Cayman Islands Government

Integrated Solid Waste Management System for the Cayman Islands

Consultation Draft Outline Business Case

September 2016

Amec Foster Wheeler Environment
& Infrastructure UK Limited

Draft - see disclaimer

Report for

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Document revisions

No.	Details	Date
1	Working Draft Not for Circulation	O2/02/16
2	Draft Outline Business Case Draft Report 16235i1	June 2016
3	Consultation Draft Outline Business Case 16235i2	September 2016
4	Consultation Draft Outline Business Case 16235i3	September 2016

Errata Notice

At the time the Consultation Draft Outline Business Case (OBC) was being drafted and the financial models were being run by Amec Foster Wheeler and KPMG, the potential to mine waste at the George Town landfill was considered as a possible component of the Reference Project and the future Integrated Solid Waste Management System (ISWMS) for the Cayman Islands.

Since that time, a policy decision has been made to exclude mining of waste from the Reference Project, as the potential of long-term nuisance conditions from mining, such as odours, outweigh the benefit of gaining back the small area of landfill space. Therefore, while financial information regarding the mining of waste at the George Town landfill is addressed in the draft OBC document, readers should be aware that it is no longer under consideration for inclusion in the ISWMS, and the Final OBC will reflect this.

Purpose of this report

This Outline Business Case (OBC) has been prepared by Amec Foster Wheeler Environment and Infrastructure UK Ltd. (Amec Foster Wheeler) and KPMG LLP (KPMG) for the Ministry and Health and Culture, Cayman Islands Government. It primary purpose is to set out the means through which the National Solid Waste Management Strategy (NSWMS) for the Cayman Islands could be implemented to deliver a modern and sustainable integrated waste management system for the islands . This has been demonstrated through the preparation of a fully costed Reference Project that meets the vison, values and strategic aims set out in the National Solid Waste Management Policy (NSWMP) for the Cayman Islands.

Executive Summary

This OBC builds upon the National Solid Waste Management Policy (NSWMP) and the National Solid Waste Management Strategy (NSWMS) which were completed and issued in 2015 and 2016 respectively. Together these documents set the objectives and vision for a new Integrated Solid Waste Management System (ISWMS) for the Cayman Islands., at the heart of which is the application of the waste hierarchy. This firstly focuses on waste reduction, and then examines each subsequent option before disposal is finally considered.

The Waste Hierarchy

- Reduction — Using less materials in design and manufacture, keeping products for longer, using less hazardous materials;
- Re-use — Checking, cleaning, repairing, refurbishing, whole items or spare parts;
- Recycling — Turning waste into a new substance or product. Includes composting if it meets quality protocols;
- Recovery — Energy is recovered from waste through a variety of methods such as thermal treatment and digestion; and
- Disposal — Landfill and incineration without energy recovery.

This OBC sets out the means by which the ISWMS will be delivered and implemented by establishing the five principles of the business case:

- The Strategic Case (Section 2);
- The Economic Case (Section 3);
- The Commercial Case (Section 4);
- The Management Case (Section 6); and
- The Financial Case (Section 8).

The Reference Project solution described in the OBC is considered to be deliverable, bankable and consistent with modern international standards for sustainable solid waste management. The affordability

of the solution will be subject to decisions by the Cayman Islands Government concerning how the required Availability Payments highlighted in the Financial Case (Section 8) will be met.

Background

Amec Foster Wheeler and KPMG have been commissioned by the Cayman Islands Government (CIG) to assist in the delivery of an ISWMS for the Cayman Islands. This work is being delivered in three main phases:

- Phase 1: The preparation of a NSWMS for the Cayman Islands and the delivery of environmental and site investigations at the George Town, Cayman Brac and Little Cayman landfills;
- Phase 2: Preparation of an OBC to deliver the NSWMS; and
- Phase 3: The procurement of new waste management services and infrastructure in line with the NSWMS.

Phase 1 was completed in June 2016 with the publication of the NSWMS for the Cayman Islands[1]. This OBC is the key deliverable for the completion of Phase 2 and prepares the way for the implementation of the ISWMS in Phase 3.

The Strategic Need

The fundamental need for a new ISWMS in the Cayman Islands is set out in in the NSWMS and is driven by an urgent recognition that existing solid waste management system is not sustainable, poses a potential threat to the environment and local amenity and does not make best use of a potential resources that could benefit the community of the Cayman Islands. This existing system is heavily reliant on the use of three aged landfills, with one located on each island. The continued use of these unengineered facilities is inconsistent with modern and sustainable waste management practices and conflicts with NSWMP[2] for the Cayman Islands.

The OBC addresses the need to close and remediate the three existing landfill sites and encompasses the estimated cost of remediation within the Financial Case (Section 8). The strategic estimate is subject to the development of a detailed remediation plan for each site.

The Economic Case

From both a practical and pragmatic perspective there is no “do nothing option” for the Cayman Islands. The waste management system cannot continue to rely on the existing landfill facilities for the disposal of solid waste. This is most acute for Grand Cayman, where the landfill site at George at current rates of in-fill, will be full in approximately five years. As a consequence, an economic case for a “do nothing” option is neither realistic nor deliverable in practice.

The Economic Case set out in Section 3 of the OBC therefore focuses on comparative analysis of alternative waste management systems that encompass waste reduction, re-use, recycling and recovery and which minimise the need for future landfill disposal.

The Reference Project and Commercial Case

Reference Project demonstrates that the vision, values and strategic objectives set out in the NSWMP are realistic, pragmatic and deliverable through the implementation of a new ISWMS. The selection of Reference Project for the ISWMS was made through a systematic appraisal process that is fully described in the NSWMS and this included elements set out in the Economic Case (Section 3), The Reference Project comprises the following elements:

[1] Ministry of Health and Culture, Cayman Islands Government (June 2016). National Solid Waste Management Strategy for the Cayman Islands.
[2] Ministry of Health and Culture, Cayman Islands Government (August 2015). National Solid Waste Management Policy for the Cayman Islands.

- Waste collection (based on three stream (residual waste, recyclables and yard waste collected weekly);
- Waste reduction measures – including waste education and pragmatic waste minimisation initiatives (e.g., home composting/ material return schemes such as bottles);
- The reuse and refurbishment of bulky waste;
- Community recycling depots and Household Waste Recycling Centres (HWRC's) recycling facilities;
- Transfer and bulking facilities (one per island);
- The windrow composting of yard/garden waste from landscaping operations and HWRC's;
- The recycling of construction and demolition (C&D) waste;
- The potential landfill mining of waste;
- The potential introduction of kerbside yard and garden waste collections (post 2020); and
- The potential introduction of kerbside dry recyclable collections with a Materials Recovery Facility (MRF) (post 2020).

A range of services and works are required by the CIG in order to implement the Reference Project and deliver the ISWMS. These include:

- Waste collection services;
- Waste and recyclate haulage services;
- The servicing of recycling depots;
- The marketing of recyclates and compost (wherever possible the use of local markets will be encouraged);
- Recycling of construction and demolition wastes;
- The construction of several new waste treatment facilities (see Table 4.1);
- The operation and maintenance of the new waste management facilities; and
- The provision and operation of landfill disposal for residual waste.

These services and works can potentially be packaged for procurement or delivery in a number of ways. Significant factors in determining the most appropriate package for CIG will include:

- CIG's desire to maintain direct delivery of some services (e.g. waste collection);
- Delivering value for money;
- The procurement schedule in relation to service requirement deadlines;
- Market interest in the packages;
- Differentiation in services that could be delivered by on island contractors (e.g. recycling centres and transfer stations) or would need off island technology providers (e.g. waste from energy);
- Existing contracts (e.g. for the disposal of used tyres);
- Effective risk management (through good competition and contractual risk transfer); and
- Delivery schedule.

The Commercial Case (Section 4) examines a range of service packing and delivery/procurement options, highlighting the strengths, weaknesses, opportunities and threats associated with each. Key operational areas where the CIG is minded to retain delivery responsibility are:

- The operation of waste transfer stations on Little Cayman, Cayman Brac and Grand Cayman;
- The operation of HWRC's; and
- The collection of waste on Cayman Brac and Little Cayman.

However, for the purpose of this OBC and the development of Financial Case (Section 8) it has been assumed that the ISWMS would be procured as a collective and entire system and that this would be delivered by a single primary contractor, under Public Private Partnership (3P's) model through a Design Build Finance, Operate and Maintain (DBFOM) contract, It has also been assumed that the procurement strategy and procurement timetable will follow a Competitive Dialogue procedure (CD). The application of this approach in practice will be subject to confirmation by the CIG.

The Management Case

The CIG understands that a major project such as the delivery of the ISWMS requires a knowledgeable, experienced and dedicated team with a range of specialist skills. The CIG has formed such a team and is confident that the appropriate project management and governance arrangements have been put in place to deliver a successful ISWMS project.

The project management and governance arrangements during the procurement phase are intended to provide high level officer and governmental oversight of the project, while facilitating rapid decision-making and shorter lines of communications. This will enable what will be largely practical, commercial, management and organisational issues to be dealt with at officer level. Stage plans will be developed throughout the procurement process to identify, control and monitor project activities. In appointing staff to the various roles and setting budgets, care has been taken to consider the need for flexibility and contingency should staff changes occur and to ensure continuity from procurement into the contract management phase.

The Financial Case

The Financial Case for the delivery of the Reference Project and develops Net Present Value (NPV) analysis for the project. It assess the value for money offered by alternative means delivering the Reference Project through the development of a Public Sector Comparator (PSC) (based on a Design, Bid and Build approach) and a P3 model (based on a DBFOM contract). It also identifies the funding requirements for the ISWMS, highlighting the Availability Payments required to fill the affordability gap.

In undertaking the business case analysis a key factor that has been considered is whether Value for Money (VFM) is generated for the CIG by using a P3 delivery model when compared to the traditional procurement option. Generating VFM does not necessarily imply that the option with the lowest base costs should be selected. Since VFM is a combination of whole lifecycle cost and quality to meet the user requirements, one must consider the risk adjusted costs to the CIG over the life of the Project for the following alternatives:

- **Traditional Delivery** – This is the estimated cost to the CIG of delivering the Reference Project using a traditional procurement process. The analysis looks at the total estimated risk-adjusted costs on a net present value (NPV) basis and is referred to as the PSC. The PSC for this OBC has been assumed to replicate the traditional Design, Bid and Build (DBB) model; and
- **Public Private Partnership (P3)** – This is the estimated cost to the CIG of delivering the Reference Project to the identical specifications using a P3 procurement model. The analysis looks at the total estimated risk-adjusted costs on an NPV basis and is referred to as the Shadow Bid (SB).

The difference between the PSC and the SB on a NPV basis is referred to as the VFM. If the SB is less than the PSC, then this indicates positive VFM by procuring a project using the P3 model. Conversely, if the SB is greater than the PSC then there is potential for negative VFM through using a particular P3 delivery model. This is a standard methodology that is used in other countries around the world such as the United Kingdom, Canada and Australia.

The table below provides the assumptions applied in the VFM analysis.

Parameter	Assumption	Source
Procurement Start Date	October 1, 2016	CIG
Procurement and Construction Period	48 months	Amec Foster Wheeler
Contract Period	25 years	Amec Foster Wheeler
Base Construction Costs	Waste to energy: CI$ 60.01M Other components: CI$ 41,71M Land: CI$ 4.36M Total: CI$ 106.08M	Amec Foster Wheeler and CIG
Annual operating costs (cumulative over the projection period without adjusting for inflation)	**Export costs**: CI$ 26.13M **Operating expenses**: CI$ 203.2M **Lifecycle costs**: CI$ 22.74M **Barge costs**: CI$ 8.9M **Collection expenses**: CI$ 165.65M **Total**: CI$ 426.52M	Amec Foster Wheeler and CIG.
Annual operating revenues(cumulative over the projection period without adjusting for inflation)	Electricity revenue: CI$ 107.93M Collection fees: CI$ 118.47M Tipping fees: CI$ 41.67M Total: CI$ 269.07M	Electricity revenues derived from CIG and projected by Amec Foster Wheeler indexed to general inflation rate. Collection fees based on empirical data, indexed to growth rate of waste tonnage. Tipping fee based on $40/ ton, indexed to growth rate of waste tonnage.
Inflation	1.6% Building materials annual inflation to be 1% in 2017, 2% in 2018, 3% in 2019 and 4% thereafter.	Selected by KPMG based on the geometric mean of the historical rates published by the Economics and Statistics office ('ESO') for the three most recent years where inflation was positive. Long term rates are not published by the ESO and the most recent period experienced deflation. All streams of income and expenses have been indexed to this rate as the ESO does not publish long term rates for different categories such as fuel, building materials etc.

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Using the assumptions presented above, the VFM analysis has been prepared and the table below presents the high-level VFM results.

Public Sector Comparator (PSC)	
Estimated Cost	
NPV of Construction Cost	CI$ 113,249,519
NPV of Capital Charges	CI$ 59,712357
NPV of O&M Costs	CI$ 328,773,028
Sub Total	CI$ 501,744,055
NPV Procurement Costs	CI$ 2,710.776
Retained Risks	CI$ 48,384,484
Total NPV of PSC	CI$ 552,839,315
Total Estimated Value for Money	
As % of PSC NPV	

Shadow Bid (DBFOM)	
Estimated Cost	
NPV of SC Payment - Land only	CI$ 4,356,000
NPV of Availability Payments	CI$ 173,649.306
NPV of O&M Costs	CI$ 328.491,898
Sub Total	CI$ 506,497,204
NPV Procurement Costs	CI$ 4,441,569
Retained Risks	CI$ 26,630,749
Total NPV of Shadow Bid	CI$ 537,569,523
	CI$ 15,269,793
	2.76%

Conclusions

The Commercial Case of the OBC examines the main service packaging options available for the CIG for the delivery of the NSWMS and implementation an ISWMS for the Cayman Islands. These options range from procurement of a fully integrated solid waste management solution delivered by a single primary contractor (or consortia), through to the delivery/procurement of a fully disaggregated set of facilities and services that are delivered direct by the CIG or a number of specialised or niche contractors.

The strengths weakness, opportunities and threats posed by these primary packaging options have been examined and the analysis suggests that the packaging and procurement of a fully integrated DBFOM/PPP contract and alternatively, the delivery of a substantial Integration (DBFOM/PPP) package with the segregation of some peripheral services, offer the most viable ways forward for the CIG. Other options involve higher levels of service disaggregation and are likely to result in reduced opportunities for risk transfer from the CIG, greater CIG contract management and monitoring requirements, reduced competition during procurement across all services areas, a high a risk of procurement failure for some services (that cannot be locally sourced) and a need for multiple co-dependant procurement processes.

Amec Foster Wheeler consider that:

- Packaging a major DBFOM may offer value for money due to the enhanced scale of development and greater degree of works cohesion and co-ordination;
- A substantial DBFOM contract is more likely to attract competition by major overseas companies with robust track record of building implementing and operating integrated wastes management solutions;
- The letting of a main DBFOM/PPP contract will facilitate a high level of risk transfer to the DBFOM partner and reduced CIG internal requirements for contract management and monitoring;
- There may be advantages in packaging some separate operational contracts for peripheral service areas that may be of limited interest to a main DBFOM partner. This may offer enhanced VFM through the direct engagement of local contractors in areas where main

DBFO partner may otherwise seek to sub-contract. This would avoid the DBFOM partner applying an additional rate of return on the sub-contracts;

- The identification of some peripheral service areas that lie outside the main DBFOM/PPP contract will open areas for direct service delivery by the CIG (where it wishes to maintain control) and, if subject to separate procurement, deflect adverse criticism that local companies have been "squeezed out" of the market; and
- Where peripheral services are delivered by the CIG or local sub-contractors, the CIG will be exposed to increased interface and performance risks. This will be higher where a greater level of service disaggregation occurs.

Several factors will dictate the most appropriate procedure to be used:

It is Amec Foster Wheeler's view that the most viable procurement procedures will be:

- A streamlined Competitive Dialogue procedure – for the major DBFOM/PPP Contract; and
- The Open or Restricted procedure for any peripheral service contracts.

The Open and Restricted Procedure should be used where a specification for the services/works can be established that enables clear and transparent pricing.

Based on the results of the financial analysis, KPMG concludes:

- A DBFOM arrangement to execute the ISWMS exhibits VFM and presents qualitative benefits to the CIG. The Commercial Case section explores this matter in further detail with consideration being given to the packaging of services, practical viability and Strengths Weaknesses, Opportunities and Threats (SWOT) analyses; and
- Currently identified revenue streams are insufficient to finance the Reference Project on a sustainable basis. This is demonstrated by the growing affordability gap both under the traditional DBB and DBFOM scenarios. This affordability gap will need to be addressed either through ongoing contributions from CIG or by identifying additional revenue streams. Indicative user models implemented in comparable jurisdictions have been described in Appendix B.

It is KPMG's understanding that the affordability gap is a matter of discussion within CIG at the date of issue of this draft OBC. A decision on this matter is expected before the procurement process proceeds as a private partner will expect reasonable clarity on such a significant matter prior to responding to a request for proposal (RfP).

