Auckland International Airport Limited

Waste Management and Minimisation Strategic Plan to 2020 and Beyond

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Introduction

Auckland International Airport Limited (AA) is Australasia's the second busiest airport servicing 120+ international flights and 300+ domestic flights every day carrying around 15 Million passengers a year.

It is an important gateway for New Zealand, with 74% of all international visitors to New Zealand either arriving or departing the country through AA. It is the place of first impressions.

AA is a major contributor to the local and national economy, adding NZD$20 Billion (almost 10%) to New Zealand's GDP. It is home to over 100 retail outlets and 16,000 sqm of shopping space.

A product of this intensive economic activity is large amounts of waste. Terminal operations generate 3500+ tonnes and the total precinct around 13,500 tonnes per annum. Not only does this have environmental and financial impacts but also adds stress to terminal operations, facility footprints and road transport use.

Sustainability is an issue of increasing societal importance. General awareness is translated into expectation on organisations such as AA to demonstrate sustainable practices. Waste is perhaps the most visible indicator of a commitment to do so.

AA has mooted an ambitious goal of diverting from landfill 80% of all waste generated across the total airport precinct by 2030.

This report outlines a recommended waste management strategy to 2020 to enable the 2030 goal. It addresses:

- Section One addresses the external macro-economic conditions, global aviation best practice and local and international waste industry developments and trends
- Section Two addresses AA's current waste management performance, resources and capabilities to understand how well it is positioned to compete.
- Section Three is a summary of findings.
- Section Four is the Strategy Recommendation and Plan
- Section Five provides further detail on the proposed OCS Integrated Facilities Management Information Management System that will underpin client value creation.

Executive Summary

The Ministry of Business, Innovation and Employment predicts the annual number of international visitors to New Zealand to increase by 77% to 37.5 Million by 2021. As a result, Auckland Airport is preparing to accommodate 20 Million passengers a year by 2020.

In a 'business as usual' scenario this growth will drive an increase in terminal operations waste from 3200 to 4100 tonnes and waste to landfill from 1650 to 2150 tonnes per annum. The cost of disposal will rise from $790,000 to $1,200,000 per annum. Movements of waste within terminals and transport off the precinct will intensify.

Incremental improvement leading to a potential 75% diversion rate in 2020 can divert 3200 tonnes over the period and reach 1150 tonnes per annum in 2020. Disposal costs will be limited to $1 million per annum in 2020 saving $500,000 over the five-year period and reaching $185,000 per annum in 2020.

The existing waste management program has exceed expectations. Since 2012 the diversion from landfill rate has improved from 17% to 50%, absolute waste disposal costs have decreased by 15% and per passenger cost has decreased by 25%. This is despite the waste generated per passenger increasing by 33% over this period. Total costs are 22% less than expected costs had the waste management programme not been initiated.

Despite excellent results the programme is now at a cross roads. The Domestic Connector, creating an integrated terminal, is planned for completion in 2022. Designs must incorporate waste operations best practice, providing appropriate facilities and pathways. The strategies employed over the next two years will have a major impact on future waste success.

The traditional model of at-source sorting by waste generators is only ever as good as the level to which users are engaged. A large workforce and high staff turnover, a lack of back of house space to manage multiple waste streams and a resistance by AA to mandate waste management practices means that designing operationally pragmatic systems and maintaining engagement to a level required to achieve the 80% target will be very challenging.

While it is inevitable that further systems change will require mandatory compliance the recommendation is to mandate the minimum possible waste standard operating procedures. This can be achieved by shifting the majority of the sorting burden from waste generators to a centralized and controlled operation.

Some leading international airports have established on site material recovery facilities (MRFs) where recycling is sorted, baled and sold to generate revenues that offset MRF operating costs. The outcomes are rapid achievement of near maximum diversion rates.

OCS recommends expanding AA's existing on-site MRF to process all terminal waste. This will deliver a range of benefits including waste diversion, carbon reduction, minimal operational impact, reduced transport intensity and job creation. To establish the financial business case a trial is proposed.

Segregating food waste is a key enabler of effective sorting and so is a key area of focus. In of itself this will deliver significant diversion gains.

LAG's is the highest cost to dispose waste stream at more than $1200 per tonne. Relatively simple and low cost solutions can deliver diversion gains and generate savings that can be invested in more costly initiatives.

At a total precinct level the current diversion rate is 24%. 32% of all waste comes from international aircraft galley operations. It is classified as high biosecurity risk and is steam sterilised before disposal to landfill. This is expensive ($2 million annually) and prevents any recycling. Without progress in unlocking this waste stream AA's potential diversion rate is capped at 45%.

Opportunities exist throughout the value chain – from procurement to in flight design and operations to alternate treatment technologies. As these are outside AA's control the strategy recommendation is to collaborate to enable innovation in biosecurity waste. The existing Sustainable Business Council Green Precinct project, which includes Air New Zealand, is the forum for this collaboration.

