Management Strategy.** Produced October 2017 (Bragg, Patterson & Naisbitt 2017).





Figures 6 & 7: The two detailed (unpublished) WRAP reports, produced during the project.

2.5 Ascension Island - Waste Management Strategy:

The key overarching Output for the Ascension project was the preparation of a Waste Management Strategy, written by Mike Haworth, which is split into two phases. The full strategy document is not officially available, but can currently be accessed via M Haworth's personal One Drive entitled Annex 6.1 (Haworth 2018a). Table 1 (below) provides a summary of the two phases:

Table 1: Ascension Island – Waste Management Strategy - Proposed waste treatment solutions. Two phases over 2018/19 to 2019/20
Phase One - 2018/19:
• **Construct Household Waste Recycling Centre (HWRC) at One Boat:** As the base of operations for the Waste Management team and to house the high temperature incinerator, car crusher and areas for the storage of waste and recycling materials.
• **High temperature Incineration of general waste:** including: food waste, plastics, paper and cardboard, garden waste, sanitary waste and other wastes. This will replace open burning, delivering a far more complete and cleaner burn, with less material for landfill remaining.
• **Operation of the newly installed car crusher:** for the purpose of crushing End of Life Vehicles (ELV), scrap metal and aluminium cans for shipping and ultimately recycling.
• **Continuation of the glass recycling trial:** Stockpiling glass collected in dedicated bays (for potentially recycling in the longer term).
• **Collection of aluminium drinks cans:** Provision of bins for the collection of aluminium drinks cans in clubs. Cans will then be stored at HWRC prior to being baled and shipped for recycling.
• **Communications:** Raise awareness of the new incinerator and the need for residents to continue to segregate glass and aluminium cans. Reinforce benefits to the Island.
• **Other Waste:** Scrap metal, ELVs, hazardous materials and WEEE waste will be stored at the HWRC until sufficient amounts are present for a full container for shipping to the UK
Phase Two - 2019/20 (subject to funding and glass and drinks cans collection rates):
• **Continuation of the Phase 1 activities.**
• **Expansion of the current glass collections:** to Travellers Hill MOD base and commercial premises (including standardisation of red collection bins to match that used by householders);
• **Glass processed using a glass imploder:** with the resultant screened glass fragments used as a replacement for some virgin aggregates used in project works, reducing the need for imports.
• **Introduction of mixed metal food and drink can recycling:** at centrally located collection points, alongside glass recycling and general waste bins in Georgetown, Two Boats and Travellers Hill.
• **Utilise low-level sorting technology and the car baler to manage the cans:** requiring new bins to be purchased for the street locations and rebranding of the existing can bins from stating "Aluminium Drinks Cans" to "Metal Cans".
• **Provision of blue recycling bags for metal cans to all dwellings.**

2.6 Project Communications Plan:

Paramount to the project goals and successes has been the communication to the different audiences on Ascension. AIG adopted the detailed 'WRAP Ascension Island Waste Management Communication Plan' (Salisbury & Poole 2018), utilising the WRAP Recycle Now campaign (WRAP 2017a) titled, 'Recycle for Ascension'.

The implementation of this communications plan was undertaken by the Project Manager, with the support of the Consultant. The following being carried out within Phase 1:

- Waste Management Strategy page created on the AIG website (AIG 2018). This includes key information on the strategies and how the population can help (Figure 8 – below).
- Seven presentations and Q&A sessions held across the island during July/August 2018 (Figures 9-12 – over page): Babcock's (45 attendees), MoD/Interserve (15), SURE (9), AIG (69), Administrator & guests (6), Councillors (3) and to public at Saint's Club (20). Total 167 people.
- Six articles were published in the Islander Newspaper (3 examples in Annex C).
- Posters/signage displayed, giving guidance for recycling glass and cans (Figure 13 – over page).
- Home recycling bags designed and ordered for glass bottles and cans.
- Signage produced for the One Boat HWRC.

Figure 8: From AIG website - showing a summary of the Waste Management Strategy and the key/simple recycling ask for residents – *'put your aluminium cans in blue bins and all your glass into red bins'.*

Figures 9-12: Seven presentations were delivered by Project Manager/Consultant, including: Babcocks (Fig. 9 top left), AIG (Fig. 10 top right), Interserve/MOD (Fig. 11 bottom left) & SURE (Fig. 12 bottom right).

Figure 13: Two posters communicating the key recycling asks and explaining what can and can't be recycled at this stage (AIG 2018).

2.7 Key Performance Indicators:

For the glass and can recycling, the WRAP feasibility report recommends targeting a capture rate of 30% by the end of Phase 2. However, because the provision of the red and blue bins for glass and cans respectively only started in September 2018 and the home recycling bags for glass will not be available until January 2019 at the earliest, the target capture rate for glass/aluminium has been modified to 15% for 2018/19 increasing to 30% in 2019/20 (Haworth 2018a).