Glossary

~	Approximately
AD	Anaerobic Digestion
ATT	Advanced Thermal Treatment
BCU	Building Control Unit
BOT	Build Operate Transfer
BOOT	Build Own Operate and Transfer
BTO	Build Transfer Operate
CapEx	Capital expenditure
C&D	Construction & Demolition
CD	Competitive Dialogue
CHP	Combined Heat and Power
CLO	Compost Like Output
CO2	Carbon Dioxide
CP	Central Planning
CPA	Central Planning Authority
CP+N	Competitive Procedure and Negotiation
CUC	Caribbean Utility Company
CWCO	Consolidated Water Company
DBB	Design Bid Build
DBM	Design Build and Maintain
DBOM	Design Build Operate Maintain
DBO	Design Build and Operate
DBFM	Design Build Finance and Maintain
DBFO	Design Build Finance and Operate
DBFOM	Design Build Finance Operate and Maintain
DCB	Development Control Board
DEH	Department of Environmental Health and Maintain
EPC	Engineering, Procurement, Construction

ESO	Economics Statistics Office
FBC	Final Business Case
FY	Financial Year
HWRC	Household Waste Recycling Centre
IBA	Incinerator Bottom Ash
IFRSIC	International Financial Reporting Standards Interpretative Committee
IPSASB	International Public Sector Accounting Standards Board
ISOS	Invitation to Submit Outline Solutions
ISDS	Invitation to Submit Detailed
ITPD	Invitation to Participate in Dialogue
ITT	Invitation to Tender
ISWMS	Integrated Solid Waste Management System
IVC	In-Vessel Composting
K	Thousand
KPI	Key Performance Indicator
MBT/MT	Mechanical Biological Treatment/Mechanical Treatment
MEAT	Most Economically Advantageous Tender
MH&C	Ministry for Health and Culture
MRF	Material Recovery Facility
MSW	Municipal Solid Waste
NPV	Net Present Value
NSWMP	National Solid Waste Management Policy
NSWMS	National Solid Waste Management Strategy
OBC	Outline Business Case
OP	Open Procedure
OpEx	Operating expenditure
P3	Public Private Partnership
PAYT	Pay As You Throw
PD	Planning Development
PPP	Public Private Partnership
PQQ	Prequalification Questionnaire

PSC	Public Sector Comparator
RCAM	Return on Investment Capital Model
RDF	Refuse Derived Fuel
RfP	Request For Proposal
RP	Restricted Procedure
SB	Shadow Bid
SPP	Satisfactory Planning Permission
SO	Service Output
SOC	Strategic Outline Case (for an ISWMS dated 24/04/2014)
SRF	Solid Recovered Fuel
SWOT	Strengths, Weaknesses, Opportunity and Threats
TBD	To be determined
VFM	Value for Money
WAC	Waste Authority Cayman
WtE	Waste to Energy
WRATE	Waste and Resource Assessment Tool for the Environment
WTS	Waste Transfer Station

Contents

1. Background

This section provides a contextual description for the Outline Business Case and details of the current waste management arrangement in the Cayman Islands.

1.1 Introduction

Background

Amec Foster Wheeler Environment & Infrastructure UK Ltd. (Amec Foster Wheeler) and KPMG LLP (KPMG) has been commissioned by the Cayman Islands Government (CIG) to assist in the delivery of an Integrated Solid Waste Management System (ISWMS) for the Cayman Islands. This work is being delivered in three main phases:

- Phase 1: The preparation of a National Solid Waste Management Strategy (NSWMS) for the Cayman Islands and the delivery of environmental and site investigations at the George Town, Cayman Brac and Little Cayman landfills;
- Phase 2: Preparation of an Outline Business Case to deliver the NSWMS; and
- Phase 3: The procurement of new waste management services and infrastructure in line with the NSWMS.

Phase 1 was completed in June 2016 with the publication of the National Solid Waste Management Strategy (NSWMS) for the Cayman Islands[3]. This Outline Business Case is the key deliverable for the completion of Phase 2 and prepares the way for the implementation of the ISWMS in Phase 3.

The Outline Business Case

This Outline Business Case (OBC) presents the proposals of the Cayman Islands Government (CIG) for the delivery and implementation of a National Integrated Solid Waste Management System (ISWMS) encompassing the future procurement of new waste management services and infrastructure. The ISWMS will cover the management of solid waste on all three islands (Grand Cayman, Cayman Brac and Little Cayman) and will be designed to deliver modern sustainable waste management practice, systems and infrastructure that are consistent with recognised international standards.

The fundamental need for a new ISWMS in the Cayman Islands is driven by an urgent recognition that existing solid waste management practices and systems are not sustainable, pose a potential threat to the environment and local amenity and do not make best use of a potential resources that could benefit the community of the Cayman Islands. This existing system is heavily reliant on the use of three landfills with one located on each island. The continued use of these aged and unengineered facilities is inconsistent with modern and sustainable waste management practices and conflicts with National Solid Waste Management Policy[4] (NSWMP) for the Cayman Islands.

The OBC addresses the need to close and remediate the three existing landfill sites and encompasses the estimated cost of remediation within the Financial Case (Section 8). The strategic estimate is subject to the development of a detailed remediation plan for each site.

[3] Ministry of Health and Culture, Cayman Islands Government (June 2016). National Solid Waste Management Strategy for the Cayman Islands.
[4] Ministry of Health and Culture, Cayman Islands Government (August 2015). National Solid Waste Management Policy for the Cayman Islands.

The key drivers underpinning the need for change in the way that solid waste is managed on the Cayman Islands are summarised as follows:

- The landfills on the Cayman Islands are all aging facilities that have not been formally engineered to protect the environment or public health and have been demonstrated to pose a potential risk[5];
- The current existing waste management infrastructure cannot support the long term needs of the Cayman Islands;
- At current rates of infill, George Town landfill has a limited remaining capacity and will be filled to completion within a relatively short period of time (approximately 5 years);
- The landfill disposal of solid waste is not a sustainable and modern practice and does not make use of a potentially valuable resources (e.g. recyclables). Landfill also produces adverse environmental impacts (e.g. odour) and emissions (e.g. the emission of methane, which is a potent greenhouse gas and contributor to global warming);
- Landfill disposal is the lowest tier of the internationally recognised waste hierarchy;
- The main landfill located at George Town is the highest point on Grand Cayman and as an operational site it causes visual intrusion over a wide area;
- Solid waste is being disposed of while it could be segregated and used productively to produce renewable energy (displacing reliance on imported fossil fuels), compost and soil conditioners (which are sparse on the Islands) and reusable and recyclable materials;
- Residents of the Cayman Islands are currently not provided with good facilities, information and the services to promote the reuse, recycling and recovery of waste and to thereby divert it from landfill; and
- Population growth and the increasing quantities of waste produced as a consequence is not sustainable and will produce greater issues and problems in future if left unchecked and continues to be managed in the same way.

This OBC builds upon the NSWMP and the NSWMS which were completed and issued in 2015 and 2016 respectively. Together these documents set the objectives and vision for a new ISWMS for the Cayman Islands. This OBC sets out the means by which the ISWMS will be delivered and implemented. It has been prepared in accordance with HM Treasury, The Green Book[6] and Green Book Supplementary Guidance[7] and sets out the cases underpinning delivery of the ISWMS. These are:

- The Strategic Case;
- The Economic Case;
- The Commercial Case;
- The Management Case; and
- The Financial Case.

[5] Amec Foster Wheeler (March 2016). Landfill Site Environmental Review, Task 2 Environmental Investigations Interpretative Report.
[6] HM Treasury (2013): The Green Book – Appraisal and Evaluation in Central Government. Treasury Guidance. TSO 2013
[7] HM Treasury (2015) Public Sector Business Cases using the five case model (updated guidance) – Green Book Supplementary Guidance on Delivering Public Value form Spending Proposals.

Collectively these cases are targeted to provide decision makers, stakeholders and the public with the information and evidence underpinning transparent decision making and with the framework for the delivery, management and performance monitoring of the ISWMS.

In addition the OBC identifies key risks confronting the delivery of the ISWMS and how these risks will be allocated, monitored and mitigated.

1.2 Profile of the Cayman Islands

Location

The Cayman Islands are a British Overseas Territory located in the western Caribbean Sea. The territory comprises the three islands, Grand Cayman, Cayman Brac and Little Cayman which are located in the northwest of the Caribbean Sea, approximately 430 miles (700 km) south of Miami,), 227 miles (366 km) south of Cuba, and about 310 miles (500 km) northwest of Jamaica. George Town, the capital of the Cayman Islands, is situated on the western shore of Grand Cayman.

Grand Cayman, the largest of the three islands, has an area of about 76 square miles and is approximately 22 miles long with an average width of 4 miles. Its most striking feature is the shallow, reef-protected lagoon, the North Sound, which has an area of about 35 square miles. The island is mostly a low-lying limestone base, with the highest point about 60 feet above sea level.

Cayman Brac lies about 89 miles northeast of Grand Cayman. The island is approximately 12 miles long with an average width of 1.25 miles and has an area of about 15 square miles. Its terrain is the most prominent of the three islands with “The Bluff”, a central limestone outcrop, rises steadily along the length of the island up to 140 ft. (43m) above the sea at the eastern extremity.

Little Cayman lies 5 miles west of Cayman Brac and is approximately 10 miles long with an average width of just over 1 mile. It has an area of about 11 square miles. The island is generally low-lying with a few areas on the north shore rising to 40 ft. (12m) above sea level.

There are no rivers on any of the islands. The coasts are largely protected by offshore reefs and in some places by a mangrove fringe that sometimes extend into inland swamps.

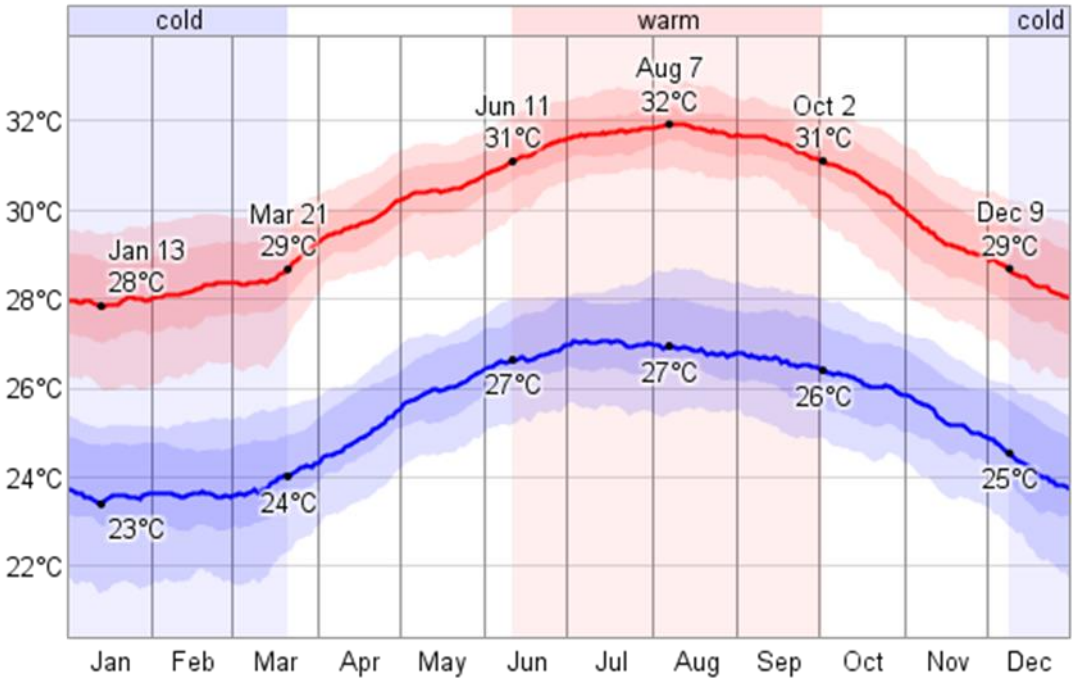
Climate

Located in the northwest Caribbean, the three Cayman Islands enjoy mainly tropical weather conditions with slight seasonal variations. The unique position places the Cayman Islands far enough north to be affected by cold fronts during the winter and but also within the belt that is influenced by tropical waves and hurricanes during the summer. Climatically the year can be divided into two seasons the wet, summer season, generally from mid-May through October, and the dry, winter season, from November to April.

The temperature, summer or winter, seldom goes lower than 21°C (70 F), or higher than 30°C (86 F). Figure 1.1 shows the average daily high and low temperatures for Grand Cayman, The average daily temperature is 25°C (78 F) in the winter and about 30°C (86 F) in the summer.

The “warm season” in the Cayman Islands generally runs from June to October, with the cold season lasting from December to March.

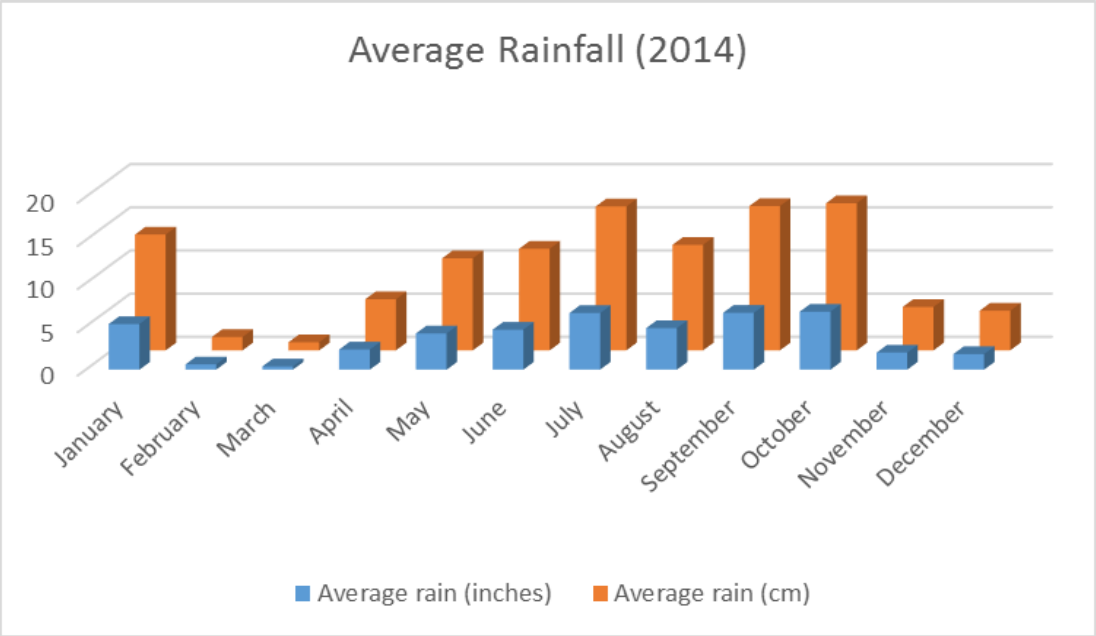
Figure 1.1 Temperature data (average daily high and low temperatures on Grand Cayman)



The relative humidity on Grand Cayman generally ranges from 64% (mildly humid) to 92% (very humid) during the year. The driest month is usually April during which the relative humidity can drop below 68% for three days out of four, The most humid is usually October, with the relative humidity typically exceeding 89% (very humid) for three days out of four. The average annual humidity is approximately 77%.

Rainfall varies across the Cayman Islands and seasonally. The wettest months are generally September and October with 14.9 inches (378.5mm) recorded in September 2010 and 6.71 inches (170.4mm) in October 2014. The driest month is usually March with 0.2 inches (5.1mm) recorded in 2010 and 0.37 inches (9.4mm) in 2014. Over the entire year, the most common forms of precipitation are thunderstorms, light rain, and moderate rain.

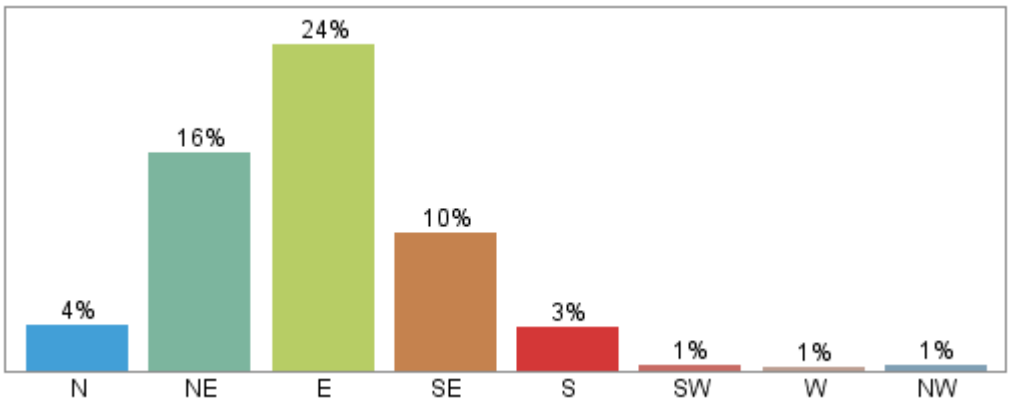
Figure 1.2 Average Rainfall Data – Grand Cayman



Over the course of the year typical wind speeds vary from 1 m/s to 7 m/s (light air to moderate breeze), rarely exceeding 10 m/s (fresh breeze). The highest average wind speed of about 5 m/s (gentle breeze) generally occurs in November. The lowest average wind speed of about 3 m/s (light breeze) typically occurs around September 3, at which time the average daily maximum wind speed is 5 m/s (gentle breeze).

Between May and October the prevailing winds are from east to south and from December to April, the coolest season of the year, the prevailing winds are from the northeast to northwest. A major natural hazard are the tropical cyclones that form during the Atlantic hurricane season from July to November.

Figure 1.3 Average Wind Direction over the Year – Grand Cayman



In September 2004 Grand Cayman was hit by Hurricane Ivan. This created an 8 foot (2.4m) storm surge which flooded many areas of the island. An estimated 83% of the dwellings on the island were damaged including 4% which required complete reconstruction. A reported 70% of all dwellings suffered severe damage from flooding or wind, whilst another 26% sustained minor damage from partial roof removal, low levels of flooding, or impacts with floating debris. Power, water and communications were disrupted for months in some areas.