Section One: External Situation Analysis

Macro-Economic Environment

Political

The Waste Minimisation Act 2008 sets the legislative framework for waste management in New Zealand. A highlight upon enactment was a levy on waste to landfill. Set at an initial $10 per tonne the intent was an initially gradual and then rapidly escalating price following successful models in the United Kingdom (£80 after 10 years) and New South Wales, Australia ($AU92).

The levy currently remains at $10 per tonne and the medium-term focus is to expand its application rather the increase the levy fee. Only around 30% of landfills are currently under the scheme.

Mandatory product stewardship is not planned as industry led, voluntary schemes are viewed as sufficiently successful.

50% of levy revenues are directed to the Ministry for the Environment (MfE) managed Waste Minimisation Fund (WMF). The WMF is contestable with funds granted to a broad range of projects ranging from feasibility studies to large capital projects.

MfE identifies a lack of onshore recycling infrastructure as a critical issue for waste management in New Zealand. Reliance on off shore recycling facilities means high exposure to volatile export recycling commodity markets with the potential to undermine the commercial viability of recycling.

MfE aims to enable the development of on shore infrastructure through WMF capital grants. Implementations with both landfill diversion and secondary benefit such as compost or energy production are viewed favourably. On-shoring internationally proven alternate waste treatment (AWT) technologies reduces risk. Examples include organic waste digestors and waste to energy (WtE) plant. A $100,000 grant was awarded to the New Zealand Defence Force to trail a Big Hanna composter.

Waste to energy is an area of interest for both MfE and Auckland Council.

Economic

The Ministry of Business, Innovation and Employment predicts the annual number of international visitors to New Zealand to increase by 77% to 3.75 Million by 2021.

Auckland Airport forecasts 24 Million passengers a year by 2020 rising to 30 million by 2030.

Waste generation is closely correlated to economic activity meaning increased passengers will see a proportional increase in waste. This is expected to be heighted by an increasingly retail-centric airport design. As customer residence times and spending increases so too will the quantum of waste per passenger.

Social

Environmental issues are of increasing concern for society in general.

Waste is perhaps the most visible indicator of an organisations environmental sustainability actions.

The frequent negative passenger feedback on the lack of public space recycling in the DTB evidences public expectations and perceptions.

Technological

The international waste management industry is responding to its inherent environmental challenges through the development of a range of alternate waste treatment (AWT) technologies (see page 8).

Legal / Regulatory

Waste management at AA is impacted by two main regulatory areas Biosecurity Risk Management and Aviation Security.

While both place constraints on waste systems, both agencies have demonstrated a willingness to challenge status quo to enable better waste outcomes.

Environmental

Climate change, resource scarcity, ecosystem degradation and pollution are major environmental issues that are playing a major role in shaping future business operations and risk management.

The built environment is a major contributor to global carbon emissions and resource use. Commercial real estate responsible for 20% of global carbon emissions.

Sustainability continues to grow in importance. Existing building operations are a new emphasis, especially energy, waste and water.

The aviation sector is a major contributor to global greenhouse gas emissions. Airports have an important role to play in supporting airlines and the wider aviation sector.

Air New Zealand, the major airline operator at AA, has a long standing sustainability programme. In September, they publically re-launched this programme. Waste is an area of focus and exploratory discussions have commenced with MPI and catering provider, LSG Sky Chefs, around international aircraft waste.

Waste Management Best Practice in the Global Aviation Sector

Leading international airports are now targeting and achieving diversion rates as high as 80%. Some of the strategies and approaches being employed to achieve this are as follows:

On-Site Materials Recovery Facilities (MRF)

The key value creating activity in a recycling system is the sorting of recyclable materials from waste. The traditional model is for sorting to be done at source by the waste generator i.e. staff, public etc. Recycling is then transported to a MRF where mixed recycling streams are further sorted into individual material types, baled and sold into export commodity markets.

If sorting does not occur at source recyclable materials are not recovered.

The opportunity exists for large waste generators to internalize all of the above activities to both ensure maximum diversion and generate recycling revenues that can offset at least some of the associated operating costs.

While the is likely a more expensive model (estimated 20% cost increase) it does overcome the significant challenges with effectively implementing and maintaining both complex, multi-stream at source recycling systems within space constrained environment and large scale behavior change projects.

A growing number of international airports have adopted this model, establishing on-site Materials Recovery Facilities (MRFs) where waste is sorted and baled ready for direct sale in to commodity markets. The result is a rapid increase in diversion rates to as high as 80% (Stansted International Airport).

Uptake in United Kingdom is high where the high cost of landfill supports commercial viability. Heathrow, Gatwick, Stanstead and Manchester airports have adopted the model.

The development of AA's Transitional Waste Facility in to a MRF processing international aircraft cabin waste (a first in the Asia-Pacific region) has both proven the concept and provided the ability to trial the feasibility and cost-benefit of an expansion to all terminal operations waste. 60% of aircraft cabin waste is recycled whilst simultaneously decreasing absolute waste costs by 15% (although this is against otherwise high cost steam sterilization treatment). Recycling is not baled for sale.

Mobile MRF

Heathrow International Airport utilised a mobile MRF supplied by Closed Loop Recycling to conduct a detailed waste audit in 2014.