2.8 Future Options:

The Ascension Waste Management Strategy lists a series of potential future options beyond Phase 2:

- Banning single use plastic items from commercial sale or free issue, including but not limited to; plastic bags, drinking straws, coffee cups, drink stirrers, cotton swabs (buds) made with plastic stems (NB: in conjunction with issuing reusable bags and cups).
- AIG to take the lead in banning disposable cups in AIG buildings and operations.
- Introduction of a reverse vending machine for plastic bottles. The plastic could then be baled and shipped back to the UK for recycling.
- Setting up a furniture reuse centre, where discarded furniture is available free of charge.
- A new 'bring' recycling scheme for mixed steel cans to run alongside the existing glass and aluminium can schemes. Potential markets for baled steel cans in the UK or South Africa.
- Additional Communications: Islander articles, Posters, Household leaflets, additional wheeled bins for the street locations and commercial premises, further engagement with EO employees, engagement with the school, updates and expansion of AIG website information.

2.9 One Boat Household Waste Recycling Centre (HWRC):

A key output of the project was to construct the One Boat Household Waste and Recycling Centre (HWRC) as the place to carry out waste management activities in a controlled manner. The construction of this new facility (Figs 14-16 – over page) was completed in November 2018.

The HMRC facility will be the focal point for waste management operations and will lead to the closure of the One Boat Landfill for general waste tipping and burning (Figures 1-3). The new enclosed HWRC site includes;

- Waste reception and sorting bays for the management of waste and recyclable materials.
- 250kg per hour hazardous and non-hazardous waste incinerator.
- Space to collect and store other waste types prior to packaging and shipping to the UK.
- Scrap metal / drinks can / car crusher.

Figure 14 (top left): One Boat HWRC under construction (August 2018).

Figure 15 (top right): The hydraulic car (and can) crusher in storage prior to being commissioned (August 2018).

Figure 16 (below): One Boat HWRC nearing completion in November 2018. Left to right: Car/can crusher, incinerator, waste storage bay and handling equipment, site office, and site gate (photo Haworth 2018).

2.10 Project Results:

The final Darwin Project (DPLUS047) Report (Haworth 2018) states that the project:

- Has taken the island from a baseline of zero to a waste management system which could be comparable with the UK.
- Produced and implemented the first Ascension Waste Management Strategy (underpinned by an exhaustive process of information gathering, stakeholder engagement, feasibility studies, training and communications), achieving the key objective of the SDP.
- Provided a modern maintainable HWRC facility which will allow the local waste management team to have a base of operations, new equipment with all the tools and spare parts required for their maintenance; and they have received extensive training.
- Will significantly reduce the pollution of the terrestrial and marine environments.
- Provided new bespoke bins at key locations, to segregate glass and cans at source. This was carried out alongside a communications plan with island organisations and public (Figure 17).
- Delivered on island capacity to manage the waste for the future and has provided a new baseline on which future improvements and new infrastructure can be built.

An update from Mike Haworth in late November 2018 (personal communication):

- The incinerator was installed, but it required more time to commission the unit. The contractor is committed to returning in January, until then it will not be operational.
- The first car has been crushed. Enough cans have been collected to fill the crusher.
- The glass and can bins are being used and during our commissioning of the incinerator, there were very little amounts of glass and even less drinks cans in the waste. Currently being stored at the old tip but will move this storage to the new site once the yard is complete.