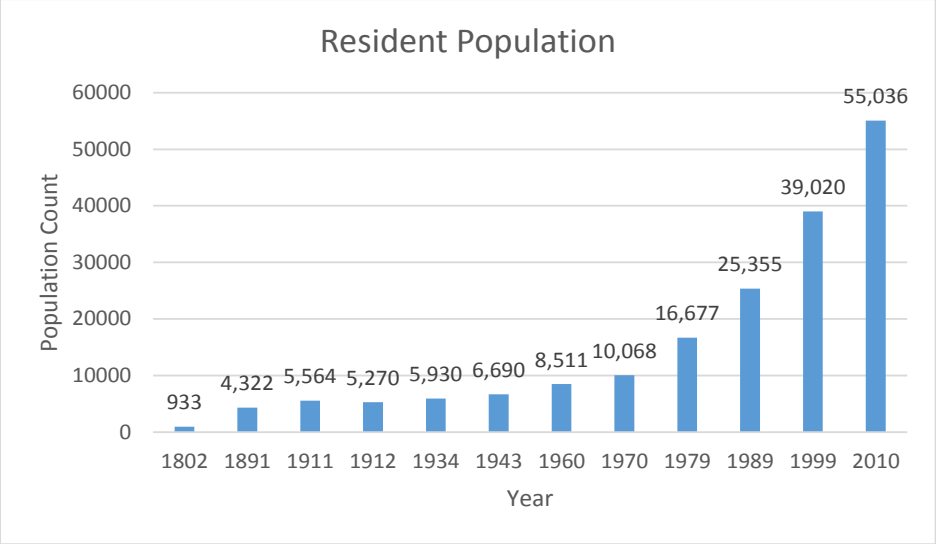
In November 2008 both Cayman Brac and Little Cayman were hit by hurricane Paloma. The category four hurricane produced winds of 140mph and a storm surge of 4 to 8 feet (1.2 to 2.4m) on Cayman Brac, and 2 to 4 feet (0.6 to 1.2m) on Little Cayman. Many properties on both islands suffered substantial damage and injuries were reported, however there were no reported deaths. Approximately 18 inches (457mm) of rain fell on Cayman Brac during the hurricane.

Due to the tropical location of the islands, more hurricane or tropical systems have affected the Cayman Islands than any other region in the Atlantic basin; it has been brushed or directly hit, on average, every 2.23 years.

Housing/ population

The 2010 census was completed by 22,760 households whose members were recorded as residents of the Cayman Islands. The population was counted at 55,456 and this represents a 41% growth upon the population from the previous 1999 census as shown in Figure 1.4. The increase in population amounts to an annual growth rate of approximately 3.1% and this growth is expected to continue with population projected to rise to 60,000 by 2020.

Figure 1.4 Population data



The vast majority of the population (95.8%) reside on Grand Cayman with the remaining 4.2% residing in the sister islands of Cayman Brac and Little Cayman (only about 170 individuals are permanently resident on Little Cayman). On Grand Cayman the majority of the population is distributed to the west and south west of the island, 51% of the population live in the capital George Town, 20.4% in the west bay area and 19.2% in Bodden Town.

The distribution of households follows a similar pattern to the distribution of the population with 54.2% of households located in George Town, 20% in west bay and 16.7% in Bodden Town. The sister Islands accounted for 4.5% of households. Since the previous census data in 1999 7,853 households were added across the Cayman Islands representing a 52.7% increase. The highest rate of household increase was in Bodden Town with a 95.1% increase, while west bay and north side grew by 56.1% and 53% respectively.

The average household size recorded during the 2010 census was 2.4 persons per household which represented a decrease from the 1999 census which recorded 2.6 persons per household. It was also recorded that almost 1 in every 3 households (32.4%) was a single person household.

The majority of households within the Cayman Islands are either detached houses (40.8%) many of which have gardens, or apartments (27.7%). Detached houses represent the highest proportion of housing in all of the Grand Cayman districts and the sister Islands with the exception of George Town, where a higher proportion of people live in apartments and townhouses.

As well as a rising residential population the Cayman Islands are also a popular tourist destination which leads to high population fluctuations. The Cayman Islands department of tourism stated that during 2013 there were 345,387 stay over visitors (travelling via air travel and staying in hotels) and 1,375,872 visitors from cruise ship arrivals. It is expected that the number of visitors from cruise ship arrivals will exceed 2 million in 2015.

Power and Electricity

The Caribbean Utility Company (CUC) has exclusive rights, granted under licence from CIG, and is the sole provider and distributor of electrical power on Grand Cayman. The company relies primarily upon imported diesel fuel for electricity generation, as the island has neither hydroelectric potential nor any inherent thermal resources. The imported fuel is transferred from supplier tanker terminals, by pipeline, to CUC's centralised generating power plant located on the periphery of George Town. The power plant houses multiple generating sets which possess a combined generating capacity of approximately 150MW. CUC is in the process of replacing several older generating sets with two new 18 MW generating unit, a 3 MW steam turbine and two exhaust gas boilers. The new generating units will be CUC's most fuel-efficient units and the steam turbine will be generating power from recaptured waste heat. In addition, CUC operates 11 mobile power units each with a capacity of 1.5 MW.

The electricity transmission and distribution system on Grand Cayman comprises eight major transformer substations, approximately 302 miles of overhead high-voltage (69 kilovolt and 13 kilovolt) lines and 14 miles of high-voltage submarine cable. The system is specifically designed to accommodate high winds and flooding from hurricanes.

The Cayman Brac Power and Light Company Limited (CBP&L) generate and supply electricity on both Cayman Brac and Little Cayman under licence from CIG.

The CIG Electricity Regulatory Authority (ERA) protects the rights of electricity consumers on the Cayman Islands, ensuring that they receive dependable power supply at the lowest cost. The ERA also promotes the development of electricity from renewable resources to reduce the Cayman Islands' dependence on diesel fuel.

Water and Wastewater

The Consolidated Water Company Limited and the Water Authority supply Grand Cayman with potable water. The Consolidated Water Company serves the Seven Mile Beach and West Bay areas, while the Water Authority serves the remainder of Grand Cayman. Both organisations extract groundwater from underground aquifers using deep abstraction wells. The saline groundwater is treated using Reverse Osmosis together with the addition of three fluoride-free chemicals to produce portable water for mains distribution.

The Water Authority also supplies piped water on Cayman Brac. Customers not served through the pipelines are provided with water by Water Authority tanker trucks. There are no Water Authority operations on Little Cayman, however a number of small desalination plants serve individual properties and developments.

Approximately 20% of the wastewater generated in the Cayman Islands is collected and treated at the central wastewater treatment plant operated by the Water Authority on the periphery of George Town. About 80% of wastewater is treated in onsite treatment systems comprising septic tanks and aerobic treatment units. Septic tanks serve the majority of developments constructed prior to 1990 as well as smaller developments constructed since that time. Aerobic treatment units are required at larger developments, to achieve a higher level of treatment, known as secondary treatment.

The effluent from the centralised waste water treatment facility, aerobic treatment plants and from the septic tanks is injected into disposal wells at a depths of 40 to 100 feet below the water table, depending on location.

1.3 Analysis of Waste Arisings

Each year between 60,000 and 80,000 tons of solid waste is produced on the Cayman Islands. The majority of this waste is produced on Grand Cayman (75,067t between March 2015 and February 2016) with smaller quantities managed on Cayman Brac (est.2659t in 2015) and Little Cayman (est. 200t in 2015). A typical breakdown of the annual tonnages delivered to George Town landfill is shown in Table 1.1 (the tonnages were sourced from the Department of Environmental Health (DEH)).

Table 1.1 Amount and Types of Waste Managed at George Town Landfill March 2015 –February 2016

	Tons	Current method of management
Commercial Waste	31,790	Disposed of in Landfill
Construction and Demolition	6,362	Landfill
Construction and Demolition	707	Estimate on recycling (10% of total C&D waste)
Yard Waste	14,710	Disposed of in Landfill
Residential Waste	13,802	Disposed of in Landfill
Pallets	639.32	Disposed of in Landfill
Cardboard	2,514.45	Disposed of in Landfill
Sand	-	Disposed of in Landfill
Food Waste from restaurants	189.98	Disposed of in Landfill
Expired Liquor	24.79	Disposed of in Landfill
Bulk Waste	653.88	Disposed of in Landfill
Special Waste (waste water sludge)	23.27	Disposed of in Landfill
Foam	-	Disposed of in Landfill
Deceased Animals	43.10	Disposed of in Landfill
Medical Waste	120	Diverted through incineration
Chemicals	120.32	Stockpiled for recycling?
Island wide government clean up (Vegetation)	27.64	Disposed of in Landfill
Mixed waste from residential and commercial properties	84.47	Disposed of in Landfill
Metal Waste	1,956.13	Recycled, most likely to be a stockpiled figure
Derelict Vehicles	565.69	Recycled
Tyres	367.14	Recycled
Batteries	22.33	Recycled
Aluminium Cans	6.80	Recycled

	Tons	Current method of management
Recycling of Oil	-	-
Christmas Tree	4.68	Recycled
Paper recycling	361.57	Recycled
Confidential waste and contraband	90	Diverted through incineration
TOTAL	75,067	

Waste Growth Assumptions

A baseline waste flow tonnage model has been developed with a 50 year strategic horizon beginning with the year 2015 and ending in 2065. This is based on sub-modules produced for each of the three islands to enable future treatment and transfer facilities to be sized appropriately and to take into account local circumstances. Waste growth has been projected using assumptions projected in line with forecast increases in population with an additional underlying waste growth rate per capita being applied.

The method by which the projections have been calculated and assumptions used are presented fully in Appendix A and are summarised below.

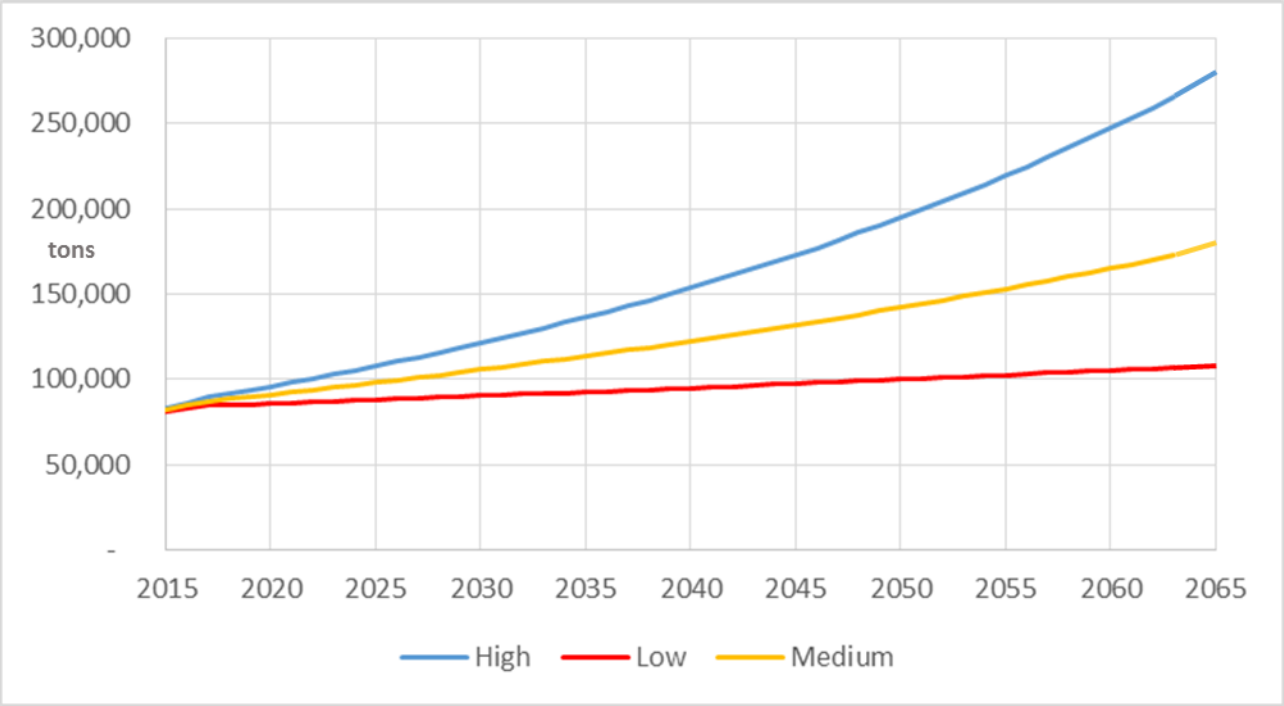
Three waste growth profiles were modelled based on differing population growth assumptions: low, medium and high, being: 2%, 3% and 4% increases per year, respectively.

In the baseline waste flow model, the Grand Cayman waste yield per capita is calculated using the pro-rata tonnage for 2015 and the projected population in 2015. The projected population is based on the known population in 2013 with the growth rate for each profile. The underlying waste growth is applied to the increased population projections.

For Cayman Brac and Little Cayman, the waste yield per capita for 2015 was calculated average of the waste per capita for the in line with the annual data returns for Cayman Brac for the years: 2011-12, 2012-13, and 2013-14. This was based on known population and waste tonnage data. For 2016 onwards the waste yield is the same for each profile, but as the population increases the total waste for each profile is different.

Figure 1.5 provides the forecast of future waste arisings over the next 50 years with waste growth applied at rates 4% (high), 3% (medium) and 2% (low). This shows that unless waste growth is constrained by waste reduction measures then over a 50 year horizon the amount of waste requiring management on the island will rise to between 100,000 and 250,000 tons per annum.

Figure 1.5 Waste Tonnage Projections (2015 – 2065)



Note: High – 4%, Medium – 3%, Low – 2%

Waste Composition

Information on general waste composition was taken from Table 3.0 of Appendix D of the WDOR, 2002/2003 report[8]. The DEH estimates on waste composition, specifically the 'average composition' were generally applied for the production of the baseline waste flow model. However, these were supplemented by adjustments made to further divide the categories into sub categories. These were based on comparable splits of waste types derived from data for the Isle of Wight, UK, which has a comparable island population, and using data from other Caribbean islands (including Barbados and the Bahamas). The composition used in the model is provide below in Table 1.2.

The composition data has been applied to the residential and commercial waste on all islands (where applicable) in the baseline waste flow model.

Table 1.2 Waste composition used in baseline model

	Composition from WDOR. 2002 Report & revised in 2003	New categories	Reasoning/ Comment	Composition used
Newsprint	5.0%	Recyclable paper	Newsprint, office paper and half other paper assumed to be recyclable.	13.1%
		Non-recyclable paper	Half other paper assumed to be recyclable.	6.3%
Office paper	1.8%		See above	-

[8] PBS&J (2002 and revised 2003). Interim Report of the Waste Disposal Options Review Committee (WDOR)

	Composition from WDOR. 2002 Report & revised in 2003	New categories	Reasoning/ Comment	Composition used
Other paper	12.6%		See above	-
Corrugated cardboard	11.7%	Recyclable card	Based on split seen on Isle of Wight.	11.5%
		Non-recyclable card		0.2%
Glass bottles	2.8%			2.8%
Glass other	0.7%			0.7%
Plastic bottles	1.9%			1.9%
Plastic other	9.1%	Other dense plastic recyclable	Based on the split of these categories found on the Isle of Wight – applied to 9.1% 'plastic other'.	2.2%
		Other dense plastic non - recyclable		1.7%
		Plastic film recyclable		2.2%
		Plastic film non – recyclable		3.0%
Wood	7.3%			7.3%
Dirt, Brick, Rubble	3.7%			3.7%
Yard waste	18.6%		Assumed to be green garden waste.	18.6%
Aluminium cans	0.8%			0.8%
Aluminium other	0.4%			0.4%
Metal cans	2.0%		Assumed to be ferrous cans.	2.0%
Ferrous metals	2.3%			2.3%
Non-Ferrous metals	0.7%			0.7%
Textiles	5.3%			5.3%
Food waste	5.4%			5.4%
Miscellaneous organics	5.5%			5.5%
Miscellaneous other	2.4%			2.4%
Total	100%			100%

In the NSWMS the aged nature of the available waste composition data and the need for improved, up to date data was recognised. The CIG has implemented the recommendation in the NSWMS to address this issue and has commissioned a new waste composition study to be completed in September 2016.

2. Strategic Waste Management Policies and Objectives (Strategic Case)

This section sets out the need for change based on a thorough assessment of the existing waste management arrangements in place on the Cayman Islands. It lays out the strategic fit and business synergy of the project with the National Solid Waste Management Policy for the Cayman Islands and the spending objectives of the Cayman Islands Government. The benefits and risks associated with the scope of the National Solid Waste Management Strategy and the delivery of an Integrated Waste Management Systems are also identified.

2.1 Organisational Overview

The organisational structure of the CIG is shown in Figure 2.1. Those ministries and departments with direct responsibilities with regard to the management of waste on the Cayman Islands include:

- The Ministry of Health and Culture: The ministry has responsibility for the production of the NSMP and the NSWMS, the procurement of an integrated waste management system for the Cayman Islands, and chairs the Steering Committee for this project. The Ministry also administers the Department of Environmental Health (DEH);
- The Ministry of Lands, Agriculture. Housing and Infrastructure: The ministry administers the departments of Planning and Public Works amongst others. The Department of Planning will be responsible for permitting the development of new waste management infrastructure;
- The Ministry of Financial Services, Commerce and the Environment: The ministry administers the Department of the Environment amongst others;
- The Department of Public Works is project managing the production of the NSWMS and procurement of the integrated waste management system and contributes to the Steering Committee for the project;
- The Department of the Environment: The department has an overarching interest and responsibility for the protection of the environment on the Cayman Islands and contributes the Steering Committee for this project; and
- The DEH: The department provides the public sector waste collection services throughout the Cayman Islands and operates the principal waste management facilities. The department also undertakes environmental monitoring (and this includes the sampling and analysis surface, groundwater and leachate samples at George Town landfill). The department also contributes to the Steering Committee for the NSWMS project.

Figure 2.1 Cayman Islands Government Organisational Structure

CAYMAN ISLANDS GOVERNMENT ORGANISATIONAL STRUCTURE

Effective 1 January 2015 *Information correct as of the issue date, but subject to change. Information vetted by the Deputy Governor's Office.