Whilst not employed on an on-going basis a mobile MRF solution is a potential de-centralised solution. This could improve logistics and reduce the cost of moving waste from source to a centralised MRF.

Liquids, Aerosols and Gels

Recent heightening of aviation security restricts liquids, aerosols and gels (LAGs) from flights. The collection of these items at airport security has led to large increases (approximately 20%) of waste collected at terminals. By weight LAGs are the most expensive waste to dispose at AA – around $1200 per tonne. The liquids within containers contribute significant weight which if decanted prior to clearing security would both greatly reduce cost and enable recycling of containers.

There are several solutions available to efficiently manage this waste. At its simplest are plumbed sinks. More sophisticated are dewatering machines which pierce, drain and compact containers ready for bailing.

Reverse Vending Machines

An emerging technological solution which also incentivizes recycling is the Reverse Vending Machine. These machines, similar in appearance to traditional vending machines, produce vouchers upon reception of beverage containers. These vouchers can be exclusively redeemable at airport retailers to encourage in house spending. Some versions of Reverse Vending Machines contain dewatering and compaction capabilities, the

larger of which are installed into a wall adjoining a small on-site waste processing area where received waste is processed and made ready for bailing.

Construction Materials Recycling

Recycling of Airport construction materials is another avenue towards waste and cost reduction. To accommodate increasing capacities, upgrades and modifications of the built airport environment are common. These are typically done using virgin materials whilst producing significant waste. Simply saving materials from demolition to be later incorporated into new construction can lead to large savings. Stansted Airport currently recycles all pavement and concrete construction waste into aggregate for new construction. Any excess soil generated by digging, leveling or foundation work is stored on site for future use. These policies have successfully diverted 85% of all the airports construction waste from landfill whilst simultaneously reducing the costs of new construction materials.

Runway Recycling

Recycling of concrete runway materials is widely implemented by international airports including at AA. AA operates an annual program of runway upgrades with recycled concrete being utilised in the on-site batching facility.

Concessionaire Controls

Recycling rates will continue to increase through innovation and incremental improvement of existing systems. However, diverting the outputs of a systemic issue can only go so far in decoupling economic growth from waste production. A more effective and holistic solution to the problem of waste management must eventually manage the inputs of the system. Strategies that reduce the use of packaging that cannot be re-used, recycled or composted should be pursued. These may include concessionaire controls or a system of incentives and disincentives that encourage the use of less wasteful packaging products. 'Soft' strategies such as regular waste audits and awards for best practice vendors may be initially implemented. These can be strengthened over time to include a 'user pays' system where vendors that produce the most unrecyclable or un-compostable waste pay more for the removal of this waste. Finally, stronger controls such as restrictions on certain packaging materials may be implemented. Influencing vendor procurement may be the most challenging of waste management solutions but its importance towards the goal of decoupling economic growth from waste production cannot be understated. It is important that when these methods are pursued, they are done so in a transparent and collaborative manner, over a long enough time period to allow the internalization of process change.

In-Flight Recycling Systems

In-flight recycling is a challenge due to limited galley space and limited operational down time for attendants.

On domestic flights cabin crew can / do sort a narrow range of materials at the point of collection from seats. It is unclear how successful this is.

All in bound international waste that has come into contract with organic material is deemed a biosecurity risk and requires steam sterilisation. At AA this waste stream is both very large (4000 tonnes per annum) and expensive ($500 per tonne).

Cabin waste is deemed low risk of organics contamination and with MPI approved operating procedures this is now sorted to recovery recyclables.

MPI have identified galley waste as a potential further area of opportunity. Continuous segregation of dry and wet waste at all times is essential to unlocking this opportunity. This seems most likely to occur for waste that is generated in back of house galley operations and not food service waste.

Some airlines have introduced separate collections from seats specifically for glass, plastics and cans.

Waste Industry Trends & Dynamics

Auckland Council

Auckland Council has strong ambitions of becoming far more involved in the local waste industry. Unlike many parts of New Zealand waste infrastructure (landfills) are not council controlled. This removes a key potential lever for change – landfill disposal rates. Competition in New Zealand's largest market means that disposal costs are amongst the lowest in the country.

The Council's Waste WMMP targets 70% control by 2030.

A significant step in this process is Council procurement of kerbside organics collection and composting services. Unfortunately, under current plans this facility is not expected to process commercial organic waste.

Local Waste Industry

The local waste industry is dominated by two major firms; Waste Management and EnviroWaste Services Limited. In recent years both have been acquired by Chinese interests attracted to advanced landfill technologies and technical expertise.

Waste Management's Redvale landfill captures around 95% of emitted methane gas for energy production.

EnviroWaste Limited's Hampton Downs landfill was consented as a resource recovery park in 2015.

Significant capital backing it is expected to result in an increase in the rate of innovation in alternate waste treatment technologies in New Zealand.

International Waste Industry – Alternate Waste Treatment

Through the application of alternate waste treatment (AWT) technologies organisations in many developed countries are now reporting zero waste to landfill.

While these should be viewed in their correct place in the waste hierarchy – the immediate step above landfill disposal and below reduce, reuse, recycle – they are a viable solution for waste streams left that are not suitable for reuse or recycling.