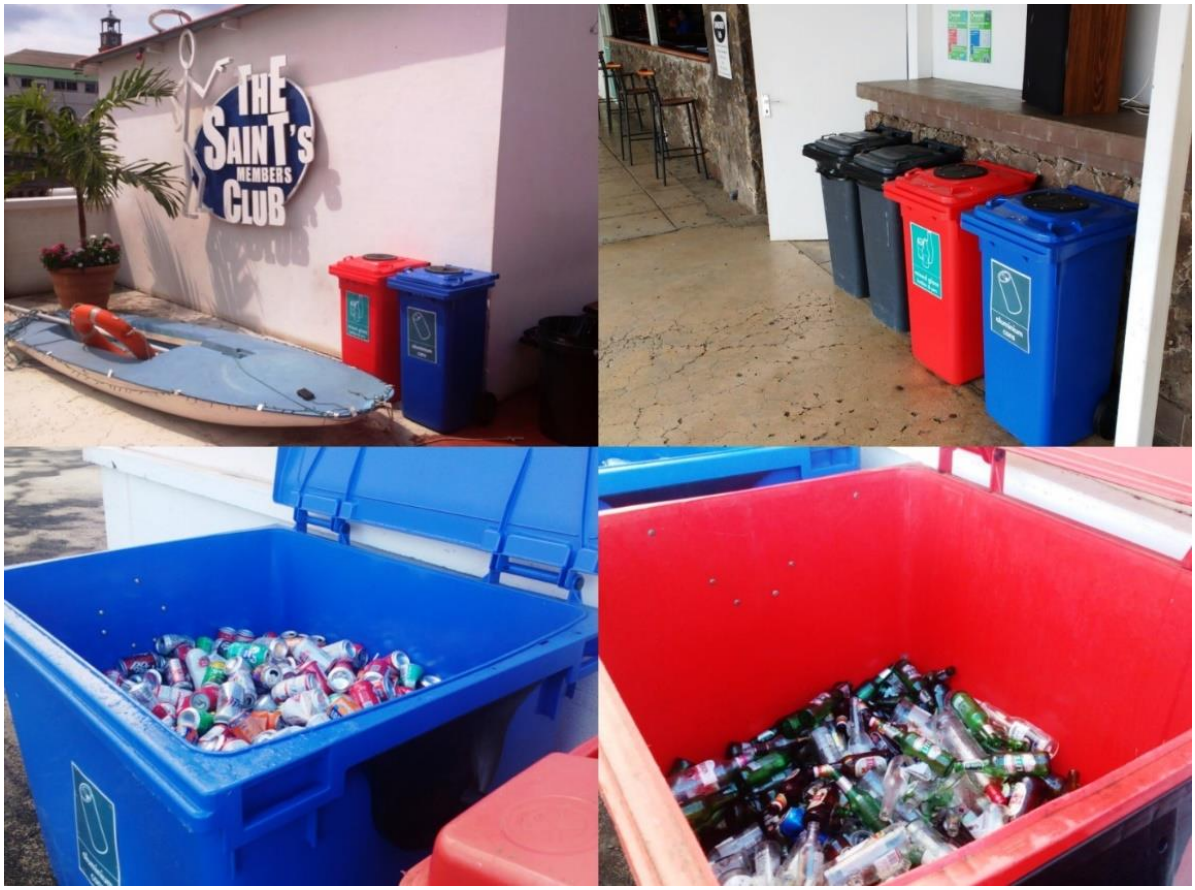


Figure 17: Glass & aluminium can collection at Saints and Two Boats Club, taken November 2018. Showing the new bins, branding, Recycle for Ascension posters (top right) and collection taking place (photo Haworth 2018).

Aluminium drink cans, when crushed and baled, are worth <£1000/tonne (WRAP 2019). A standard beer can weighs 20g, so is worth 2p when baled. There are 50,000 cans in a tonne, and you can apparently load 17 tonnes into a shipping container. It costs c.£5k to get the container to the UK, giving a c.£12K return on the shipment, far more than is needed to cover the collection and crushing of the cans. This will not be a quick win and it could perhaps take a few years to collect the c.850,000 aluminium cans required to fill a container. However, only a minimal amount of space is needed to store the crushed cans, which can then be shipped as/when. Importantly, it appears to be financially viable and it will also keep the cans out of the incinerator and from them ultimately being land-filled.

Mike Haworth left Ascension in November 2018 at the end of the project. In terms of Sustainability and Legacy, according to him, the operation of the HWRC and the supporting strategy is most likely to endure. This infrastructure set-up and development of a Working Procedure for the HWRC (covering operation and maintenance requirements of the site, and waste management practices), fully engaged with and utilised local expertise, including those persons who will be manning the site once it is operational. The AIG team are well engaged to make this a long-term success.

3. Waste Management on St Helena:

The Consultant has been based on St Helena since January 2018 and has engaged with the St Helena Government (SHG) Waste Management Team and visited their waste management facilities on a number of occasions. This section of the report is not intended to be a review and/or appraisal of SHG waste management *per se*, but simply to highlight waste management practices on St Helena (i.e. another small island and UK Overseas Territory in the South Atlantic), which could have relevance to other remote islands, including Ascension, and, importantly, suggest possible opportunities for alignment and collaboration between the two islands.

3.1 St Helena Waste Management Strategy:

Waste management on St Helena is managed by Mike Durnford, Environmental Risk Manager, SHG and details of the SHG Waste Team and links to key documents are available on the SHG website (SHG 2018). The SHG Waste Management Strategy was written in September 2017 (EMD 2017).

The hub of waste management on St Helena is the Horse Point Landfill Site and Public Recycling Facility (Figures 18-21), which receives c.700 tonnes of waste annually (c.70% of all island waste). Given the remoteness, limited economy and lack of international hazardous waste agreements the site comprises historical uncontained landfilling of all materials. Preparations for airport operations enabled site redevelopment, enabling a degree of waste segregation, notably separation of:

- Domestic waste disposal into a netted, un-engineered, waste cell (Figure 19);
- Bulky waste disposal into an un-engineered waste cell;
- Green waste disposal into a separate stockpile;
- Hazardous waste disposal into an engineered hazardous waste cell (Figure 20);
- Asbestos waste disposal in deep un-engineered cells;
- Thermal treatment of select biosecurity, clinical and hazardous wastes (EMD 2017).