CAYMAN ISLANDS GOVERNMENT

LEGISLATIVE ASSEMBLY

SPEAKER
Hon. Juliana O'Connor-Connolly, JP
DEPUTY SPEAKER
Hon. Anthony S. Eden, OBE, JP
PREMIER
Hon. Alden McLaughlin, MBE, JP
DEPUTY PREMIER
Hon. Moses Kirkconnell, JP
CABINET MINISTERS
Hon. Alden McLaughlin, MBE, JP
Hon. Moses Kirkconnell, JP
Hon. D. Kurt Tibbetts, OBE, JP
Hon. Osbourne Bodden, JP
Hon. Marco Archer, JP
Hon. Wayne Panton, JP
Hon. Tara Rivers, JP
CABINET MEMBERS
First Official Member, Deputy Governor
Hon. Franz Manderson, Cert. Hon., JP
Second Official Member, Attorney General
Hon. Samuel Bulgin, QC, JP
GOVERNMENT BACKBENCH MEMBERS
Mr. Joseph Hew
Mr. Winston Connolly
Mr. Alva Suckoo
Mr. Roy McTaggart
LEADER OF THE OPPOSITION (LoO)
Hon. W. McKeeva Bush, OBE, JP
OFFICIAL OPPOSITION MEMBERS
Capt. A. Eugene Ebanks, JP
Mr. Bernie Bush
INDEPENDENT MEMBERS
Mr. Ezzard Miller, JP
Mr. Arden McLean, JP

COUNCILLORS
Mr. Joseph Hew
(Tourism)
Mr. Winston Connolly
(Education & Employment)
Mr. Alva Suckoo
(Computer Services & eGovernment, Culture)
Mr. Roy McTaggart
(Financial Services, Health)

EXECUTIVE/ JUDICIAL RELATIONSHIPS
ACCOUNTABILITY LINES
POLICY GUIDANCE
WORK RELATIONSHIP

LEGISLATIVE ASSEMBLY

AUDITOR GENERAL / CHIEF OFFICER
Mr. Alastair Swarbrick

COMPLAINTS COMMISSIONER/ CHIEF OFFICER
Ms. Nicola Williams

ACTING INFORMATION COMMISIONER/ CHIEF OFFICER
Jan Liebaers

HER EXCELLENCY THE GOVERNOR
Mrs. Helen Kilpatrick, CB

Elections Office

COMMISSIONS
Judicial & Legal Services Commission
Human Rights Commission
Commission for Standards in Public Life
Constitutional Commission
Anti-Corruption Commission
Civil Service Appeals Commission

Advisory Committee on the Prerogative of Mercy
Electoral Boundary Commission
National Security Council
Parole Commissioners Board
Prisons Inspection Board

PREMIER
Hon. Alden McLaughlin, MBE, JP

DEPUTY PREMIER
Hon. Moses Kirkconnell, JP

DIRECTOR OF PUBLIC PROSECUTIONS/CHIEF OFFICER
Ms. Cheryll Richards, JP
Office of the Director of Public Prosecutions

THE CABINET
MINISTERS
Hon. Alden McLaughlin, MBE, JP
Hon. Moses Kirkconnell, JP
Hon. D. Kurt Tibbetts, OBE, JP
Hon. Osbourne Bodden, JP
Hon. Marco Archer, JP
Hon. Wayne Panton, JP
Hon. Tara Rivers, JP
OFFICIAL MEMBERS
Hon. Franz Manderson, Cert. Hon., JP
Hon. Samuel Bulgin, QC, JP

Chief Justice of the Cayman Islands
Hon. Justice Anthony Smellie, QC

Grand Court Puisne Judges
Hon. Justice Alexander Henderson
Hon. Justice Charles Quin, QC
Hon. Justice Angus Foster
Hon. Justice Andrew Jones
Hon. Justice Sir Peter Cresswell
Hon. Justice Richard Williams

Cayman Islands Court of Appeal
President
Rt. Hon. Sir John Chadwick
Appeal Court Judges
Hon. Justice E. Mottley, JA
Hon. John Martin, QC, JA
Hon. Sir George Newman
Hon. Sir Bernard Rix, QC

SUMMARY COURT
CORONER'S COURT
DRUG REHABILITATION COURT

Magistrates: Summary Court and Coroner's Court
Chief Magistrate
Her Honour Nova Hall, JP
Magistrates
His Honour Valdis Foldats, JP
Her Honour Kirsty-Ann Gunn, JP

COURTS ADMINISTRATOR/ CHIEF OFFICER JUDICIAL ADMINISTRATION
Mr. Kevin McCormac, JP

CABINET SECRETARY/ CHIEF OFFICER
Mr. Samuel Rose, JP

Departments & Sections
- Cabinet Secretariat
- Policy Coordination Unit
- Protocol Office
- Freedom of Information Unit
- Premiers Office
- Government Information Services
- Radio Cayman
- CIGTV

Authorities, Boards & Committees
- Immigration Appeals Tribunal

DEPUTY GOVERNOR & HEAD OF THE CIVIL SERVICE
Hon. Franz Manderson, Cert Hon., JP

PORTFOLIO OF THE CIVIL SERVICE (POCS)

CHIEF OFFICER
Mrs. Gloria McField-Nixon, JP

Departments & Sections
- Civil Service College
- Public Sector Reform
- Strategic and Corporate Human Resources
- Internal Audit
- HR Audit
- Legislative Department
- National Archive
- Commissions Secretariat

Authorities, Boards & Committees
- Records Advisory Committee
- Public Service Pension Board

DEPUTY GOVERNOR'S OFFICE

Departments & Sections
- Parole Board Secretariat
- Prisons Inspection Board Secretariat
- ACPM Secretariat
- Strategic Reforms Implementation Unit

Authorities, Boards & Committees
- Civil Aviation Authority
- Air Transport Licensing Authority

ATTORNEY GENERAL
Hon. Samuel Bulgin, QC, JP

PORTFOLIO OF LEGAL AFFAIRS (PLA)

SOLICITOR GENERAL / CHIEF OFFICER
Ms. Jacqueline Wilson

Departments & Sections
- Law Revision
- Legal Department
- Legislative Drafting Department
- Law Reform Commission
- Financial Reporting Authority
- Cayman Islands Law School

Authorities, Boards & Committees
- Grand Court Rules Committee
- Legal Advisory Council
- Law Revision Commission
- Anti-Money Laundering Steering Group

MINISTER
Hon. Alden McLaughlin, MBE, JP

HOME AFFAIRS, HEALTH & CULTURE (HAH&C)

CHIEF OFFICER
Mr. Eric Bush, JP

Departments & Sections
- Immigration
- Police (Budget & Support)
- Public Safety Communications
- Hazard Management Cayman Islands
- Prisons
- Fire
- Community Rehabilitation
- Computer Services
- London Office

Authorities, Boards & Committees
- Business Staffing Plan Board
- Cayman Brac and Little Cayman Immigration Board
- Caymanian Status & Permanent Residency Board
- Work Permit Board
- National Hazard Management Executive
- National Hazard Management Council
- e-Government Advisory Committee
- National Drug Council

MINISTER
Hon. Osbourne Bodden, JP

COMMUNITY AFFAIRS, YOUTH & SPORTS (CAY&S)

CHIEF OFFICER
Ms. Jennifer Ahearn, JP

Departments & Sections
- Health Regulatory Services
- Mosquito Research & Control Unit
- Environmental Health

Authorities, Boards & Committees
- Health Services Authority
- Health Practice Commission
- Medical & Dental Council
- Council for Professions Allied with Medicine
- Nursing & Midwifery Council
- Pharmacy Council
- Cayman Islands National Museum
- Cayman National Cultural Foundation
- National Gallery

MINISTER
Hon. Tara Rivers, JP

EDUCATION, EMPLOYMENT & GENDER AFFAIRS (EE&GA)

CHIEF OFFICER (Acting)
Mr. Christen Suckoo

Departments & Sections
- Department of Children and Family Services
- Department of Counselling Services
- Department of Sports
- Youth Services Unit
- Cadet Corps

Authorities, Boards & Committees
- Adoption Board
- Children and Youth Services (CAYS) Foundation
- National Sports Council
- National Youth Commission

MINISTER
Hon. Marco Archer, JP

FINANCE & ECONOMIC DEVELOPMENT (F&ED)

CHIEF OFFICER /FINANCIAL SECRETARY
Mr. Kenneth Jefferson, JP

Departments & Sections
- Education Services
- Labour and Pension
- National Workforce Development Agency
- Public Libraries
- Sunrise Adult Training Centre
- Educational Standards Assessment Unit (ESAU)
- Gender Affairs Unit

Authorities, Boards & Committees
- Caribbean Examinations Council National Committee
- University College of the Cayman Islands
- Education Council and Education Board for Cayman Brac and Little Cayman
- National Pensions Board
- Public Library Management Committee
- Labour Tribunals and Labour Appeals Tribunals
- Gender Equality Tribunal

MINISTER
Hon. D. Kurt Tibbetts, OBE, JP

PLANNING, LANDS, AGRICULTURE, HOUSING & INFRASTRUCTURE (PLAH&I)

CHIEF OFFICER
Mr. Alan Jones, JP

Departments & Sections
- Economics and Statistics Office
- Risk Management
- Treasury
- Finance Administration
- Customs

Authorities, Boards & Committees
- Public Sector Investment Committee
- Central Tenders Committee
- Cayman Islands National Insurance Company

MINISTER
Hon. Moses Kirkconnell, JP

DISTRICT ADMINISTRATION, TOURISM & TRANSPORT (DAT&T)

CHIEF OFFICER
Mr. Stran Bodden, JP

Departments & Sections
- Planning
- Agriculture
- Facilities Management
- Lands & Survey
- Public Works
- Vehicle and Equipment Services
- Temporary Housing Unit
- Vehicle & Drivers' Licensing
- Petroleum Inspectorate
- Postal Services

Authorities, Boards & Committees
- Animal Welfare Advisory Committee
- Veterinary Board
- Land Surveyors Board
- Water Authority
- National Roads Authority
- Electricity Regulatory Authority
- Street Naming & Numbering
- Information & Communications Technology Authority
- Development Control Board
- Electrical Trade Licensing Board of Examiners
- Central Planning Authority
- National Housing Development Trust (NHDT)
- Planning Appeals Tribunal
- Development Plan Tribunal
- Sister Islands Planning Tribunal

MINISTER
Hon. Wayne Panton

FINANCIAL SERVICES, COMMERCE & ENVIRONMENT (FSC&E)

CHIEF OFFICER
Dr. Dax Basdeo, JP

Departments & Sections
- District Administration
- Tourism
- Public Transport Unit
- Sister Islands Sports
- National Weather Service

Authorities, Boards & Committees
- Port Authority
- Airports Authority
- Cayman Turtle Farm
- Cayman Airways
- Hotel Licensing Board
- Miss Cayman Committee
- Public Transport Board
- Tourism Advisory Council
- Tourism Attractions Board
- Tourism Apprenticeship Training Programme Council
- National Festival Committee & District Committees
- Sister Islands Affordable Housing Development Corporation

Departments & Sections
- Financial Services Secretariat
- Department of Commerce & Investment
- General Registry
- Tax Information Authority
- Liquor Licensing Unit
- Environment
- Marketing & Communications Unit

Authorities, Boards & Committees
- Financial Services Council
- Financial Services Legislative Committee
- Cayman Islands Monetary Authority
- Cayman Islands Stock Exchange
- Auditors Oversight Authority
- Trade and Business Licensing Board
- Maritime Authority of the Cayman Islands
- Film Commission Advisory Board
- Special Economic Zone Authority
- Cayman Islands Development Bank
- Marine Conservation Board
- Beautification Committees
- Liquor Licensing Board
- Cinematograph Board

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DEH has 86 personnel that are involved in the delivery of the solid waste management service these include:

- 4 staff involved in administrative functions;
- 48 staff undertaking the waste collection service;
- 17 staff involved in landfills operations;
- 11 staff engaged in the litter collection; and
- 6 staff carrying recycling operations.

Funding

As shown in the Table 2.1, DEH's solid waste revenue is largely generated from fees on commercial waste collections, vehicle disposals and removals, incineration of clinical and other waste, as well as container rentals. An annual budget allocation from CIG represents just under 50% of DEH's overall revenue. There is limited revenue from recycling (most recently scrap metal sales) and no tipping fees are charged for landfill disposal.

Additionally, fines are issued under the Litter Law and Public Health Law, however these do not constitute a material source of revenue for DEH. DEH funding is also generated by "upfront" solid waste management fees on imported goods. However, in practice, these fees do not flow directly to DEH[9].

Table 2.1 DEH Funding Breakdown

Cayman islands' solid waste annual revenue			
Current revenue streams	**Services**	**CI$**	**US$**
Garbage fees	Annual container rental	2,630,000	3,140,299
	Commercial container servicing		
	Incinerators		
	Daily container rentals		
	Grapple truck service		
	Litter bin rentals		
	Derelict vehicle removal		
Recycling fees	Scrap metal sales	30,000	35,821
	Other recycling		
Vehicle disposal fees	Tires	708,000	845,373
	Batteries		
	Imported vehicles		
Third party subtotal		3,368,000	4,021,493
Cabinet revenue	Budget allocation	3,132,552	3,740,361
Total		6,500,552	7,761,853

Source: CIG Strategic Outline Case

2.2 Spending Objectives

The CIG policy guidance states:

"It is the Government policy to provide the Cayman Islands' people with and environmentally sound and cost effective means to manage the disposal of all solid waste generated on the Cayman Islands at no greater cost to the Cayman Islands Government than currently experienced by CIG".

[9] Information provide in interview with DEH staff.

Furthermore, under the current regulatory regime the CIG is unable to utilise conventional borrowing to fund a major capital programme to deliver the new ISWMS. As a consequence, the additional capital and operational costs required for the delivery of the ISWMS will need to be financed by alternative means and this could include the use of a public private partnership, introduction of gate fees, charges and use of self-generated revenues (e.g. from the sale of recyclables and power), or a combination of these. Further analysis of these requirements is set out in Appendix B of this OBC.

The CIG has recognised the additional costs associated with the mitigation of environmental impacts and remediation of the existing waste management facilities and currently unknown, potential costs arising from the disruption to existing services. A cost estimate for the remediation of the existing landfill sites has been included with the Financial Case (Section 8) of this OBC and is subject to the development of a detailed remediation plan for each site. Other costs that may be incurred, are currently unknown, will need to be taken in to consideration as the tactical delivery and implementation of the ISWMS progresses. However, these costs are accounted for within accuracy of the strategic financial estimates used throughout this OBC (please refer to Section 3.4).

Detailed remediation and closure plans will be developed for each of the existing landfills on Grand Cayman, Cayman Brac and Little Cayman, as recommended with the NSWMS. These plans will need to consider and be co-ordinated with the interim waste management requirements of the islands prior to construction and commissioning of the alternative waste management facilities as part of the new ISWMS.

Budgetary provisions in the order of CI$4 million have been made by the Ministry of Health and Culture, for work in developing the NSWMS, the OBC and for procurement of the ISWMS and other associated costs.

2.3 Current Waste Management Arrangements

Government Services

The DEH has responsibility for providing and operating a waste collection service and disposal facilities capable of dealing with the wastes generated within the Cayman Islands on behalf of CIG.

The current waste management infrastructure consists of 3 landfills, one on each island; a single operational clinical waste incinerator, 1 welding and maintenance area; 1 vehicle washing bay; and a recycling/ processing area for selected recyclables.

Between March 2015 and April 2016 scalehouse (weighbridge) data showed that 75,067 tons of waste were generated on Grand Cayman and managed at George Town landfill. 4,322 tons of this were diverted from landfill through disposal by incineration or recycling (including material stockpiled on the landfill site for recycling), achieving a landfill diversion rate of approximately 5.8%.

At Cayman Brac the total waste managed at the landfill was estimated to be approximately 2.600 tons in 2015/16.

There no available waste arising's information available for Little Cayman, although this is estimated to be approximately 200t/pa.

Residential waste:

Residential waste is collected at the kerbside from residents on Grand Cayman, Cayman Brac and Little Cayman. Rear-loading compactor vehicles with three men crews, one driver and two collectors, are used for single family residences and small, multi-residence dwellings.

Residents using the service are required to do the following:

- Each bag or container should not exceed 40 pounds in weight (approximately 18kg);
- Place garbage in water tight, metal or plastic garbage containers with tight-fitting lids;
- Place containers in front of premises or to the side of property on the street, immediately beside the property before 4:30am; and

- Sharp objects such as pieces of metal, tree branches, glass or needles should not protrude from any bags or containers.

Commercial Waste:

Commercial waste collection is accomplished through container rental and servicing. Several sizes and types of containers are available and can be rented on a daily, monthly or annual basis. The servicing frequency can be arranged from once per month to six days per week.

The DEH also service recycling bins distributed across the Cayman Islands for use by residents at grocery stores.

Waste is not accepted from cruise ships although smaller boats may deposit small amounts of waste for disposal.

Biomedical / infection waste:

Biomedical waste is collected separately. That collected on Grand Cayman is disposed of at the clinical waste incinerator located at the George Town landfill. The 2 hospitals at Grand Cayman produce around 131 tons of waste that is incinerated each year. Biomedical waste collected on Cayman Brac is currently landfilled in a discrete hazardous waste pit excavated at the landfill on Cayman Brac, although this was previously burnt in a now disused incineration unit.

Litter / Roadside Collection

The DEH provides a road side litter collection service on Grand Cayman and Cayman Brac. Details of this service are:

- Central George Town is cleaned every working day;
- All other Grand Cayman districts are cleaned on a weekly basis; and
- Areas on Cayman Brac are cleaned on a weekly basis.