Some of these technologies enable the reuse of materials (such as conversion into compost) and some recover energy, whilst others can do both.

Anaerobic Digestion

Anaerobic digestion is the biological decomposition of putrescible waste in a low oxygen environment. Within closed vessels anaerobic digesters generate Biogas, a mixture of Carbon Dioxide and Methane, which can be captured and combusted to produce heat and electricity. The solid end product can also be used (and commonly sold) as a valuable high-nutrient fertilizer.

Anaerobic digesters can accept a wide range of putrescible wastes but are more suited to wet forms of waste. However, solid wastes can be mixed with a variety of wet waste to increase their digestibility. The process, in batch form, usually takes ~3 months for completion, and the captured biogas is combusted through turbines to produce electricity.

Aerobic Digestion

Aerobic Digestion is the biological decomposition of putrescible waste in an oxygen-rich environment. The process converts a wide range of wastes into valuable compost fertilizer however, there is no usable heat or energy recovered.

The process is relatively quick (between 10 days to 6 weeks depending on the method used), space efficient and non-odorous when housed in enclosed vessels. The process is also scalable to a wide range of waste volumes and reaches temperatures high and consistent enough to eliminate pathogens.

The large quantities of food waste generated on precinct make composting a viable solution. Any significant financial benefits will be medium-long term but there are clear carbon and transport intensity benefits and potential wider community benefit in addition the production of compost for use on airport grounds.

Combustion Technologies

Combustion technologies combust dry wastes in an external combustion engine to produce heat and or electricity.

Biomass Boilers burn wastes such as waste wood products to exclusively produce heat. This heat is either used on site at production facilities or used to heat residential homes through district heating piping. The ash left over can also (depending on the waste burnt) be used as fertilizer, though at reduced nutrient loads when compared to compost production.

Combined Heat and Power generators (or Co-generation) combust dry waste to produce electricity and recoverable heat. These are similar to Biomass Boilers except the heat is used to produce steam and power a turbine. As with all the combustion technologies, as long as only non-toxic waste is burnt, the ash may be used as fertilizer.

Gasification technology, whilst not technically a combustion technology, heats waste to a high temperature (>700 degrees Celsius) in a controlled amount of oxygen or steam. The reaction that occurs creates Syngas, which is then combusted to power a turbine to produce electricity. The process is more efficient then direct combustion and cleaner.

Steam Sterilisation

A waste autoclave uses heat, steam and pressure from an industrial autoclave to process waste by subjecting it to high-pressure saturated steam. Steam is injected into the autoclave at about 160º C and maintained for 45 minutes to cook the waste. This process also kills pathogens and viruses.

This is the current treatment for biosecurity risk waste from AA. Following sterilisation the waste is disposed at landfill.

There is a prima facie opportunity to utilise a combustion solution to process this waste. The output to landfill (ash) could be as low as 5% of the input as well as generating electricity whilst still meeting biosecurity requirements.

Internal Environment

Auckland Airport's Sustainability Strategy

AA's Sustainability strategy addresses 10 areas of focus.

A well-formed waste minimisation strategy can and should also positively contribute to a number of the sustainability focus areas.

Area of Focus	Contribution
Environmental protection	Reduction in GHG emissions from landfilling and transport
Economic contribution	Reduce per passenger operating expenditure / improved profit per passenger Job creation (TWF currently provides 8 extra jobs; full site MRF would employ up to 25)
Community engagement	Visible indication of airport's CR/sustainability programs Regular feedback from passengers on lack of recycling systems
Security and safety	Improved biosecurity management

Waste Management Leadership, Vision & Strategy

The above Sustainability Strategy evidences AA Board and Executive commitment to sustainable and responsible operations including in respect to waste.

In 2010 a five year sustainability plan was approved. Over that five year period the Airport has been externally recognised for the gains made in its vision for a sustainable airport operation.

In 2012 a 20% diversion from landfill by 2020 on a per passenger basis target was formalised. This target was achieved in 2015.

An aspirational target of 80% diversion from landfill by 2030 across the total precinct has been mooted. This recommendation informs the pathway to this goal.

AA envisions itself as a leader, locally and globally in the sustainability space. Sustainability is viewed as a source of competitive advantage. AA is prepared to invest in low risk solutions to achieve waste best practice.

Airport Precinct Development Plans

AA has recently commenced Phase 3 of the Airport Development Plan. This involves the expansion of the ITB including a doubling of the airside retail area over the next two years. This significantly outstrips the forecast 10% growth in passenger numbers.

Phase 4 is the expansion of Pier B creating 2 new gates.

Phase 5 is the Domestic Connector, which effectively achieves an integrated terminal due for opening in 2022.

A key objective of this waste strategy is to identify and develop AA waste operations best practice to inform facility requirements in the integrated terminal design. This is required by end of 2017.

Waste Management Framework

The management framework in respect to waste is currently unstructured and informal.

Neither specific policies nor standard operating procedures exist.

Diversion from landfill targets exist however it is not clear that these are widely known.

Performance data is only collected and reported and an overall airport company level. Data is not captured at a user/source level meaning performance cannot be monitored and is not collected from external precinct operators.