Fig. 18 (top left): Horse Point landfill Site & Public Recycling Facility. **Fig. 19 (top right):** One of the netted landfill cells. **Figure 20 (bottom left):** Hazardous waste cell. **Fig. 21 (bottom right):** Incinerator and main building behind.

3.2 Public Recycling – St Helena:

The Public Recycling Facility (PRF) at Horse Point provides the public and commercial entities with an opportunity to deposit waste at the site in person. The PRF enables the segregation of recyclable waste and some hazardous waste (motor and cooking oil, paint, batteries, waste electrical equipment etc.) for appropriate disposal. The separated waste within the PRF is available for the public to retrieve for reuse or spare parts (EMD 2017). A percentage of the glass is recycled (see 3.3) and a small fraction of waste cardboard is re-used through St Helena's Participation in Enterprise (SHAPE).

Acceptable waste at the PRF includes: Glass, Cans, Scrap Metal, Wood, Paint, Motor & Cooking Oil, Tyres, Vehicle & Domestic Batteries, White Goods & Small Electrical Appliances, Textiles & Clothing, Furniture, and Paper and Cardboard (EMD 2017). The sorting and storage of the waste streams at Horse Point is similar to the approach used on Ascension at the old One Boat site (Figures 22-25).

Figures 22 & 23 (above): Part of the Public Recycling Facility at Horse Point, St Helena, with tyre bays, shipping containers and bulk boxes for collection of specific waste streams. **Figures 24 & 25 (below):** Similar facilities at the old One Boat waste site on Ascension Island. Here the bays for the separate waste streams are made with steel drums, but there is a comparable collection of various sorted waste types.

3.3 Glass Collection and Recycling:

On St Helena, some of the waste glass has been collected over the last c.3 years and a small-scale private sector business (run by Mr Chris Bargo) has carried out recycling of waste glass at HPLS, crushing glass for use in construction materials (Figures 26-29 – over page). SHG have supported this initiative through provision of red wheelie bins across the island for glass, which is collected by SHG and the private business in alternate weeks. According to EMD (2017), currently c.10% of used glass is collected, crushed and then used in construction as part of concrete blocks.

Figures 26-29: St Helena glass storage and recycling. **Fig. 26 (top left):** Collection bay at Horse Point waste site. **Fig. 27 (top right):** Inside the large shed at Horse Point – glass imploder (crusher) at the back right of photo, with a rotating screen and pile of screened crushed glass in foreground. **Fig. 28 (below left):** Crushed and screened glass. **Fig. 29 (below right):** Concrete block made using recycled and crushed glass as 25% of the aggregate.

4. Glass Recycling on Ascension:

The organised collection of glass bottles and jars, with the aim to then crush the glass and re-use as replacement for virgin aggregates in concrete (Fig. 30), was a key recommendation by WRAP and an initial target within the Ascension Island Waste Management Strategy.

The financial benefit of using crushed glass to replace some of the sand and gravel in concrete, is the saving on shipping aggregate to the island, which costs £300/tonne to ship to the island (plus the cost of the aggregate itself). There are proven concrete mixes in use globally, where c.25% of the sand/gravel is replaced with recycled glass. This includes New Zealand (Allied Concrete 2019) and has been reviewed (Olofinnade, Ede, Ndambuki, Ngene, Akinwumi & Ofuyatan 2018). Such concrete could be suitable for making footpaths, bollards, horticultural planters and even public recreation furniture. Importantly, this would also keep the glass out of the incinerator and ultimately land-fill.

The Administrator, Project Manager and AIG Director of Operations carried out a Project Review in March 2018. This review confirmed AIG's chosen waste treatment options (aligned with the WRAP recommendations) with one exception; it was decided that (to save money) the investment in a glass imploder and screening system for the crushing of glass bottles and jars was to be removed from the project outputs (Haworth 2018a).

Financial models were prepared to determine the potential benefit of the investment costs of glass storage and crushing equipment. These showed that if crushed glass could be processed to an aggregate standard, financial viability was still dependent on achieving collection rates of up to 30% and then selling the processed glass on island for profit. Even then, the payback period for the investment is >10 years. It was therefore decided that, until the collection rates could be relied upon, the glass materials would be stored for crushing at a future date (Fig. 31 – over page) (Haworth 2018a).

Figure 30 (left): Bulk bags of sand and gravel aggregate being stored by AIG in Georgetown (Aug 2018).
Figure 31 (right): The pile of collected glass bottles and jars at the One Boat waste site (August 2018).

Glass collection is taking place and increasing on Ascension (Fig. 17) and the AIG Head of Operations stated that he is aiming to develop a concrete mix for Ascension that incorporates recycled glass (personal communication). Using the using of crushed glass as aggregate, however, remains an ambition for now, until the 30% target collection rates for glass bottles and jars is met and the c.£60K can be allocated to purchase the required imploder and screen.