Bulky waste collection

Large bulky items such as bicycles, furniture, tyres and redundant appliances are not collected as part of the routine residential or commercial waste collection services. These items are either taken to the landfill sites directly by residents, collected by the DEH for a fee, or are gathered as part of the periodic DEH collection sweep.

The DEH also conducts a special clean-up campaign for bulk waste where a collection service is offered from various locations on specific dates, usually in November/December.

Hazardous Waste Management

The DEH requests service users ensure that hazardous wastes are separated from other wastes and at each landfill there is a designated storage area for all hazardous materials that enter the landfill. At each designated area, hazardous materials are stored and processed for shipping overseas to the United States, where it is disposed of in accordance to the United States Environmental Protection Agencies (US EPA) regulations.

Performance of Existing Services

The DEH operates the exiting landfill facilities at George Town, on Cayman Brac and on Little Cayman and undertakes some monitoring of the environment surrounding George Town landfill. In this capacity DEH is self-monitoring, however the department does not undertake this function in relation to formal regulatory standards or requirements. The lack of such standards and an independent regulatory body, has, in Amec Foster Wheeler's view, contributed to the current situation where the impact of the landfills upon the local environment and amenity has been unclear and raised local concerns. This has been exacerbated by the

lack of containment of these facilities and the restricted funding available to the DEH to both operate and monitor the landfill sites to modern standards.

An assessment of the environmental impacts from the landfill sites was undertaken by Amec Foster Wheeler on behalf of the CIG in 2015[10].

Recently the CIG has initiated a waste education and awareness initiative. In March 2015 students throughout the Cayman Islands were invited by the DEH to enter the Waste Pyramid Essay & Poster Competition.

The purpose of the competition was to raise awareness about the new waste management hierarchy of "Reduce, Reuse, Recycle, Recover, and Dispose" in Waste Management in the Cayman Islands. This new waste management hierarchy is incorporated into the new NSWMP and NSWMS. The DEH aims to get students involved in the process of reducing, reusing, recycling, recovering and safe disposal whereby the students can express what this means to them, to the Caymanian Society and to the environment, through involvement in the Waste Pyramid Essay & Poster Competition; and by efforts post-competition.

2.4 Non-Government Waste Services

There are several privately owned waste collection companies operating on Grand Cayman including: Island Waste Carriers and Junk These companies collect waste and in some cases targeted recyclables (such as metal cans and plastics) from commercial and industrial premise. Residual waste collected for disposal is deposited at George Town landfill free of charge or a gate fee. The collected recyclables are understood to bulked and exported to various destinations and markets.

2.5 National Solid Waste Management Policy (NSWMP)

The NSWMP was formulated as part of the NSWMS development process to provide an overarching guiding policy that outlines the vision, values, strategic directions and the objectives with regards to the future management of solid waste on the Cayman Islands. The policy consequently provides a key foundation to the direction of solid waste management for the Cayman Islands.

Consultation on the NSWMP for the Cayman Islands

In June 2015 the CIG published a draft NSWMP[11] for public consultation. This consultation process ran from 16th June to 15th July 2015 and was announced through a press release and was reported in the local newspapers, radio and television.

The purpose of the NSWMP is to provide an overarching guiding policy that outlines the vision, values, strategic directions and the objectives with regards to the future management of solid waste on the Cayman Islands. The draft document proposed a vision, values, strategic directions and objectives and sought the public's views on these as a guiding policy. Collectively these principles represent a key foundation to the production of the list of short-listed options for the production of the NSWMS.

The consultation process confirmed that the vision, values, strategic directions and objectives set out in the draft NSWMP were appropriate and fit for purpose; with the vast majority of consultees either agreeing or strongly agreeing with the vision, values, strategic directions and objectives.

[10] Amec Foster Wheeler (March 2016). Landfill Site Environmental Review, Task 2 Environmental Investigations Interpretative Report.
[11] Ministry of Health and Culture Cayman Island Government (2015): National Solid Waste Management Policy for the Cayman Islands

Policy Framework and Content.

The framework for draft NSWMP is set out as:

- Vision;
- Value Statements ("Values");
- Strategic Directions; and
- Objectives relating to the Strategic Directions.

Vision and Values

Vision

"Integrated, sustainable, and effective waste management for the Cayman Islands".

Values

The CIG believes that the following value statements should guide the efforts in realising the vision of an "*integrated, sustainable, and effective waste management for the Cayman Islands":*

- We will implement sustainable waste management in a manner that respects the needs of future generations;
- We will apply the waste hierarchy preference for reduce, reuse, recycle, and recover prior to the final resort of disposal;
- We believe that the generators of waste should be responsible and bear their proper share of costs for waste management;
- We will ensure that environmental impacts of waste management are assessed and understood, and that measures are undertaken to protect human health and the environment;
- We will pursue waste management opportunities that have the potential to reduce greenhouse gas emissions and reduce our dependence on fossil fuels;
- We will ensure that economies of scale are considered in determining suitable waste management practices, having due regard for the geographical aspects of the Cayman Islands;
- We will pursue multi-sectorial collaborations and partnerships with various stakeholders to achieve our vision for waste management in the Cayman Islands;
- We believe in the enhancement of personal responsibility for waste management through advocacy, education, and the creation of opportunities to help realise the national vision for waste management; and
- We will ensure there is an appropriate legal, regulatory, and institutional framework, embracing good governance principles, to support achieving the national vision for waste management.

Strategic Directions and Associated Objectives

The strategic directions and associated objectives set out in the NSWMP are reproduced in Table 2.2 below.

Table 2.2 Strategic Directions and Objectives

Strategic Direction	Objective
1. Apply good governance principles to strengthen institutional capacity and leadership.	1.1. Establish enabling public health and waste management legislation, regulation, and enforcement. 1.2. Establish a framework to encourage multi-stakeholder collaboration.
2. Broaden the understanding of sustainable waste management issues and practices throughout the entire community of the Cayman Islands.	2.1. Institute a programme of awareness, promotion, education, and publicity in partnership with community groups, schools, and other organisations.
3. Manage waste in a manner protective of human health, the environment and local amenities.	3.1. Apply a process, based on recognised best practice, for the assessment and mitigation of health and environmental impacts of existing and proposed waste management practices. 3.2. Assess the capacity and develop a long-term management plans for each of the landfill sites, including measures to ensure that the sites do not pose an on-going risk to the environment or human health.
4. Reduce the proportion of solid waste being landfilled by diverting waste per the sustainable waste management hierarchy.	4.1. Implement and expand programmes to reduce, re-use, and recycle waste materials. 4.2. Promote the development of improved practices and facilities for solid waste management which are demonstrably consistent with the waste management hierarchy. 4.3. CIG will lead by example by examining how it purchases, uses, and manages materials, with the objective of reducing consumption and waste.
5. Implement a waste management system that is principally financed on the basis that the waste producer pays.	5.1. Evaluate and adjust the current financing framework for waste management to ensure that the waste producer pays proportionate to the waste that they generate. 5.2. Develop and implement initiatives to support waste segregation at the source, both households and businesses, for the purpose of reducing, reusing, and recycling.
6. Establish partnerships with community and business groups with a view to achieve the strategic directions for sustainable waste management in the Cayman Islands.	6.1. Promote multi-sectorial partnerships and collaboration for the integrated and efficient delivery of waste management services and programmes.

2.6 The Need for Change

The fundamental need to improve the systems and practices used for the management of solid waste in Cayman Islands is not driven by regulatory compliance but by an urgent recognition that these practices and systems are not sustainable, pose a potential threat the environment and local amenity, and do not make best use of a potential resource that could benefit the community of the Cayman Islands. The NSWMP for the Cayman Islands has been has been developed during the course of producing the NSWMS and recommendations have been provided in order strengthen the regulatory framework for future developments.

The key drivers underpinning the need for change can be summarised as follows:

- The landfills on the Cayman Islands are all aging facilities that have not been formally engineered to protect the environment or public health;
- Current existing waste management infrastructure cannot support the long term waste needs of the Cayman Islands;
- The landfill disposal solid waste is not a sustainable and modern practice as it wastes potentially valuable resources (e.g. recyclables) and produces adverse environmental impacts (e.g. odour) and emissions (e.g. the emission of methane which is a potent greenhouse gas). Landfill disposal is the lowest tier of the waste hierarchy;
- The main landfill located at George Town is the highest point on Grand Cayman and as an operational site it causes visual intrusion over a wide area and an adverse impact on the local amenity;
- At current rates of infill, George Town landfill has a limited remaining capacity and will be filled to completion within a relatively short period of time (approximately 5 to 6 years);
- Solid waste is being disposed of while it could be segregated and used productively to produce renewable energy (displacing reliance on imported fossil fuels), compost and soil conditioners (which are sparse on the islands) and reusable and recyclable materials;
- Residents of the Cayman Islands are generally not provided with good facilities, information and the services to promote the reuse, recycling and recovery of waste and to thereby divert it from landfill; and
- Population growth and the increasing quantities waste that are associated with is are not sustainable and will produce greater issues and problems in future if left unchecked and continues to be managed in the same way.

2.7 National Solid Waste Management Strategy (NSWMS)

The draft NSWMS was issued for public consultation on the 25 October 2015 with comment and input invited through letters, questionnaires and email response. In addition CIG convened “a drop in session” on each of the islands during the consultation period during which information boards were available for inspection and CIG personnel and its consultant were available to answer comments and queries from members of the public. The consultation period concluded on the 30th November 2015 and this produced an overwhelming endorsement of the NSWMS and proposed reference project. The results of the consultation are fully addressed in the consultation report[12].

Following consideration of the results of the consultation process and the consequent adoption and incorporation of post consultation amendments, the final NSWMS was published in the June 2016.

Scope

The development of the NSWMS encompassed the production of key policies and objectives for the future management of solid waste and the delivery of an ISWMS within the Cayman Islands. It also identified important steps and actions needed to deliver the ISWMS. These actions are specifically targeted to improve the sustainability of waste management practices, make increased use of waste as a resource and ensure the protection of the environment and amenity of the Cayman Islands.

Long and short listed options for change and improvement in the way that waste is managed on the islands were systematically appraised and examined to develop options for the delivery of the ISWMS. The scope of these options encompass wide range of service and delivery areas ranging from the strengthening of the existing regulatory regime, the provision of recycling systems and facilities and alternative methods of treating the residual waste that remains after recycling. The options covered:

[12] Amec Foster Wheeler (2016). National Solid Waste Management Strategy : Consultation Report

- The building of institutional regulatory capacity and systems;
- Methods for improving the sustainability of waste management practices;
- Improved waste communication at all levels within the Cayman Islands' communities;
- Waste education initiatives;
- Measures for waste reduction;
- Measures for improved waste re-use;
- Improved access recycling facilities;
- The increased reuse, recycling and compositing of waste;
- Organic waste treatment;
- The recovery of energy from residual waste;
- Reduced dependence on unsustainable and aged network of existing landfills;
- The integration of facilities and systems on all three islands;
- The promotion of the internationally recognised waste hierarchy;
- Enhanced protection of environment;
- Self-sufficiency as far as this is pragmatically deliverable; and
- The polluter pays principle.

Key Benefits

The potential key benefits arising from the NSWMS and the consequent delivery of the ISWMS (based on the reference project) would include:

- An enhanced regulatory framework for the monitoring and control of waste management activities and the protection of the environment;
- Enhanced sustainability and efficiency through use and recovery of limited resources for improved reuse recycling, composting and the production of energy;
- Improved public awareness and knowledge of the role they are required play in delivering a workable and new ISWMS and the facilities they can access to do so;
- The managed reduction in local and global environmental impacts as result of improved and sustainable waste management practices;
- A reduction in public health risks, nuisances and the impacts on amenity associated with the existing waste management system;
- Enhanced self-sufficiency and the resilience of the Cayman Islands to accommodate future population growth, increased tourism, natural disasters and demographic change;
- Opportunities for business and economic growth through investment in a new NSWMS, new partners and the improved integration of waste services delivered across all business sectors;
- Improved public relations and communications; and
- A modern, largely self-financing system of managing solid waste that is capable of meeting the Cayman Islands future long term requirements.

2.8 Key Risks

Key risks and threats to CIG for the successful delivery a working ISWMS are set out below. The potential impact, ownership and measures for migration of these risks is more thoroughly assessed in Section 5:

- Continued waste growth;
- Changing waste composition;
- Population growth and economic development;
- Financing and funding;
- Market risks;
- Planning and sites;
- The impacts of redundant waste management facilities (i.e. the existing landfills);
- Political Impacts;
- Social impacts;
- Natural disasters;
- Institutional capacity;
- Technical and delivery risks (e.g. waste composition, geographic barriers);
- Commercial and contractual risks;
- Project team; and
- Programme and timetable.

3. Waste Management Options (Economic Case)

This section explains how a long list of waste management options has been systematically appraised and a short list assessed to identify a realistic and achievable solution that meets the objectives, policies and success factors for the project. It describes how each of the short listed options perform on comparative basis in terms of monetary value, measurable and quantitative performance and the wider ranging delivery of policy and benefits.

3.1 Details of Long List Evaluation Criteria

In November 2014 a workshop was convened to develop a series of weighted evaluation criteria against which an initial long list of waste management options could be evaluated for potential consideration as part of the NSWMS. This workshop was attended by the CIG Officers from the Ministry of Health and Culture, Department of Environmental Health, Department of Environment, Public Works Department and the Water Authority, as well as by Amec Foster Wheeler project staff.

The agreed weighted criteria developed at the workshop are set out in Table 3.1.

Table 3.1 Weighted long list assessment criteria

Ref	Theme	Criteria	Weighting*
1a	Finance	Compatibility with PPP	1
1b	Finance	Revenue potential	3
1c	Finance	Whole Lifecycle Cost	4
1d	Finance	Short term cost/funding	3
2a	Environmental	Waste Hierarchy	4
2b	Environmental	Recycling potential	4
2c	Environmental	Carbon impact/greenhouse gas	1
2d	Environmental	Energy generation/green energy	3
2e	Environmental	Life cycle environmental impact	3
3a	Social	Employment	3
3b	Social	Training/Education	4
3c	Social	Public acceptability aesthetics	2
3d	Social	Political buy in	4
4a	Technical	Track record/Proven technology	4
4b	Technical	Simplicity	4

Ref	Theme	Criteria	Weighting*
4c	Technical	Applicability to island environment	2
4d	Technical	Market off takes	2
4e	Technical	Diversion of waste from landfill	4
5a	Sites	Planning/site assessment	4
5b	Sites	Integration across all islands	3
5c	Sites	Remediation of existing landfills	4

* The weightings applied to the criteria were as follows: 4 – Very important; 3 – Important; 2 – Moderate importance; and 1 – Lowest importance.

Amec Foster Wheeler compiled a draft list of waste management options to be evaluated against the long list evaluation criteria. This long list comprises viable and modern waste management options that have been deployed as part of waste management solutions elsewhere in North America and Europe.

The long list of options are shown in Table 3.2 grouped within several service delivery areas (including waste collection, recycling and waste treatment etc. The long list was issued to the workshop participants as part a long list options scoring worksheet.

Table 3.2 Long List of Waste Management Options

Option Ref	Service Area	Option Description
1	Collection	Recycling Depots/HWRCs
2	Collection	Segregate Dry Materials
3	Collection	Co-mingled Dry Materials
4	Collection	Segregated Garden
5	Collection	Segregated Food and Garden
6	Collection	Co-mingled Food and Garden
7	Collection	All in residual
8	Minimisation	Education
9	Minimisation	Returns schemes (e.g. bottles)
10	Minimisation	Home Composting
11	Reuse	Bulky waste reuse
12	Reuse	WEEE reuse
13	Reuse	Other reuse (e.g. nappies)
14	Recycling	Bulking Stations
15	Recycling	Clean MRF
16	Recycling	Dirty MRF
17	Recycling	Windrow

Option Ref	Service Area	Option Description
18	Recycling	IVC
19	Recycling	AD
20	Treatment	MBT stabilisation to Landfill
21	Treatment	MT/MBT SRF Export
22	Treatment	MT/MBT SRF ATT
23	Treatment	MT/MBT SRF WtE
24	Treatment	WtE
25	Disposal	Landfill

Table Key:

ATT _ Advanced Thermal Treatment (e.g. Gasification)

AD – Anaerobic Digestion

WtE – Waste to Energy

IVC – In Vessel Composting

HWRC - Household Waste Recycling Centre

MBT – Mechanical Biological Treatment

MRF – Materials Recovery Facility

MT – Mechanical Treatment

SRF- Solid Recovered Fuel

WEEE – Waste Electrical and Electronic Equipment.

3.2 Long List Options and Appraisal

Using the scoring mechanism shown in Table 3.3, workshop participants were asked to score each long list waste management option against each criterion and to enter these scores into the long list options scoring worksheet. Where a score of zero was applied this represented a “knockout” score within the scoring mechanism and resulted in the overall score for the option being assigned a zero.

Table 3.3 Evaluation Criteria Scoring

Score	Guide	Interpretation
0	Unacceptable option	A knockout score which means the option is fundamentally unacceptable & should not be pursued as part of the Waste Management Strategy
1	Incompatible with Criterion	The option does not contribute to the delivery of the criteria
2	Moderate compatibility with Criterion	The option performs moderately against the criteria
3	Compatible with Criterion	The option performs well against the criteria

Score	Guide	Interpretation
4	Highly compatible with criterion	The option performs very well against the criteria

The results from the longlist evaluation worksheets were collated by Amec Foster Wheeler to produce recommendations for the short listing of waste management options for detailed consideration as part of the development of the NSWMS.

Comparative Analysis

Process

In order to review the initial recommendations for the short listing of waste management options and examine their consistency with the NSWMP, Amec Foster Wheeler has undertaken comparative analysis of the long list waste management options evaluation undertaken; both before and after the consolidation of the results of the public consultation exercise on the NSWMP. This process comprised three stages;

- The vision, values, strategic directions and objectives set out in the NSWMP policy were mapped on to comparable long list evaluation criteria originally developed at the workshop. Where no comparable vision, values, strategic directions and objectives were identified, the relevant evaluation criterion was deleted; and
- The weightings applied to the individual criteria used in the initial long list evaluation were removed. This is because the vision, values, strategic directions and objectives in the NSWMP have no equivalent weighting.