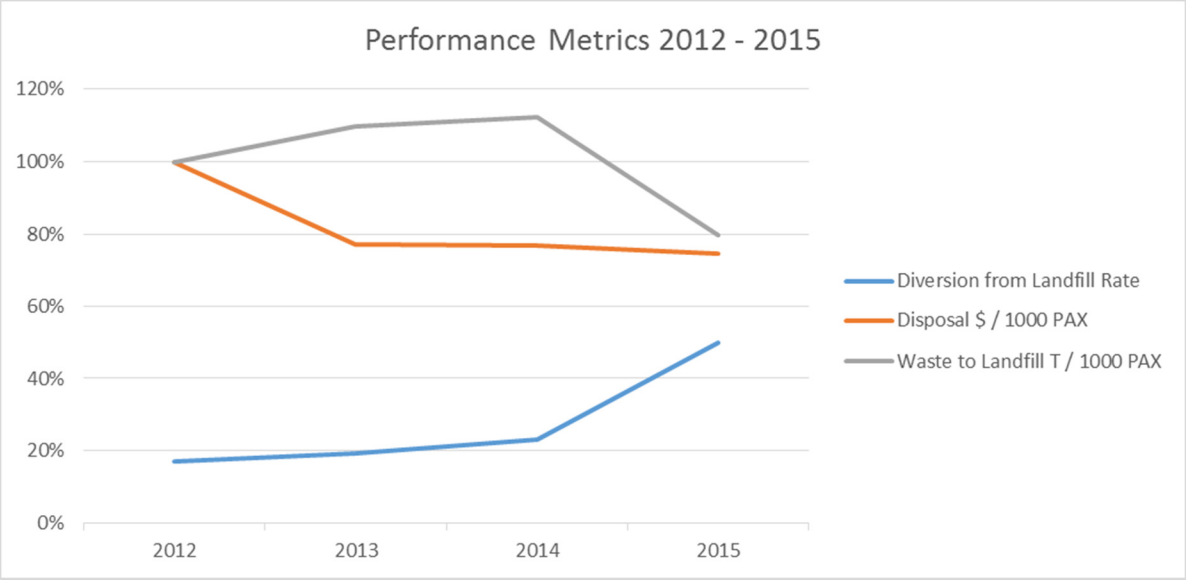
Neither retail nor property leases obligate tenants to comply with minimum recycling practices, demonstrate a planned approach to waste minimisation nor procure for easy and high value recycling outcomes. Mandating waste practices is not desired by AA.

Waste disposal cost recovery from tenants is embedded in opex charges and allocated on a sqm basis. A user pays model would create greater incentive for larger waste generators to recycle more and produce less waste.

Waste Management Performance Levels

Terminal Operations

Against all key metrics waste management has seen steady performance improvement over the period 2012 – 2015.



The diversion from landfill rate has improved from 17% to 50%.

Absolute waste disposal costs have decreased by 15%, although these have risen over each of the last three years from a low of 22%. Savings have been reinvested in management and operations personnel and equipment.

Per passenger cost has decreased by 25% and maintains a downwards trend. This is despite the waste generated per passenger increasing by 33% over this period.

Total waste management costs are currently 22% less than expected annual costs had the waste management programme not been initiated.

Terminal Operations Forecast Waste Profile & Costs

Based on 5% CAGR for PAX terminal operations waste is forecast to increase from 3200 to 4100 tonnes, generated by 20 million passengers, by 2020.

Without interventions waste to landfill will increase over this period from 1650 to 2150 tonnes per annum and disposal costs will increase to $1.2M per annum.

Incremental improvement leading to a 75% diversion rate in 2020 will divert 3,200 tonnes over the period and reach 1,150 tonnes per annum in 2020.

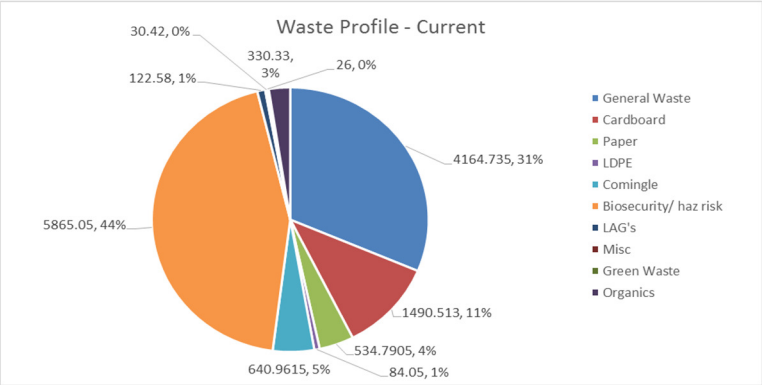
The cost-benefit analysis for an expanded site MRF is dependent upon the findings of the proposed trial / feasibility study.

Total Precinct

Around 13,000 tonnes of waste are currently generated across the total airport precinct with 24% diverted from landfill.