5. Plastics:

No review of waste management would be complete without specific reference to plastics, which (according to the The Ascension Island – Waste Management Strategy) constitutes c.12% of the total weight of waste on the island (Fig. 5). There is currently a bay at the One Boat waste site where public can deposit their plastic waste, however, there is currently no sorting of the different types of plastics on island and no current solution as to what to do with any that is separated from other waste.

Open burning of plastic waste (Fig. 1-3) results in the release of toxic chemicals (potentially dioxins, furans and styrene gas) from the burnt plastic. A key aim of the new AIG strategy was the procurement and long-term use of a high temperature incinerator, which will deliver a far more efficient burn and significantly reduce such omissions. NB: There is much published on the pros and cons of landfill verses incineration for plastics (e.g. Ask Umbra 2016 and Greentumble 2018), the decision taken on Ascension, following the feasibility study and recommendations from WRAP, is to incinerate.

There is the ambition to reduce future plastic use on the island and potentially recycle plastic bottles, using a reverse vending machine and then shredding, baling and shipping the plastic to the UK. The cost of shipping is a likely barrier to this. On St Helena plastic is landfilled with other household waste (see 3.1), however, in 2018 the National Trust, SHG and SHAPE secured £72K of UK Government funding through Defra for a project aimed at minimising (marine) plastic debris (SHG 2018a). An important part of this project is trialling the collection, recycling and reusing of some of the island's plastic waste. The plan on St Helena is to collect specific plastic waste streams and then to manufacture from them new products on island using simple processing machines to the designs produced (and distributed free) by Precious Plastics.

6. Conclusions:

6.1 Ascension Waste Management Project (DPUS047):

The project was a great success, with the key output, an Ascension Island - Waste Management Strategy, being a significant step forward for the island. The incinerator and car/can crusher are in place, the Two Boat HWRC site is complete, the AIG Waste Team are upskilled, partners are on board, collection of some waste streams for recycling is under way, communications to the population have been delivered, and overall systems are in place.

There is much enthusiasm on the island for the new waste management system, demonstrated by the attendees at the presentations delivered during July/August 2018. Further highlighted by three of the island Councillors (Samantha Arms-Lawrence, Terence Young and Kitty George), who, in August 2018, were delighted by what is being developed by AIG. Kitty George in particular was *'looking forward to championing our environmental development at my next meeting with the Govt. in the UK'.*

The ending of 'open burning' of household waste and a move to high-temperature incineration should be a game changer for the island – delivering a far more complete and cleaner burn, with less material for landfill remaining. The big question around the use of the high temperature incinerator is the ongoing annual cost of operation (c.£50K) – for the diesel fuel and maintenance. This should be regarded as 'excellent value' in completely removing open burning and reducing landfill, but it is still money that needs to be budgeted annually by AIG.

Recyclable materials are a significant percentage of the island's waste, and the decision to initially prioritise the collection and recycling of glass bottles and jars and aluminium cans is the right one. The bins are in place, the bags for collection at home are on the way, and the AIG Waste Team are collecting and storing the aluminium cans and glass. The engagement with the EOs, residents and other stakeholders during the creation and roll out of the Waste Management Strategy and the project overall were excellent. The WRAP Communications Plan was delivered, with the key messages communicated well through a range of channels. The key ask of the population is a simple one; *'put glass bottles and jars in red bins and put drink cans into the blue bins'.*

6.2 Next Steps on Ascension:

6.2.1 Leadership: There is a risk that waste management on Ascension Island could lose its momentum following the end of the Project and the departure of Mike Haworth. AIG needs another waste champion to ensure that waste management is kept high on the island agenda.

The population on Ascension is small (<800) and offers a fantastic opportunity to establish a model of small island waste management in respect to collaboration, reduction, reuse and recycling. At the recent World Economic Forum, a case study was presented on a Japanese village that has almost become waste free (Gray 2019). The UK Government could drive the same ambition for Ascension.

6.2.2 Island Collaboration: It is interesting that with a population of <800 there were three different waste management systems in operation on Ascension prior to the commencement of the project (i.e. MoD, USAF and AIG). The project has successfully brought the MoD and AIG far closer together, but the USAF did not engage and still has complete separation and autonomy in their waste management operations. This needs to change and bringing the USAF to the table should be a priority for overall waste management on island, particularly for future recycling and waste reduction initiatives.

6.2.3 Recycling: Financial investment is required to set-up and manage recycling schemes, and it is expensive to ship anything on/off any remote island. As a result, all materials collected for recycling must be either: usable on the island or have a value great enough to cover the transport costs. It appears that for Ascension the crushing of glass to use on-island to replace virgin aggregate in concrete, and the collecting, crushing, baling and shipping of aluminium cans to be shipped and sold for recycling elsewhere, offer such financial rewards.

More glass is now being collected for recycling and the pile of bottles and jars is growing. The business model for using the glass in concrete now needs to be worked up, a usable recipe and purpose for such concrete developed, and the equipment to crush and screen the glass acquired and ideally installed at Two Boat HWRC.