The original scoring for each long list waste management option from the initial long list evaluation exercise was applied to the revised unweighted criteria to produce an updated set of scores.

The comparative results of the pre and post consultation long list evaluation process are shown in Table 3.4.

Table 3.4 Analysis results

Ref.	Category	Long List Option	Weighted Score	Rank	Unweighted Revised Score	Revised Rank	Rank Movement
1	Collection	Recycling depots/HWRCs	219	6	56	6	0
2	Collection	Segregate Dry Materials	190	18	49	18	0
3	Collection	Co-mingled Dry Materials	218	7	56	7	0
4	Collection	Segregated Garden	220	5	56	5	0
5	Collection	Segregated Food and Garden	209	13	54	13	0
6	Collection	Co-mingled Food and Garden	203	15	51	15	0
7	Collection	All in residual	184	22	48	22	0
8	Minimisation	Education	184	21	49	20	1
9	Minimisation	Returns scheme	213	11	54	12	-1
10	Minimisation	Home Composting	190	18	51	16	2
11	Reuse	Bulky	192	17	48	21	-4
12	Reuse	WEEE	196	16	49	19	-3
13	Reuse	Other	177	23	44	24	-1
14	Recycling	Bulking Stations	216	8	55	11	-3
15	Recycling	Clean MRF	208	14	53	14	0
16	Recycling	Dirty MRF	175	24	44	23	1
17	Recycling	Windrow	230	1	59	1	0
18	Recycling	IVC	215	9	55	9	0
19	Recycling	AD	226	3	58	3	0
20	Treatment	MBT stabilisation to Landfill	190	20	49	17	3
21	Treatment	MT/MBT SRF Export	214	10	55	8	2
22	Treatment	MT/MBT SRF ATT	210	12	55	10	2
23	Treatment	MT/MBT SRF WtE	223	4	57	4	0
24	Treatment	WtE	228	2	59	2	0
25	Disposal	Landfill	126	25	31	25	0

3.3 Short List Options

The long list evaluation process led to the following shortlist options being taken for more detailed evaluation. The options carried forward for short list appraisal and cost benefit analysis are shown in Table 3.5.

Table 3.5 Short list options

Short list Scenario/Option Components	Option/Component Description
1	Introduction of recycling depots and HWRC network to enhance the collection of segregated recyclables and garden waste.
2	The collection of co-mingled dry recyclables and processing of these materials in a clean MRF prior to market.
3	The collection of segregated garden/yard waste and windrow composting of the collected material.
4	The collection of segregated garden waste through and HWRC network and the windrow composting of the collected material.
5	The separate collection of food waste and use “wet” AD for treatment.
6	Waste education/return schemes, home composting.
7	Bulky Waste reuse, WEEE reuse, Other reuse.

Short list Scenario/Option Components	Option/Component Description
8	MT/MBT to produce SRF/RDF for export.
9	Advanced thermal treatment (pyrolysis/gasification).
10	MT/MBT to produce SRF/RDF for WtE.
11	Conventional WtE.
12	The “as is” waste management system/ Landfill.

Note: The residual waste treatment options shown as Options 8 to 11 are combined with other options higher in the waste management hierarchy (waste reductions and the collection of co-mingled recyclates) to produce the modelled ISWMS’s.

A detailed mass flow model was completed for each of the shortlisted options. The mass flow model allowed each option to be compared and key details such as size of facility, cost, material flows, recycling/ composting rates and recovery rates to be assessed. In addition to the mass flow model, a WRATE assessment was undertaken to assess the likely environmental impacts of each option. The Waste Resources Assessment Toolkit for the Environment (WRATE) is a lifecycle assessment (LCA) model has been developed by the UK Environment Agency (EA) to enable the modelling of the potential effects of current and future waste services and facilities on the environment.

The component options comprising the modelled ISWMS’s are shown in Table 3.6. It is assumed that all options would be implemented at the same time with the exception of the residual waste treatment – only one of these would be implemented.

The options shown in 3.6 have been assembled into a number of waste management scenarios representing the elements of an integrated waste management system.

Table 3.6 Options used in the Scenario Modelling

Community Sites	Recycling	Organic Waste Treatment	Minimisation and Reuse	Residual Treatment
1. Recycling Depots and Household Waste Recycling Centres (HWRC’s)	2. Clean Materials Recovery Facility (MRF)	3. Windrow composting from kerbside	6. Education and home composting	8. Mechanical Treatment (MT) making Solid Recovered Fuel (SRF) for export
		4. Windrow composting from HWRC	7. Bulky waste reuse	9. Advanced Thermal Treatment (ATT)
		5. Wet Anaerobic Digestion (AD)		10. MT making SRF for treatment in on – island Waste to Energy (WtE) Plant (CHP ready)
				11. Conventional WtE Plant (CHP ready)
				12. Landfill (as is scenario)

Common Elements

The scenarios modelled contain a number of common elements and these are described below in relation to the waste management hierarchy.

Waste Reduction

The importance of waste reduction measures as part of an integrated waste management system is highlighted by the compounded waste growth profile shown in section 1.3. This shows that under lying waste growth linked to population growth if left unchecked would result in a considerable increase in the tonnage of solid waste requiring management each year. This would have significant financial and environmental impacts.

A waste reduction function has been applied to the medium waste growth profile for all ISWMS scenarios. The waste reduction function has been applied at a rate of -1.0% per annum. The CIG will undertake waste education and pragmatic waste reduction initiatives to augment the physical management of solid waste in the Cayman Islands.

Waste Re-use

The waste minimisation function has been supplemented by a waste re-use function that has been applied across all of the modelled ISWMS scenarios. This has been applied at rate of -0.5% per annum and this reflects effort applied by CIG to actively divert materials (such as furniture, books and electrical goods) which are functional condition form waste disposal in to re-use applications. This rate is comparable with residual waste re-use schemes observed in the UK at HWRC sites.

The CIG will promote pragmatic and practical reuse measures by providing for the separation of re-useable waste at future waste management facilities (e.g. at Household Waste Recycling Centres) and promoting engagement with community and third sector organisations to reuse waste such furniture and paints.

Recycling and Composting

The CIG is committed to providing increased access to recycling facilities for the residents of the Cayman Islands. In the short term this is likely to be achieved through the provision of community recycling facilities comprising;

- A recycling depots network located in supermarket car parks and similar accessible locations; and
- A refurbished and upgraded drop off facility at the George Town landfill to provide a Household Waste Recycling Centre (HWRC) supplemented by an additional new HWRC for Grand Cayman, Cayman Brac and Little Cayman. These sites will be important for the reception of segregated waste fractions such as yard waste.

Kerbside collection of other waste fractions such as mixed dry recyclables and green/yard waste will provide enhanced rates of recycling and could be introduced at a later date. However this will be dependent on the new facilities being available to receive and process the collected fractions.

The recycling of construction and demolition (C&D) wastes has been assumed in all ISWMS scenarios modelled. This can be readily achieved through the use of mobile crushing and screening equipment of the landfills. The resultant graded aggregate can then be used in construction and highways projects. It has been assumed that the recycling of C&D Waste gradually rises from 10% to 50% by 2027/28.

Large quantities of separated yard waste are currently being delivered into the Cayman Island landfills located on Grand Cayman and Cayman Brac. These tonnages can potentially be treated by relatively simple windrow composting technology to produce a beneficial compost or soil conditioner. This has been assumed across all of the waste management scenarios with a windrow plant located on Grand Cayman; augmented with a smaller facility on Cayman Brac.

Waste Recovery

A residual waste recovery facility has been assumed for each waste management scenario with the exception of the landfill baseline. These recovery technologies are different for each modelled ISWMS scenario. Those scenarios that have CHP, have been modelled as CHP ready facilities only and do not include financial provision for a heat distribution network as this will be largely determined by location and site specific factors. However the lifecycle (WRATE) modelling included the environmental benefits that an

operating WtE CHP facility would deliver to demonstrate the positive environmental effects of this technology.

Disposal

The landfill disposal of waste that cannot be recycled or recovered and process residues (such air pollution control residues from a waste recovery plant) will be required for all ISWMS scenarios. However the capital and operating costs associated with this function was not included in the comparative ISWMS cost estimates for the Economic Case (this Section 3) as these are similar for all scenarios. Landfill capital and operating costs have however been included for the Reference Project in the Financial Case (Section 8).

At current rates of infill it is expected that the George Town landfill will be full in year 2021/22, however this could be extended by the early diversion of waste in to recycling and composting and potentially by landfill mining[13]. The anticipated cost of providing an alternative landfill would be expected to be approximately US$24/t of capacity provided as a capital cost and with an operational cost of US$1.7 per annum.

It is assumed across all scenarios that the existing landfills on Cayman Brac and Little Cayman will close when the transfer and treatment facilities become available on these islands.

Other Common Elements

Three waste transfer stations have also been modelled for each ISWMS scenario, one for each island. The majority of the waste collected on the sister islands can be transferred to Grand Cayman for treatment or for bulk haulage to off-island treatment/ markets. It is assumed that the waste transferred from the sister islands will be transported to the relevant waste management facilities on Grand Cayman. The third waste transfer station is on Grand Cayman and will be used for the import of waste from Cayman Brac and Little Cayman, the bulking of recyclates and for waste requiring export (e.g. derelict vehicles, gas canisters and chemicals).

For several ISWMS options that involve the collection of segregated fractions of kerbside collected waste (i.e. the source separation of dry recyclable, and/or food waste from residual waste) it has been assumed that as far as practicable this would be achieved using the existing waste collection resources and vehicles by altering operational practices and collection frequencies. This should enable one segregated fraction to be collected along with residual waste collected on weekly basis. The expansion of a kerbside collection system beyond this could be achieved by the lifecycle replacement of the existing refuse collection fleet with more flexible multi-compartment vehicles.

Table 3.7 Scenario make up

Scenario A	Scenario B	Scenario C	Scenario D
Mechanical Treatment (MT) making Solid Recovered Fuel (SRF) for export	**ATT**	**MT making SRF for treatment in on – island Waste to Energy (WtE) Plant (CHP ready)**	**Conventional WtE Plant (CHP ready)**
HWRC and Recycling Depots	HWRC and Recycling Depots	HWRC and Recycling Depots	HWRC and Recycling Depots
Materials Recovery Facility	Materials Recovery Facility	Materials Recovery Facility	Materials Recovery Facility
Windrow Grand Cayman	Windrow Grand Cayman	Windrow Grand Cayman	Windrow Grand Cayman
Windrow Cayman Brac	Windrow Cayman Brac	Windrow Cayman Brac	Windrow Cayman Brac
Anaerobic Digestion	Anaerobic Digestion	Anaerobic Digestion	Anaerobic Digestion
Waste Transfer Stations on all islands	Waste Transfer Stations on all islands	Waste Transfer Stations on all islands	Waste Transfer Stations on all islands

[13] Landfill mining would involve the excavation of deposited waste from the landfill and treatment and diversion of this material through other waste management processes

The Do Nothing Option (continued landfill at the existing sites)

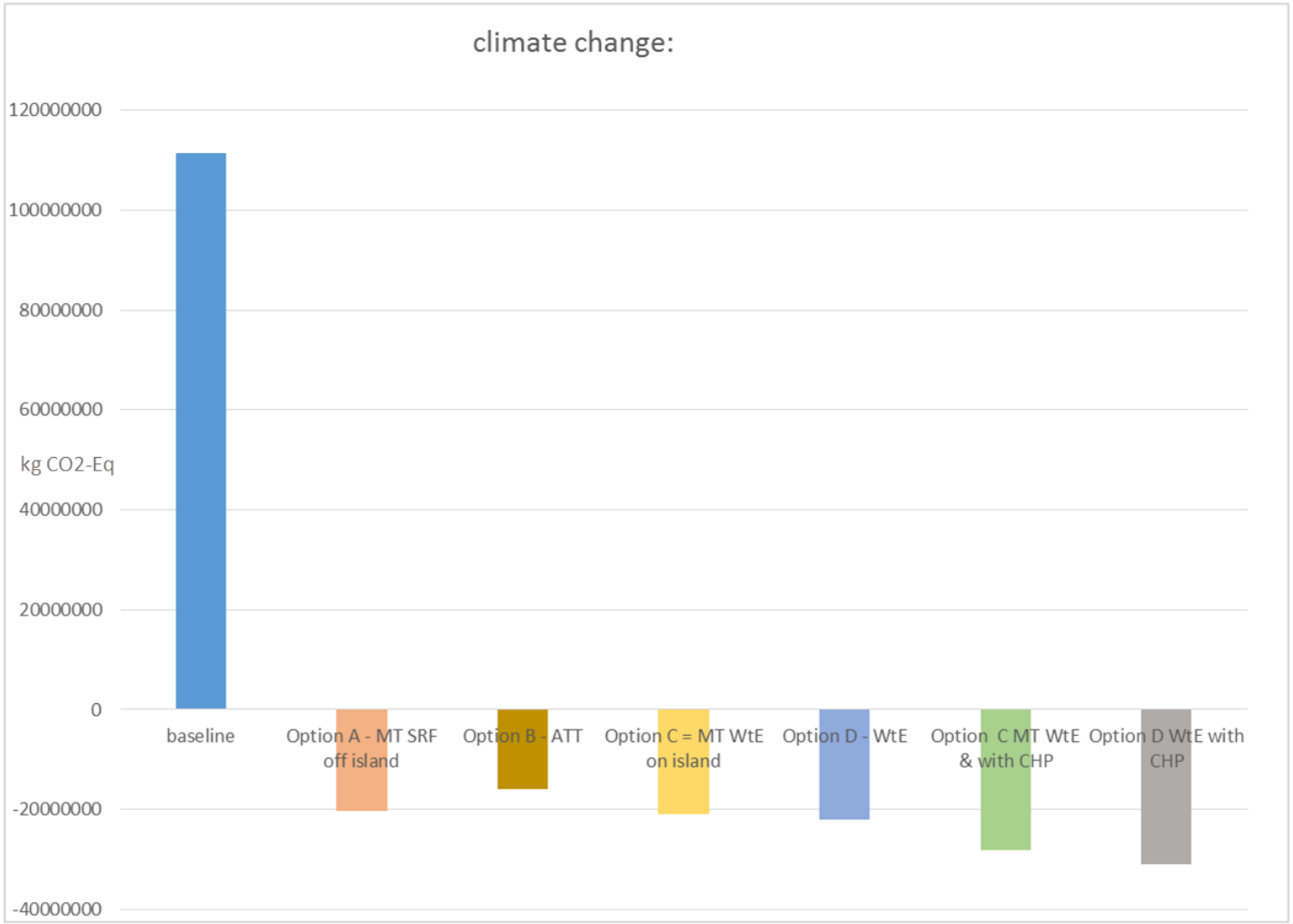
From both a practical and pragmatic perspective there is no “do nothing option” for the Cayman Islands. The waste management system cannot continue to rely on the existing landfill facilities for the disposal of solid waste. This is most acute for Grand Cayman where the landfill site at George Town is almost full. As a consequence, an economic case for a “do nothing” option is neither realistic nor deliverable in practice, as are any associated design or cost estimations for such a scenario.

The current reliance on three existing, unengineered and aged landfills will cease when the remaining void capacity is filled. For the largest landfill facility located at George Town, which currently serves the waste management requirements of Grand Cayman, the predicted completion of the site will be in approximately 5 years at the current rate of in fill. The much smaller landfill sites located on Cayman Brac and Little Cayman could have lifespans which extend for a longer period but these facilities are totally suited to delivering modern standards of waste management and the protection of human health and environment.

The nearest approximation to a “do nothing option” would be the construction and operation of a new fully engineered containment landfill for the receipt of all solid waste on Grand Cayman and Cayman Brac (the latter also serving the needs of Little Cayman) . This alternative is consistent with the landfill option considered as part of the options appraisal process undertaken for the production of the NSWMS. As described in Section 3.2 above, the landfill option (reference 25 in Table 3.4) was overwhelmingly scored as the lowest ranking waste management option of all the options assessed in the appraisal process. Furthermore, the option was highly incompatible with the vision, value and strategic objectives set out in the NSWMP. As a consequence, the landfill option was not considered further as a viable strategic option for the Cayman Islands as part of the NSWMS.

The lifecycle and environmental impact of the continued landfilling of solid waste has been modelled using WRATE to provide a comparative baseline against which the short listed ISWMS scenarios within the NSWMS were assessed. The results of this process are described in Section 3.5 (and summarised in Table 3.11). These show that the continued landfilling of solid waste has by far the most adverse impact upon the environment and is the least sustainable waste management option of those assessed across all six environmental and lifecycle indicators employed. This is effectively illustrated by the Climate Change Indictor for the landfill option shown as the “baseline” in Figure 3.1.

Figure 3.1: Combined Scenarios – Climate Change Impact (kg CO2-Eq)



This indicates that the continued landfilling of solid waste will result in an adverse contribution to global warming and as a consequence, to a rising sea level. By comparison, all of the other short listed waste management options considered in the NSWMS result in a net reduction in global warming. Placing this in context and considering the low lying disposition of the Cayman Islands, the continued landfilling of solid waste would appear to be inconsistent with protecting the local environment and amenity of the Cayman Islands over the long term.

The continued landfill option is not considered further in this OBC.

The landfill remediation cost estimate included within the Financial Case (section 8) of this OBC encompasses provision for the capture and control of landfill gas (the emission responsible for the contribution by landfills to global warming). For George Town landfill this also encompasses the utilisation of landfill gas to produce local electricity. As a consequence, the remediation of the landfills will result in a net reduction in their collective contribution to global warming and sea level rise.