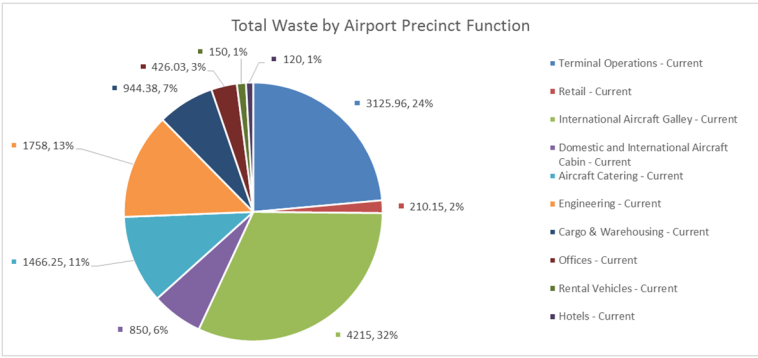
44% is treated as biosecurity or hazardous waste.

The estimated total waste spend by all parties is $4.5 million per annum.



32% of all waste is generated in international aircraft galley operations. The next largest generator is terminal operations (23%), followed by engineering operations (13%) and aircraft catering operations (11%).

Collectively, they account for 80% of all waste and, therefore, are the key areas of focus and opportunity.



Priority Areas of Focus

Terminal Operations

Terminal operations are within the operational control of AA and, therefore, should be the immediate priority. It is also imperative that terminal best practice is identified by end of 2017 to inform the design of the integrated terminal.

Organics is the major stream to be targeted. Doing so will not only increase diversion by an expected 15% but also enable potential sorting at an onsite MRF.

LAG's is a high cost waste stream with low cost, low impact solutions. While the diversion rate impact is minor (3%) potential savings could support more costly initiatives.

Aircraft Galley Operations

Over 4000 tonnes per annum of international aircraft waste is steam sterilised and disposed at landfill.

Without progress in either opening up this waste for recycling or treatment through alternate compliant processes with non-landfill outcomes the potential total precinct diversion rate is capped at 45%.

Recent initiatives on international aircraft cabin waste has successfully challenged status quo thinking about waste biosecurity risk management. All stakeholders, including the Ministry for Primary Industries, now recognise the potential to further reduce environmental impacts without compromising biosecurity. MPI have identified aircraft galley waste as an area of opportunity.

Procurement, on board handling and segregation practices and alternate waste treatment technologies all present opportunities. As they are outside AA control it should seek to influence change through leadership and collaboration. The Sustainable Business Council's (SBC) Green Precinct project, which includes representatives from AA, Air NZ and LSG Sky Chefs, has identified galley waste as a priority issued and opportunity.

Airport Waste Operations - Resources & Capabilities

Operations Management Expertise

OCS is the lead waste management service provider to AA. Under its wider facilities services contract OCS is responsible for all aspects of waste management and minimisation including design and implementation of systems, performance monitoring and review and procurement and management of sub contracted waste haulage and processing providers.

OCS's dedicated waste managers possess a wealth of knowledge on operational and regulatory requirements and proven ability to navigate the constraints, opportunities and stakeholder interests to redesign systems for waste minimisation gain.

Supply Chain

OCS sub contracts to three primary suppliers:

Interwaste, which steam sterilises biosecurity risk waste. There is no indication that they intend to innovate to meet both biosecurity and environmental management outcomes. As quarantined waste is 45% of all waste on precinct the status quo must be challenged.

Waste Management provides all general waste services. They are the largest waste services provider in New Zealand with around 70% of market share. Waste Management's main Auckland landfill, Redvale, is sophisticated by international standards. Around 90% of methane is recovered for power generation.

Reclaim provides all recycling and organics services. Recyclables are sorted in to single streams at a Reclaim facility and then sold into both domestic and export commodity markets.

Organics are disposed of at the Envirofert composting facility in Tuakau. This service incurs a 10% price premium compared to landfill. Transport accounts for a large proportion cost.

User Awareness & Engagement

High levels of engagement amongst front line waste generators is critical to success but is difficult to achieve and maintain due to the high turnover of a large work force.

Continued training and engagement programs will be resource intensive without improved data capture, which will allow targeted engagement with poor performers.

Stakeholder Engagement

Awareness amongst airport stakeholders of the overall waste minimisation objective is good and there is a general willingness to support these where pragmatic – easy to use, no additional cost and no adverse operational or business impact.

Within AA waste objectives are subservient to wider commercial objectives. The resistance to mandating waste minimisation and recycling practices is evidence of this fact.

Both MPI and AVSEC has demonstrated a desire to facilitate better waste outcomes. Blanket risk assessments have been revised and operating procedures approved to unlock waste for potential diversion.

The airlines also support better environmental outcomes. Air New Zealand is particularly visible in the sustainability space and through BARNZ the airlines as a collective have endorsed aircraft cabin waste recycling.

Facilities

Across the precinct a number of facilities are operated for the handling, processing and storage of waste materials. Beyond the terminal facilities are little more that external locations for bins and waste storage.

International Terminal

There are two main waste facilities at the ITB.

Western Forecourt

A full suite of waste services are located at the Western Forecourt. Recent waste system changes have increased the complexity of ITB waste systems and led to issues with system non-compliance, fly tipping and contamination of recycling and organics streams is common. These can quickly compound affecting overall system effectiveness.