It will be interesting to see if the aluminium can and glass recycling is successful on island, which then stimulates and perhaps financially enables, the collection and recycling of other types of waste e.g. money generated from drinks cans, and saved by using glass in concrete, could be used to fund the collection and shipping of steel cans and/or plastic bottles collected in reverse vending machines.

6.2.4 Reduction: Perhaps the greatest opportunity for the next major positive impact on Ascension island waste is a reduction in the overall waste generated. The Waste Management Strategy highlights several ways to reduce the waste created on-island, including a reduction in the use of single use plastic items, however, for this to achieve the greatest success, reusable items may need to be provided to replace the single use items. This will need funding, which could offer environmental organisations (such as BLUE) the opportunity, through the purchase and supply of reusable shopping bags, water bottles and drinking cups, to potentially have a huge positive impact on the reduction in single use item consumption.

6.2.5 Communications: For a Waste Management Strategy to be successful, it requires the continued and increasing support of an island population. Core to this is driving and sustaining behaviour change of the residents, and communication is an important tool in achieving this. The Ascension Waste Strategy has been launched now, and the key messages must be repeated and reinforced to ensure that there is full adoption of the strategy and it becomes a firm part of the island culture.

Additional Communications should include: additional Islander articles, posters, household leaflets, more branded recycling bins for the street locations and commercial premises, further engagement with EO employees, engagement with the school and the children's Explorers Club. Digital communication has a potentially vital role to play, including regular updates on the AIG website, and through social media to showcase good news stories through photos and film clips.

6.3 Cross-Island Synergies:

There is potential for stronger collaboration/alignment between Ascension and St Helena (and perhaps other islands) on their waste management strategies and approaches.

6.3.1 Glass Recycling: Ascension is collecting glass bottles and jars, but has no equipment to process the glass for use in aggregate. St Helena has such equipment. The potential exists to develop, test and showcase a recipe for concrete using a percentage of crushed/screened glass, utilising the existing glass imploder on St Helena. A range of 'glass-concrete' products could be manufactured and demonstrated, potentially leading to a wider demand for a 'glass-concrete' mix. The possibility exists to perhaps ship the glass imploder to Ascension and manufacture some demonstration products on Ascension, from the glass being collected there. A higher demand for glass concrete, would likely stimulate an increased drive towards more collection and recycling of glass on both islands.

6.3.2 Aluminium Cans: Aluminium cans, when crushed and baled, offer a potential financial return when shipped for recycling. St Helena does not have the equipment necessary to crush and bale the cans, and the purchase of such equipment (c.£40-50K) is unlikely to be prioritised. However, the population is c.6 times greater on St Helena than it is on Ascension, so potentially a shipping container could be filled with cans for shipment far quicker and offer a far shorter pay-back period on the equipment. A business model needs to be worked up and it is perhaps feasible that crushed/baled aluminium cans from both islands could be joint shipped for recycling if this was financially viable.

6.3.3 Plastics: The biggest challenge for all small islands lies with plastic waste, as the value of recycled plastic is so low that you can't cover the costs of shipping it off the islands (you have to pay to get rid of it). Ascension's decision to continue burning their plastic waste (but now in a far cleaner way in a high temperature incinerator) is therefore a sensible one. As is the approach on St Helena of landfill.

The future ambition, however, must go beyond incineration and landfill. For remote islands (where shipping waste is so expensive) the focus must be on reducing the plastic being used, particularly single use items. The current Defra Plastics Project on St Helena is a good start in understanding the local issues, assessing the amount of plastic being consumed and testing reduction and recycling strategies. It will be very interesting to assess how successful this project is and the level of community engagement stimulated, to drive a reduction in single plastic use, recycling and reuse.

The Zoological Society of London (ZSL) are aiming to deliver a similar plastic reduction and recycling project on the British Indian Ocean Territory (BIOT). This is being led by Fiona Llewellyn and Rachel Jones, who were spoken to during the research for this report. They agreed potential benefits in working more closely with other UKOTs to increase knowledge sharing around plastics and developing broad strategies and tool kits, which could be tailored for individual islands.

Reducing the use of single use plastics must be the top priority and recycling should then be considered. The different types of plastic being used on-island must be understood, and the types that could/should be recycled. Shipping plastic off-island is expensive and so the approach of the Defra Plastics Project is believed to be the correct one, with SHAPE looking to recycling and reuse plastic *on the island*, turning it into local products. If successful, this model could be developed on Ascension

6.3.4 Recycling Other Waste Streams: It could be good to explore the potential for joint shipment of other waste types from the two islands for recycling abroad. Shipment is expensive, perhaps discounts could (should?) be offered to make shipments of waste for recycling more affordable.