3.4 Economic Appraisal of Costs

Financial Assumptions

The financial modelling undertaken for the Economic Case (Section 3) explores both the capital costs (CapEx) associated with the construction of the facilities, and the ongoing operational costs (OpEx) of the facilities (including maintenance costs and any income revenue from the sale of power). These have been used to provide a comparative analysis of the economic performance of each modelled ISWMS scenario. A full Net Present Value (NPV) model has not been developed by KPMG for each of the scenario's considered in the Economic Case. This was viewed as unnecessary and inconsistent with the prudent use of resources. This is because each of the scenarios considered was largely comparable in both structure and performance, varying primarily in terms of the type of residual waste treatment plant deployed. As a consequence, differences in baseline CapEx and OpEx of each scenario were considered sufficient to discriminate between the alternative scenarios for the purpose of the Economic Case. An NPV based comparison would not result in an alternative outcome.

A "do nothing option" has not been included within the Economic Case. This is because a "do nothing option" is neither realistic nor deliverable for the Cayman Islands as described in Section 3.3. Furthermore, the lack of a feasible design basis for the continued landfilling of solid waste within the existing landfills prevents the development a cost estimate and economic case for such a scenario.

The development of the capital and operating (revenue) cost models was based on the application of a number of assumptions. These assumptions were drawn from a number of previous projects Amec Foster Wheeler has worked on as Technical Adviser and the assumptions are summarised in Table 3.8.

The average order of costs presented in this section are based on 'order of magnitude costs' which have been sourced from Amec Foster Wheeler's internal database. These costs have been compiled from various sources, including recent waste procurement projects (Private Finance Projects (PFI) and Public Private Partnership (PPP) projects at various stages in the bidding process), information from technology suppliers and published literature. All capital and operating costs are best estimates at this time based on knowledge of similar schemes in the UK. The costs are accurate to +/- 50% as many unknowns remain (e.g. site locations, ground conditions, material import costs etc.).

The cost estimates used for the Economic Case (this Section 3) were developed in accordance with the UK Institution of Chemical Engineers (IChemE) classification for cost estimation to the classification of E. This classification has been selected as the most appropriate for the cost estimation for the each ISWMS scenario at this OBC stage.

Cost estimation can be undertaken using a variety of methods and formats by Amec Foster Wheeler quantity surveyors and estimators. The UK IChemE has a formal but useful structure with 5 "classes" of estimate, and these have been adopted for general use by Amec Foster Wheeler on similar projects.

The accuracy of cost estimates at various stages of a project is a function of the information that is known at that particular stage. With a greater level of site and design information available, the greater the opportunity

to prepare a higher accuracy or class of estimate. However the associated preparation time and cost associated with the more precise cost estimate is also higher.

Listed in Tables 3.8 and 3.9 are the IChemE Classes of cost estimate, with some of the alternative terms used to describe the various classes. This is not an exhaustive list and there are no precise boundaries between the Classes. In absence of site specific, geotechnical and land condition information, neutral ground conditions have been assumed for the purpose of the cost estimation process. A definitive site(s) for the development of ISWMS facilities is to be determined (please refer to Section 7) and the assumption of neutral conditions is therefore considered appropriate and this is reflected in the accuracy applied to the strategic cost estimates in this OBC.

Table 3.8 IChemE Capex Classes Typical Accuracy

Class	Terminology	Typical Accuracy
E	Order of Magnitude, feasibility.	+/- 30% to 50%
D	Predesign or Inception, Rough Order	+/- 20% to 30%
C	Preliminary, Evaluation, Conceptual	+/- 10% to 25%
B	Definite, Control, Sanction, Pretender	+/- 5% to 15%
A	Detailed, Tender, Contractors	+/- 2% to 5%

It should be noted that a 100% accurate cost estimate is never achievable, even at tender stage as other external factors will affect actual tendered prices (e.g. market conditions, tendering procedure, risk allocation, insurance requirements). For the purpose of this report the cost estimates are at the upper boundary of class E.

Table 3.9 IChemE Capex Classes of Estimate

Class	Terminology	Alternative terms	Purpose of Estimate	Design Information available	Estimating methods
E	Order of Magnitude or Strategic Estimate	Inception, Feasibility	To indicate approx. level of expenditure for a given design solution. Assists in very broad business investment decisions.	Works capacity, population size, building area.	Unit cost (e.g. £/unit basis) Cost curves,) Gross (overall) proportion based on historic data for similar schemes adjusted for differences in location, execution, escalation and size.
D	Study Estimate	Option Study	Assist in evaluation of options and decisions to proceed with investments. Primarily interested in delta costs between options.	Basic Process Design (PFD, mass balance, process control philosophy).	Factored or Semi-detailed based on pro-rata methods or approx. quantities and in-house rates to estimate main individual elements and historic Approx. quantities, equipment schedule, factoring to cover the balance.
C	Preliminary Estimate	Conceptual	Confirm design and costs are still within budget. Investigate / incorporate residual issues from previous stages.	PFD Approved, P&ID's, Equipment Spec, Geotechnical surveys, Approximate quantities.	Similar to study estimate but estimate for main individual items to be backed up by Budget quotes.
B	Definite Estimate	Pre-Tender	Client Sanction and provides the cost plan against which individual orders and all project expenditure will be monitored Assists in Tender evaluation, change control and is a basis for forecasting project outcome.	P&ID's, building layouts, particular spec's, geotechnical surveys, contract drawings, equipment list etc. and all other drawings used to define the project.	Fully detailed estimate requiring a full parts and materials take off from complete "Approved for Estimating" design package. Quotes and current contract rates to be used wherever possible. Use of historic In-house rates to be minimised.
A	Final Cost Estimate	Tender	Contract Award.	As above.	Priced Bills of quantity. Firm orders, Contracts and sub-contract prices.

Capital expenditure (termed 'CapEx') includes all costs associated with the delivery of the required infrastructure. This includes the design, preparation, management and construction costs for the delivery of each facility. Design and management costs include professional fees (e.g. planning, permitting, architectural and engineering fees) together with a design or project manager to co-ordinate design requirements and construction. Construction costs include the supply of labour, materials and equipment (sometimes referred to as 'plant' costs) together with preliminaries such as site supervision, temporary accommodation. Electrical grid connection costs are not included as these will be site specific.

The on-going operational expenditure (termed 'OpEx') include all fixed and variable annual costs, including staffing, maintenance, utility costs, licensing, and fuel. Lifecycle costs reflect the need to periodically replace elements of equipment and plant during the operational lifespan of facilities.

Actual costs will vary according to the method of procurement, market conditions and risk profile adopted. Movement in foreign exchange rates can also significantly affect actual costs, depending on the country of origin for major equipment items.

The CapEx estimates for the Combined Heat and Power Options for WtE and ATT options assume that the relevant facilities are CHP enabled (ready). This means that they are equipped with suitable turbines and

valves to facilitate the off take of steam (for cooling systems or desalination systems. The CapEx does not include provision for a heat distribution network as this will depend of the location of the facilities and the requirements of the off take markets.

Table 3.10 Financial Assumptions

Option	Annual Design Capacity (US tons)	CapEx (CI$/ ton of annual design capacity)	OpEx (CI$/ ton throughput)	Lifecycle replacement costs (% of OpEx or CI$/ ton throughput)
WtE power only	50,829	1,214	58	CI$4
WtECHP (ready)	50,829	1,214	58	CI$4
ATT power only	50,829	1,173	31	CI$18
ATT CHP (ready)	50,829	1,173	31	CI$18
MT	50,829	229	25	CI$9
SRF treatment on island	40,663	1,401	38	CI$22
SRF Treatment off island	40,663	94.50 Gate Fee		
AD	2,300	1,041	105	2.5%
Windrow Composting				
Grand Cayman	34,851	57	17	2%
Cayman Brac	582	152	29	3%
MRF	13,900	338	25	4%
Waste Transfer Station				
Grand Cayman	8,202	114	11	3%
Cayman Brac	3,595	137	14	4%
Little Cayman	250	183	23	4%
Recycling Depots		228,564 (Estimated Total costs)	57,141	1.0%

Additional assumptions

Costs were converted from metric tonnes in UK sterling to short tons and Cayman Island dollars. The following assumptions were used:

- 1 short ton = 0.907 metric tonnes; and
- £1 = CI$1.26[14].

[14] Note that this exchange rate dropped in late June 2016 and in September 2016 was £1 to CI$ 1.09.

General assumptions used in the cost modelling

- All solid waste is managed on the Cayman Islands unless otherwise stated (i.e. bulked for off-island transport or SRF treatment off-island);
- No income is assumed for recyclables (this a conservative position of recyclable income). Wherever possible the use of local markets for recycled materials and compost will be encouraged;
- All waste is reported in short tons; and
- All costs are reported in CI $.

Estimated Costs and Exclusions

As part of the Economic Case (Section 3), the costs estimates for each of the modelled ISWMS options provide a comparative analysis of the baseline CapEx and OpEx for each solution on a nominal basis. These estimates have an accuracy of +/- 50% reflect the lack of detail concerning site and project specific circumstances (e.g. land and remediation costs, site abnormals etc.) at this OBC stage.

The strategic cost estimates used in the comparative assessment of the ISWMS scenarios used for the Economic Case (this Section 3) do not constitute a full Net Present Value (NPV) financial assessment. The NPV model for the Reference Project is presented in the Financial Case (Section 8).

There are a number of costs that will be the same for all the options and so have not been included for the comparison of the options for the Economic Case (Section 3). These elements have been addressed and included in the Financial Case (Section 8) for the Reference Project. . The costs excluded from the comparative ISWMS modelling for the Economic Case:

- Any additional collection of waste and associated costs (i.e. vehicles, staff);
- Business rates;
- Import duties;
- Interest charges;
- Depreciation of assets and residual value;
- Inflation;
- Procurement costs;
- Insurance payments; and
- Profit margins.

The Results of the Comparative Economic Cost Estimation

Figures 3.2 and 3.3 below provide the gross cost comparison of each of the scenarios. The error bars represent the level of confidence in the figures (i.e. 50%). These estimates represent costs over 25 years, as this is the general industry standard accepted life of waste facilities. Furthermore, it is highly unlikely that CIG would place a 50 year waste management contract which included the full lifecycle replacement of the facilities at year 25, as this would be unlikely to provide best value or the best available technologies at that time.

Figure 3.2 Comparative summary of overall baseline costs for each scenario

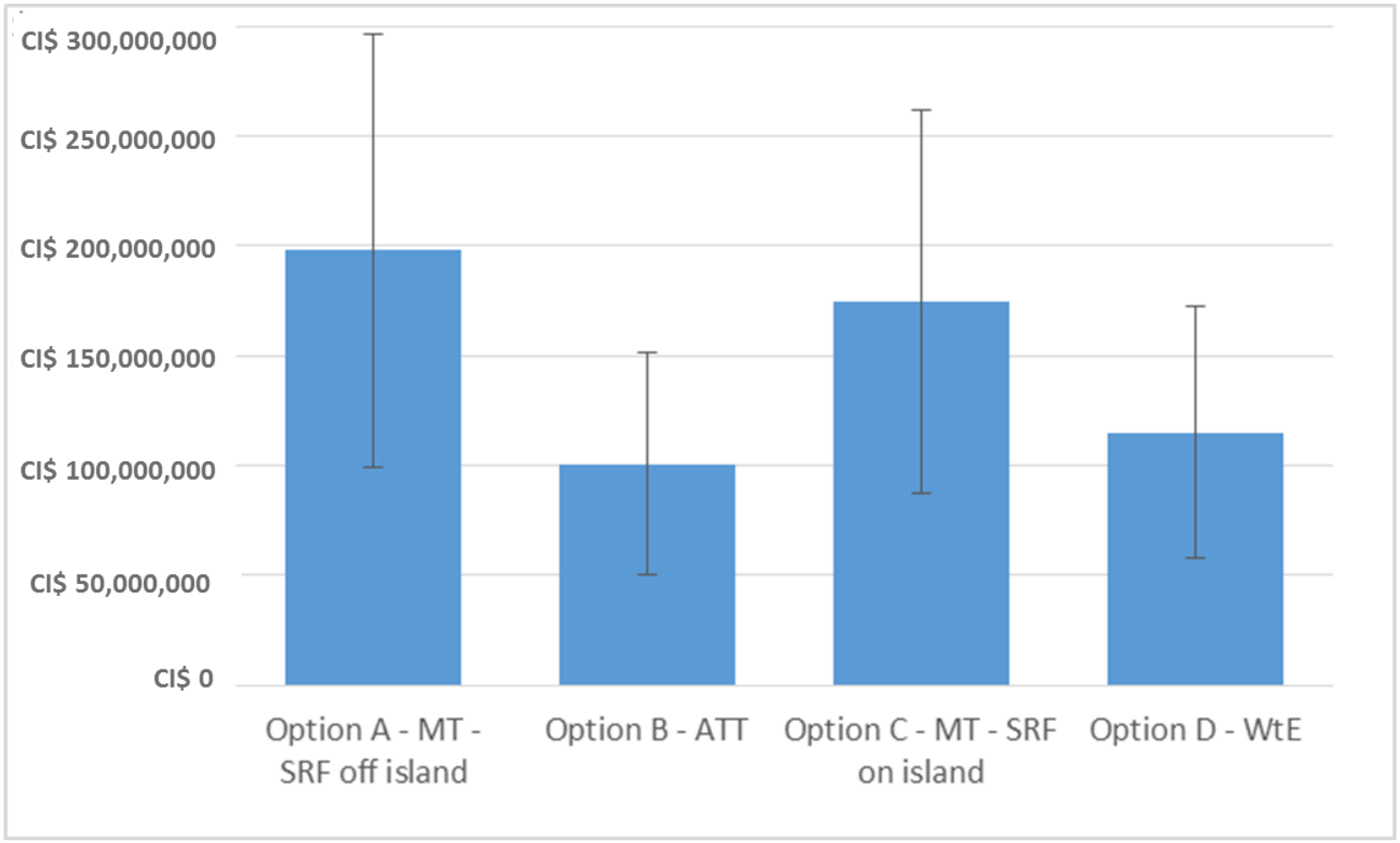
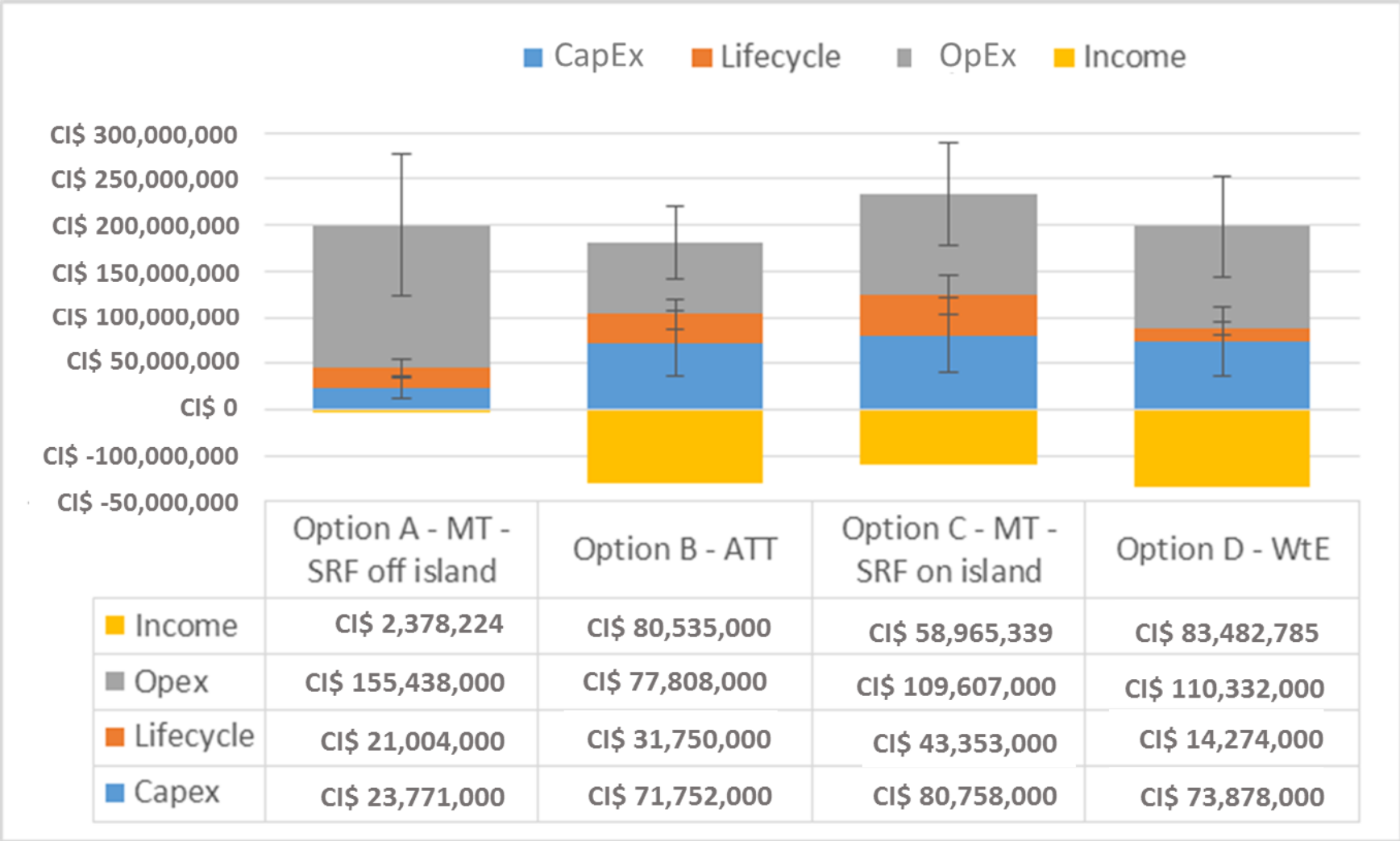