As the area is not controlled these issues will likely be persistent as recycling levels increase further. To manage these it is expected that this area will need to be manned; coordinating the system and monitoring compliance. The alternative is penalties for non-compliance.

Manning would also provide a low-tech solution to user-level data collection for reporting and targeted engagement purposes.

Transitional Waste Facility (Honey Pot)

Biosecurity regulations requires AA to operate a Transitional Waste Facility to receive in bound international aircraft waste and process it for biosecurity risk.

Its scope was expanded to operate as a Material Recovery Facility, manually sorting waste to recover recyclables. Seven full time staff are employed to process around 800 tonnes per year recovery around 60% (300 tonnes) for recycling.

Further expansion to receive all terminal waste would rapidly improve diversion rates to near maximum levels (70%).

A trial / feasibility study is proposed to enable a robust business case and operating plan to be developed. Both MPI and AVSEC approval is required.

MPI have also indicated that, subject to separation at source of dry and wet (food) waste, aircraft galley waste could similarly be sorted and recycled in this facility.

Consolidation Rooms

The movement of waste from point of generation to point of disposal is a significant indirect waste cost. It is non value creating activity that is rightly viewed as system waste.

In large retail environments such as airports this can be up to 100% of the cost of waste disposal.

Most terminal operators resist recycling systems that are more time consuming, especially when no financial benefit from compliance or penalty for non-compliance exists. Back of house space constraints limit the number of streams that can be managed.

A solution is to provide intermediary consolidation points where multiple waste streams easily and quickly be moved, offsetting an increased number of movements with shorter time and distance. This also improves overall system efficiency by increasing the average volume per movement for part of the total journey.

Domestic Terminal

DTB waste infrastructure is a significant constraint on improved recycling. The waste compound is located on the far side of the forecourt making waste movement time consuming. A lack of back of house space and consolidation points increases movements.

The Domestic Connector (phase 5 ADP) is the right time to design for improved waste management. In the interim the DTB should not be an area of focus except for public place recycling bins to improve customer perception.

Summary of Situational Analysis – SWOT

Strengths • Senior management commitment to CR strategy • Existing TWF operating as a MRF achieving excellent diversion rates (60%). • Strategic supply partner (OCS) committed to waste minimisation vision with dedicated management resource (2 FTE's) • Regulator (MPI & AVSEC) demonstrated willingness to challenge convention for waste minimisation outcome • Total precinct waste quantity is of scale to enable creative solutions and investment • 2012 – 2015 waste programme demonstrates stakeholder willingness for change where no adverse operational impact • Good waste programme awareness amongst stakeholder management	**Opportunities** • Central and local government support including through potential funding for capital projects and feasibility studies • SBC Green Precinct as vehicle for collaboration on problematic biosecurity waste stream • Develop local processing capability for high cost problematic waste streams (AWT digestion and combustion technologies) • Establish site based Material Recovery Facility to maximise diversion and generate recycling revenues to offset operating costs • Utilise tracking and weighing solutions for improved data and analysis • LAG's decanting stations • Spatial procurement across total precinct
Weaknesses • Lack of leadership at operations / functional area management level • Lack of formalised compliance framework for waste management and materials (policy, SOP's, quality controls and monitoring) • No mandatory waste management and minimisation requirements on tenants, suppliers and contractors • Fragmentation of waste management control across multiple parties • Lack of effective waste systems and engagement program at DTB • Poor diversion of key high volumes waste types (organics and comingle) • Low levels of engagement at user level plus high staff turnover within large workforce • Lack of accurate data capture, monitoring and reporting • Significant non value creating activities in waste value chain (transport, on site labour, consumables) • High cost of LAG's plus operating model prevents diversion • High levels of recycling contamination particularly in public place bins • Lack of back of house space for multiple recycling streams	**Threats** • Tourism / PAX and precinct growth will at least proportionally increase waste quantities and disposal costs • Potential future regulation of waste and materials • Volatility of recycling export commodity markets could undermine recycling industry • Biosecurity regulation prevents recycling from international aircraft waste under current operating model • Increased waste quantities will increase in-terminal waste movements • Increased waste quantities will increase airport road transport movements

Critical Success Factors

1. Establish a vision for AA to be a global leader in aviation waste management
2. Implement waste management standard operating procedures supported by a compliance monitoring framework, balancing need for minimum approaches with least possible operational impact
3. Maximise diversion of food waste to increase diversion rate and enable sorting of recycling
4. Implement sorting of dry waste from all Airport controlled environs (terminal operations)
5. Collaborate with airlines and regulators to unlock international aircraft galley waste streams to enable low-risk recovery for recycling
6. Collaborate with airlines, central and local government to establish alternate to landfill treatments for non-recoverable biosecurity waste
7. Influence wider precinct operators to achieve optimal diversion from landfill rates, notably catering operations

Recommended Strategy and Plan

The following strategy recommendation is informed by a high level Strategic Options Evaluation conducted by the author using the tool and criteria given as Appendix A. It is expected that this evaluation will be undertaken by AA to review these recommendations.