6.3.5 Joint Communications: The core population on Ascension and St Helena are *Saints*, which offers a great opportunity to have a one waste management communications plan across both islands, delivering the same key messages. The opportunity exists to develop and deliver a strong social marketing campaign around the reduction, reuse and recycling of waste. The asks of both populations could be the same, with identical bins/posters for glass and aluminium cans recycling, and ideally the same legislation in terms of single use plastics. Both islands could be provided with reusable large shopping bags, water bottles and reusable cups to enable a joint reduction culture. The schools on both islands are highly enthused about being part of a reduce, reuse and recycle programme and a strong education section would be an important strand of the communications plan.

6.3.6 Leadership: The trash generated by people is a key environmental and conservation issue, particularly on small islands. The shared vision of many is for 'sustainable islands, where all waste generated is reduced, reused or recycled, generating a circular economy', and there are some inspiring examples of positive change in waste management being driven on individual islands.

It would fantastic to see more of these ideas shared and appropriate initiatives implemented across several small islands. There is potential for a 'small island waste management tool kit' to be developed, and the ships travelling in the South Atlantic between the UKOTs of Ascension and St Helena, and even Tristan da Cunha and Falklands, could perhaps collate/transport specific waste streams for recycling.

The big challenge to increased collaboration is that individual islands have separate governance, limited budgets and a long list of other projects that need managing and funding. Motivated individuals, in the right positions on different islands, wanting to collaborate, can make a significant positive difference by driving joint low-cost benefits. Ultimately, however, cross island/UKOT approaches need to be driven/encouraged by the UK Government, and/or NGOs with an interest across all UKOTs. The GB Oceans Coalition perhaps offers such an opportunity to raise the profile of island waste, lobby UK Government, and develop stronger collaborations within the UKOTs.

7. Recommendations:

7.1 Ascension Island Government:

7.1.1 **Identify a waste champion:** to replace Mike Haworth, to help ensure the new Waste Management Strategy is kept high on the island agenda.

7.1.2 **Establish an Ascension Waste Management Forum:** for key stakeholders to monitor progress, maintain momentum, and drive next steps.

7.1.3 **Encourage USAF into the forum:** to move towards one Ascension waste management solution.

7.1.4 **Deliver further communications (including digital):** to reinforce key messages and help ensure the strategy becomes a firm part of the island culture.

7.1.5 **Develop a business plan for glass-concrete:** test and showcase a recipe mix using a percentage of crushed/ screened glass, potentially utilising the existing glass imploder located on St Helena.

7.1.6 (If 7.1.5 is successful) **Purchase Ascension's own glass crushing and screening equipment.**

7.1.7 **Expand the collection and crushing of aluminium cans:** schedule to ship the first load for sale.

7.1.8 **Foster closer collaboration with St Helena on Waste Management:** Joint communication plan, learn from Defra Plastics Project, and develop links with glass and cans (and plastic?) recycling.

7.2 Blue Marine Foundation:

7.2.1 **Advocate and facilitate collaboration in waste management across the South Atlantic:** driving (funding?) a strong, joint social marketing campaign for waste reduction and recycling.

7.2.2 **Fundraise to supply reusable items:** (in priority order) large reusable shopping bags, water bottles, cutlery and coffee cups for the entire populations of Ascension and St Helena.

7.2.3 **Encourage and facilitate increased knowledge sharing, technology transfer and joint working**: in waste management across all UKOTs, through the GB Oceans Coalition.

7.3 UK Government:

7.3.1 **Facilitate discussions between South Atlantic UKOTs:** to prioritise and drive joint waste management approaches.

7.3.2 **Carry out a feasibility study for the joint shipments of waste:** aluminium cans and other waste streams from the islands for recycling.

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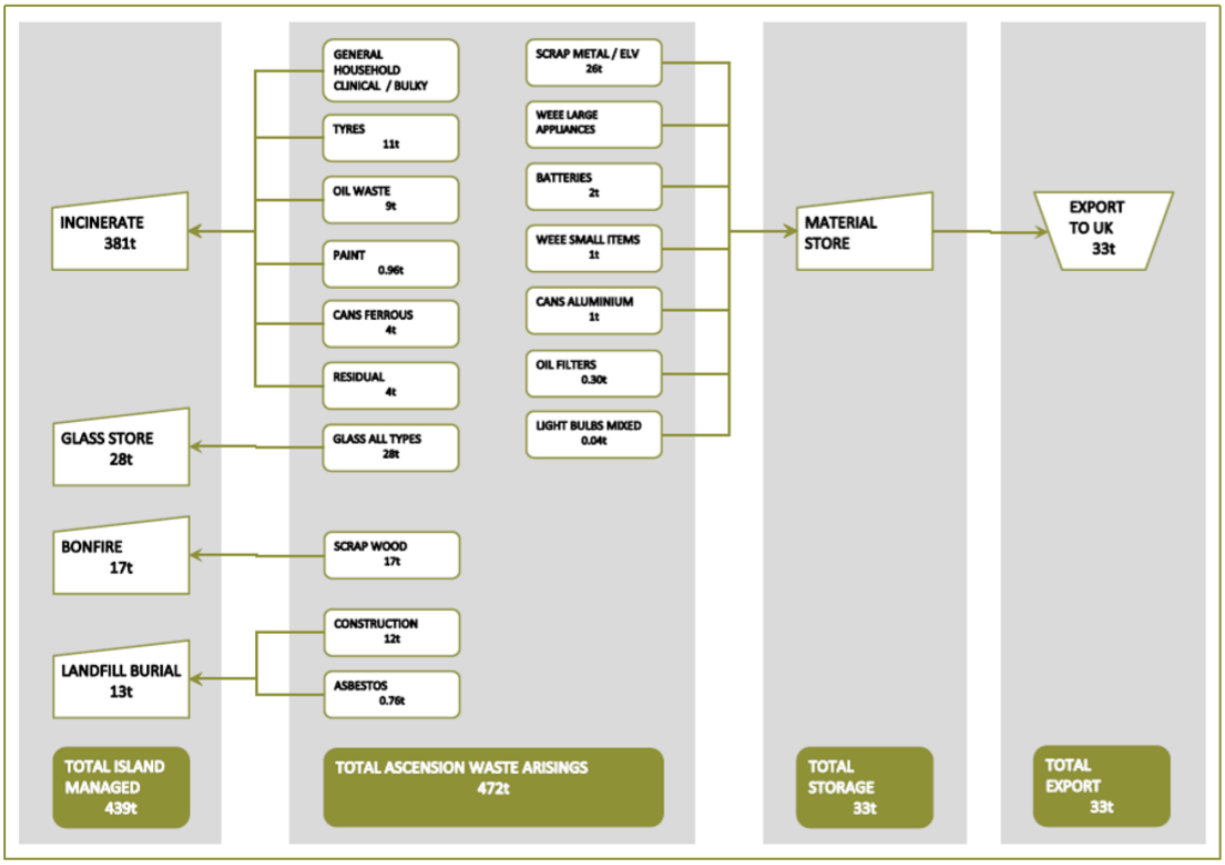
Annex A: Notable small Businesses servicing the population on Ascension:

- **The Chandlery** – the main supermarket operated by Seafish (Falklands) Limited. Located in Georgetown.
- **NAAFI** – this operates from the Travellers Hill base and includes a supermarket, café and bar.
- **Saints Members Club** – a club and bar in Georgetown.
- **Two Boats Club** – a club and bar in Two Boats.
- **JAMS** – local convenience store in Two Boats.
- **A&P Gift World** – small supermarket stocking food, gifts, clothes, books and other sundry items in Georgetown.

NB: In addition to the above, some small businesses operate out of units to let in Georgetown run by local persons on a part time basis.

Annex B: Projected waste Mass Balance Sheet (Haworth 2018a):

This mass balance sheet shows the estimated input quantities, the throughput for the chosen solutions (subject to 30% collection rate for glass and aluminium cans) and the output of recyclable materials and residual waste materials for Ascension:



Annex C: Three articles for the 'Islander' newspaper

recycle for Ascension

Ascension Island Government

Waste Management Plan: Phase 1

September sees the launch of AIG's Waste Management Plan; Phase 1 sees the commissioning of a new high temperature incinerator, the expansion of our glass recycling programme and planning for a cans recycling scheme across the island.

High Temperature Incinerator: for the disposal of general household waste. Funded by the Foreign & Commonwealth Office and supplied by Addfield, the Incinerator is due to arrive on Ascension in September and be launched in October. This is the most effective way to manage our waste, and far better than open burning for our residents and environment.

Glass Recycling: Is being expanded. We will be collecting more glass, so that it can be crushed and added into building and road aggregate materials. *Look out for the glass recycling logos!*

wrap

DARWIN INITIATIVE

Foreign & Commonwealth Office

For all enquiries, please contact:

Tel: 66233

Email: waste.management@ascension.gov.ac

recycle for Ascension

Ascension Island Government

Our Plan for Glass Recycling

For Phase 2 of the project in 2019, we will seek funding for a glass crushing facility. Before then, we will continue to collect glass from the red bins, we will provide a household recycling bag for your use and will be providing more red bins. This will reduce the amount of glass incinerated and imports of aggregates onto Ascension; improving our environment and saving money

mixed glass
bottles & jars

Please recycle all glass; remove lids/caps/corks and rinse out.

Use your household bag to transport glass to the red bins for collection.

Glass will be crushed by the machine arriving in Phase 2.

Crushed glass will be used in aggregates for island projects.

wrap

DARWIN INITIATIVE

Foreign & Commonwealth Office

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recycle for Ascension

Ascension Island Government

Drinks Can Recycling

Our recycling programme will be expanded to include metal drinks cans. This will commence in September from the clubs in the blue recycling bins. Cans will be stored ready for crushing before being transported off island for recycling into new products.

metal cans

wrap

DARWIN INITIATIVE

Foreign & Commonwealth Office

For all enquiries, please contact:

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Email: waste.management@ascension.gov.ac