Strategic Vision

AA seeks to be a global leader in sustainable waste management in the aviation sector.

Doing so will not only enhance an already strong sustainability brand, but also ensure over the medium-long term the most efficient waste operating model from a cost, facilities footprint and transport and logistics perspective.

Collaboration, with supply chain and stakeholders, has been a key element of success to date that will be strengthened through existing and new partnerships.

Goals

1. Work towards an 80% diversion from landfill across the total precinct by 2030 and report this reduction by material type, tonnages and avoided greenhouse gas emissions
2. Support and promote New Zealand's domestic recycling industry to minimize the footprint of waste recovery and recycling and capture economic benefits.

Strategies & Tactics

The following strategies and tactics are recommended for AA over the next four years to achieve the vision and goals.

1. Establish an on-site MRF to achieve maximum recycling levels

1.1 Engage with MPI and AVSEC to develop TWF operating procedures that allow sorting of non-quarantine waste
1.2 Review existing TWF MRF operation and facility to establish current and potential capacity
1.3 Implement at-source organics separation in trial area (ITB landside food court and F&B retail) to create dry waste stream for sorting
1.4 Identify a trial area for implementation of sorting of dry non-biosecurity waste to define key metrics for business case as per proposed operating model.
1.5 Scale to capacity to maximise diversion rates
1.6 Establish preferred delivery model
1.7 Design waste operations solution including facilities to inform integrated terminal design

2. Adopt minimum mandated waste SOP's & compliance framework

2.1 Mandate separation of wet (food) and dry waste as a minimum
2.2 Develop data collection and reporting at an individual user level to monitor performance levels and target engagement activities
2.3 Implement auditing / review program with users to monitor compliance with SOP's
2.4 Align audit process with user level engagement to support common vision, overcome obstacles and enable behaviour change
2.5 Engage key precinct waste generators to influence waste diversion outcomes including offer of consultancy support – aircraft catering,

3. Collaborate to enable diversion of biosecurity waste stream

3.1 Leverage the Sustainable Business Council "Green Precinct" waste project team to focus collaboration on problematic biosecurity waste stream

3.2 Review biosecurity waste stream system and value chain to identify key areas of collaboration and reengineering opportunities for reduce, reuse and recycle outcomes
3.3 Conduct feasibility study for alternate waste treatment options (initial identified focus on waste to energy) for non-recoverable waste
3.4 Target central and local government capital funding for feasibility study and subsequent commissioning (if applicable)

Implementation Plan

	Horizon One (2016)	Horizon Two (2017)	Horizon Three (2020)	Horizon Four (2030)
Diversion Rate – Terminal Operations	55%	60%	75%	80%
Diversion Rate – Total Precinct	25%	30%	45%	80%
Sphere of Intended Influence	Terminal Operations	Terminal Operations and Key Precinct Operators	Total Precinct	Total Precinct
On-Site MRF	Engage MPI and AVSEC to establish approval for trail Scope and conduct trial (ITB landside F&B) Prepare business case and plan	Review delivery model Scale up to capacity Define waste operating best practice to inform integrated terminal design	Full site/local MRF implemented	
Waste SOP's and Compliance Framework	Implement data capture and reporting at user level (terminal and total precinct) Implement waste system review / compliance audit with users	Develop waste management guidelines for operators Mandate food waste separation within terminal	Include waste minimisation requirements in retail and property leases	
Biosecurity Waste Stream	Green Precinct Project review of biosecurity waste stream system	Conduct feasibility study for alternate waste treatment options (initial identified focus on waste to energy) for non-recoverable waste	Waste to Energy plant commissioned (if feasible and commercially viable)	

Appendix A: Strategic Options Evaluation

Strategic options can be assessed against a number of criteria including fit, cost and benefit. Suitability (how confident will achieve goals and critical success factors), feasibility (organisational ability to achieve options) and acceptability (extent to which options are acceptable to stakeholders) are three measures of fit.

As assessment of each option against each of these criteria is given in the table below using a high = 3, moderate = 2 and low = 1 scoring method.

Options	Suitability	Feasability	Acceptability	Cost	Operational Impact	Waste Diversion Outcome	Transport / Carbon	Community Engagement	Economic Contribution	Customer Experience	Total Score	Outcome
Internal vs. External Delivery of Key Value Creating Waste Sorting Activity												
Full on-site sorting at-source by waste generators												
Limited on site sorting by waste generators plus on-site sorting in MRF by AIAL operatives												
Limited sorting at source plus off-site sorting in MRF by external party												
Engagement vs. Mandate and Enforce												
Engagement only strategy designed to change culture and behaviours (knowledge, skills and attitudes)												
Strictly manadated and enforced policies and procedures dictating operational and management requirements with consequences for non compliance												
Balanced approach based on minimum mandated SOP's supported by range of performance monitoring and engagement tactics												
Internal vs. External Processing												
Limit processing and treatment options to external market provided options												
Collaborate with precinct participants to develop on site processing facilities to address critical, costly or problem waste streams												
Collaborate with precinct participants and wider local community to develop processing facilities												