Figure 3.3 Summary of baseline costs of each option group broken down to elements



	Option A - MT - SRF off island	Option B - ATT	Option C - MT - SRF on island	Option D - WtE
Income	CI$ 2,378,224	CI$ 80,535,000	CI$ 58,965,339	CI$ 83,482,785
Opex	CI$ 155,438,000	CI$ 77,808,000	CI$ 109,607,000	CI$ 110,332,000
Lifecycle	CI$ 21,004,000	CI$ 31,750,000	CI$ 43,353,000	CI$ 14,274,000
Capex	CI$ 23,771,000	CI$ 71,752,000	CI$ 80,758,000	CI$ 73,878,000

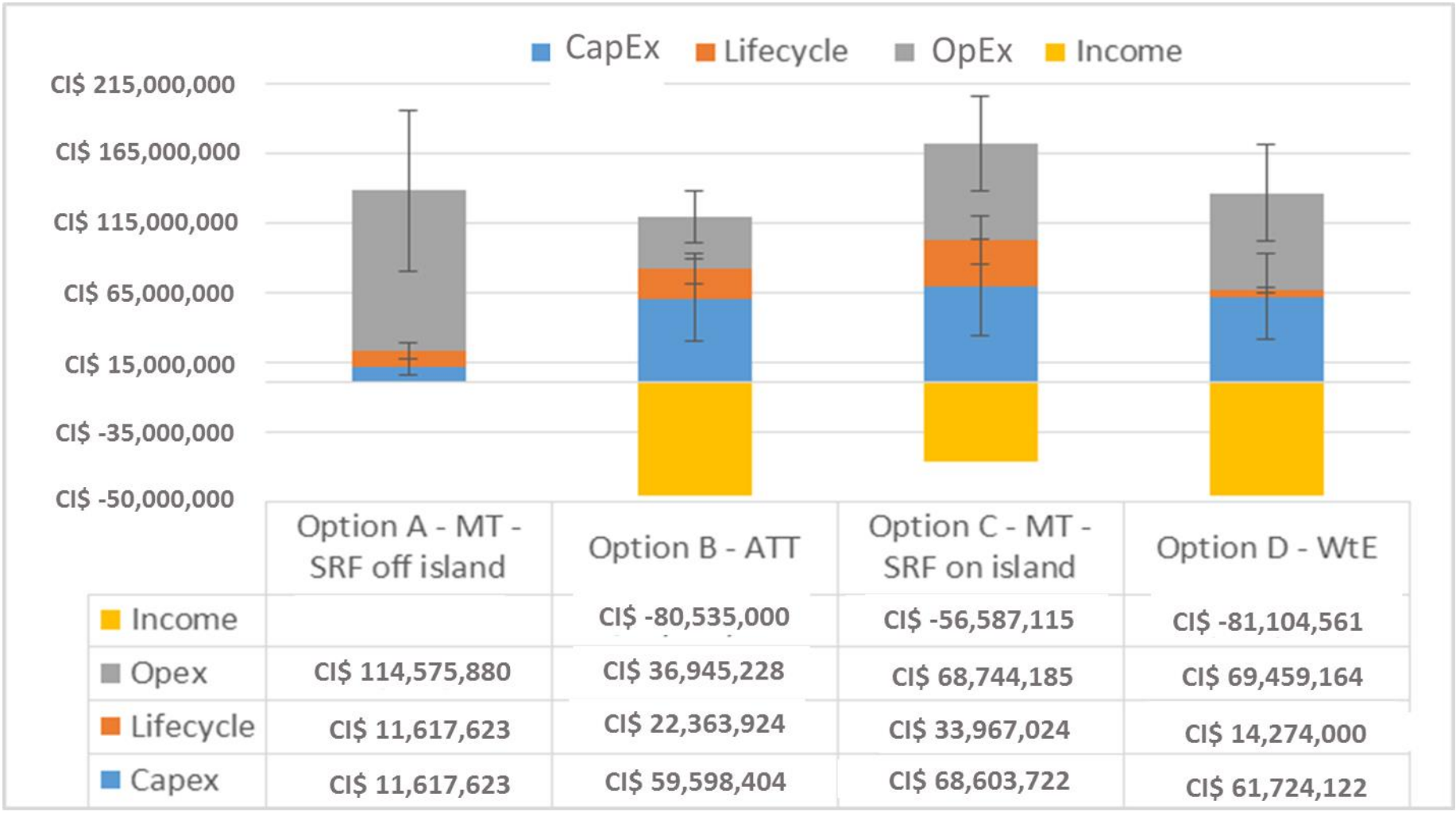
For the overall costs of each scenario, income comes from electricity sales from the AD facility and the thermal treatment facilities. No sales from heat have been included (CHP option).

Figure 3.4 shows the cost of each of the residual waste treatment options associated with each scenario.

There is no income for the residual treatment in option A; as the solid recovered fuel (SRF) would be taken off-island and the electricity generated would be used by users local to the off take facility.

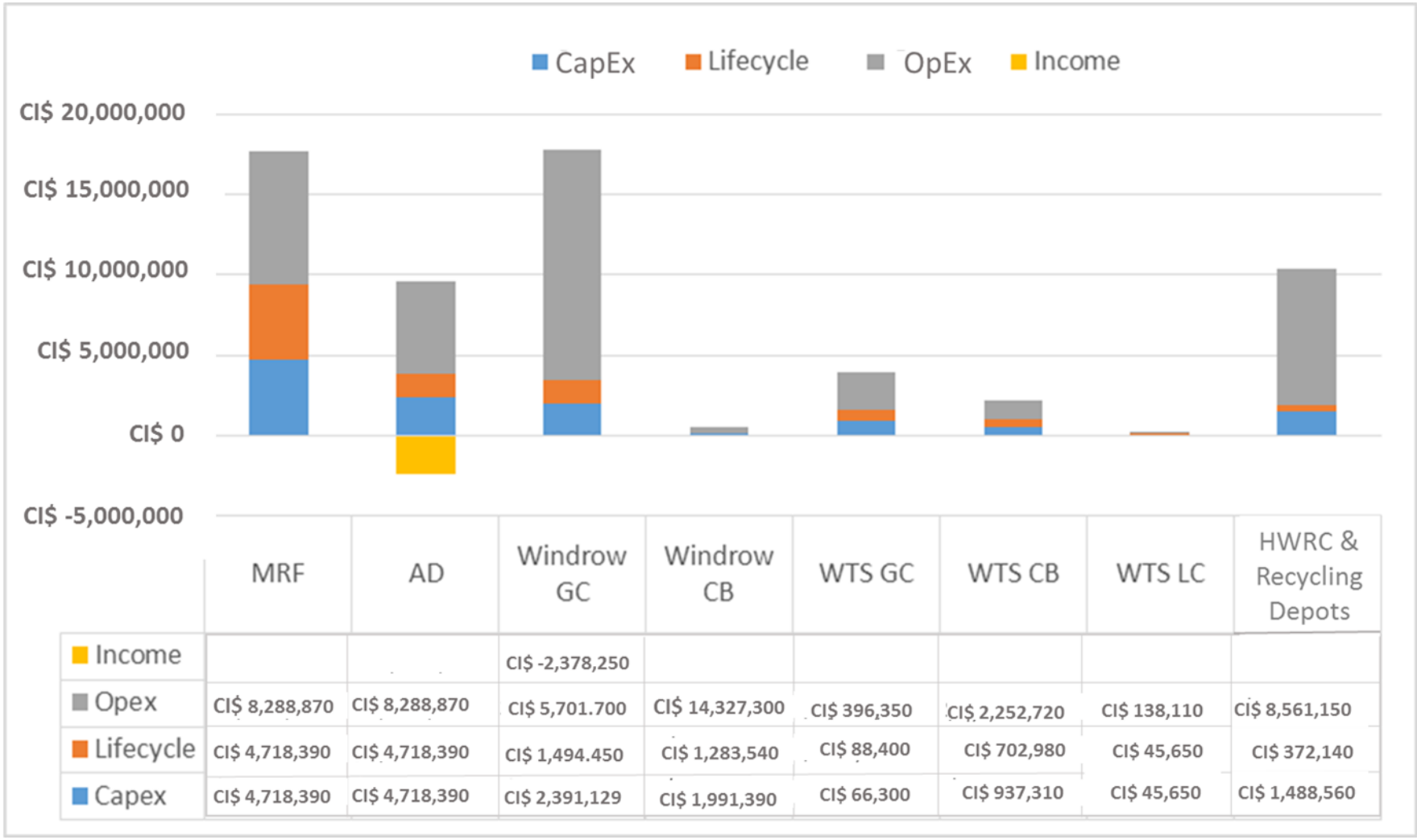
Figure 3.5 shows the costs associated with each of the other facilities that are included with all of the four options as shown in Figures 3.2 and 3.3. For a conservative position no income has been assumed for the sale of dry recyclates; as this will be subject to prevailing market conditions.

Figure 3.4 Residual waste treatment option cost breakdown comparisons



	Option A - MT - SRF off island	Option B - ATT	Option C - MT - SRF on island	Option D - WtE
Income		CI$ -80,535,000	CI$ -56,587,115	CI$ -81,104,561
Opex	CI$ 114,575,880	CI$ 36,945,228	CI$ 68,744,185	CI$ 69,459,164
Lifecycle	CI$ 11,617,623	CI$ 22,363,924	CI$ 33,967,024	CI$ 14,274,000
Capex	CI$ 11,617,623	CI$ 59,598,404	CI$ 68,603,722	CI$ 61,724,122

Figure 3.5 Other facility cost breakdown comparisons



	MRF	AD	Windrow GC	Windrow CB	WTS GC	WTS CB	WTS LC	HWRC & Recycling Depots
Income			CI$ -2,378,250					
Opex	CI$ 8,288,870	CI$ 8,288,870	CI$ 5,701.700	CI$ 14,327,300	CI$ 396,350	CI$ 2,252,720	CI$ 138,110	CI$ 8,561,150
Lifecycle	CI$ 4,718,390	CI$ 4,718,390	CI$ 1,494.450	CI$ 1,283,540	CI$ 88,400	CI$ 702,980	CI$ 45,650	CI$ 372,140
Capex	CI$ 4,718,390	CI$ 4,718,390	CI$ 2,391,129	CI$ 1,991,390	CI$ 66,300	CI$ 937,310	CI$ 45,650	CI$ 1,488,560

3.5 Lifecycle and Performance Benefits

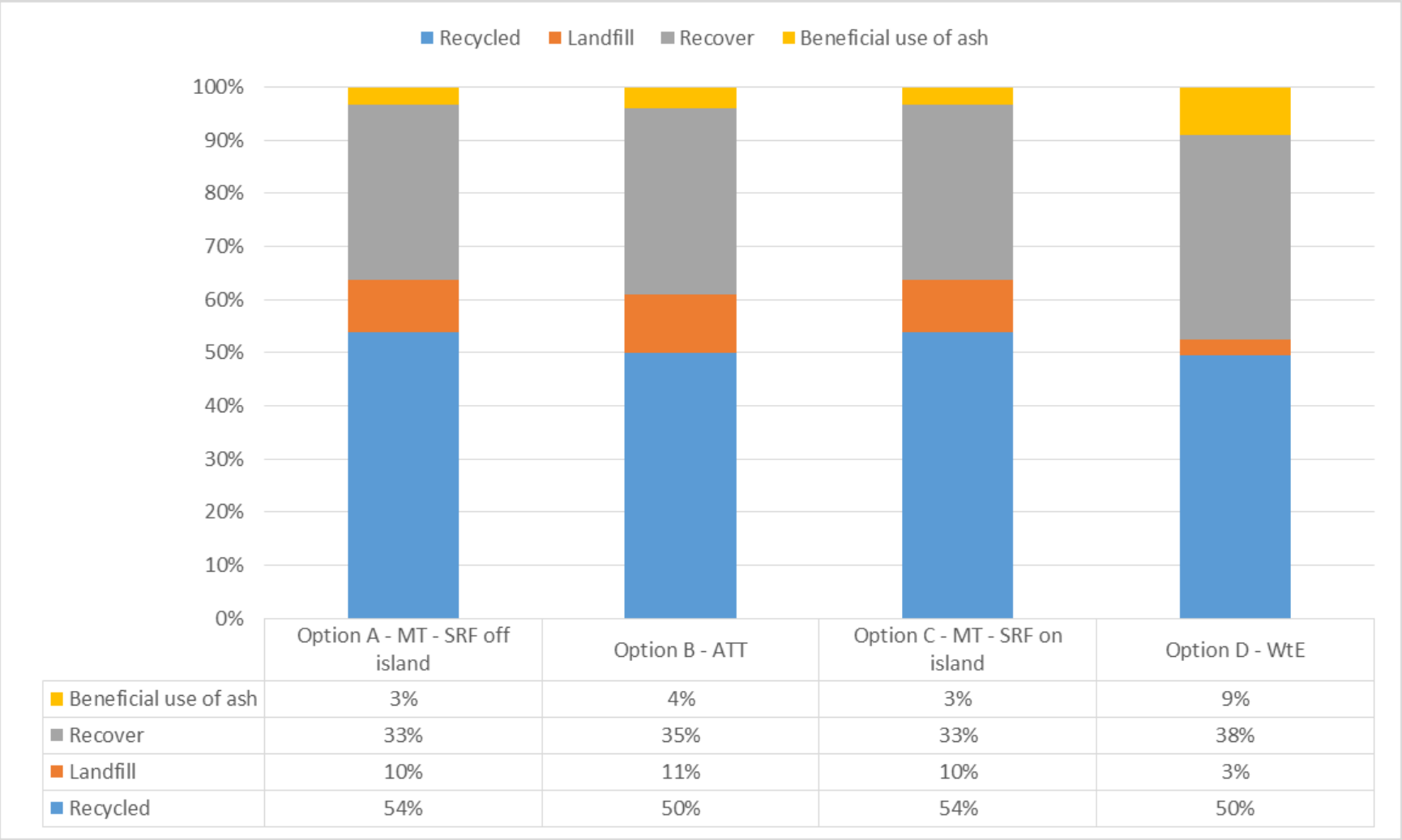
Operational performance

Figure 3.6 shows the operational performance of the four scenarios in terms of recycling, composting and recovery. This is presented over the 45 years, assuming the strategy is for 50 years and facilities are actually implemented after 5 years. The performance is shown in percentage terms, and views the whole waste lifecycle from cradle to grave looking at waste sent to recovery as well as any resultant ash being beneficially used or sent to landfill. The performance also includes the non-residual treatment facilities, but as these are all the same for each option, and any difference can be attributed to the residual waste treatment processes.

If the options were not implemented, there would be little opportunity to increase operational performance beyond the existing performance.

Generally the WtE option sends less waste to landfill; as more of its ash can be used beneficially and the process is more resistant to the nature of the input waste, so there are less pre-treatment rejects.

Figure 3.6 Environmental performance of the grouped options.



	Option A - MT - SRF off island	Option B - ATT	Option C - MT - SRF on island	Option D - WtE
Beneficial use of ash	3%	4%	3%	9%
Recover	33%	35%	33%	38%
Landfill	10%	11%	10%	3%
Recycled	54%	50%	54%	50%

Environmental and Lifecycle Assessment (LCA)

The environmental and lifecycle assessment of shortlisted options has been carried using the Waste Resources Assessment Toolkit for the Environment (WRATE). The model has been developed by the UK Environment Agency (EA) to enable the modelling of the potential effects of current and future waste services and facilities on the environment. As an LCA tool WRATE considers the impact of solid waste from the point of collection through to either the point of final disposal or the point whereby the waste has been processed into a material available for use again within the materials chain.

Default Impacts

WRATE measures the potential impact on the environment through six parameters or default impacts:

- **Abiotic Resource Depletion (kg antimony equivalent)** – Use of non-renewable and renewable resources. Abiotic resources are non-living things, including land, water, air and minerals;
- **Global Warming Potential (kg carbon dioxide equivalent)** – Measure of what mass of Greenhouse Gases are estimated to contribute to global warming, a relative scale that compares emissions to Carbon Dioxide;
- **Human Toxicity (kg 1,4-dichlorobenzene equivalent)** – This covers a number of different effects: acute toxicity, irritation/corrosive effects, allergenic effects, irreversible damage/organ damage, genotoxicity, carcinogenic effects, toxicity to reproductive system/teratogenic effects, and neurotoxicity. The equivalence factors are determined for emission to different compartments: air, water, and soil and exposure via different media: air water, and soil;
- **Freshwater Aquatic Ecotoxicity (kg 1,4-dichlorobenze equivalent)** – Toxicity towards ecosystems can be regarded as either chronic (causing long lasting illness) or acute (short term/ immediate effects);
- **Acidification (kg Sulphur Dioxide equivalent)** – Emissions of acidifying compounds such as sulphur dioxide and nitrous oxides attack leaves and acidify the soil which can result to changes in the ecosystem; and
- **Eutrophication (kg Phosphate equivalent)** - is caused by the increase of chemical nutrients, typically compounds containing nitrogen or phosphorus.

Modelling Assumptions

WRATE models require information on the year of the study (to inform the energy mix used in the calculations), the waste tonnages; composition and the types of processes to be used as a minimum. WRATE includes a range of standard processes which have been developed through information obtained by the UK Environment Agency's Waste Technology Data Centre and the modelled short list options were based on one of these technologies with certain elements adjusted to reflect the specific technology.

Short List modelling Results

The short list options were combined to generate a matrix of waste management options for input in to WRATE software. In addition the existing baseline waste management system has been modelled for comparative analysis. In total. this produced 33 different combinations of options that were modelled and each of these contained a number of stream that are collected, recycling and organic waste treatment and a residual waste treatment and disposal method.

The results of the WRATE analysis are shown in Table 3.11. In summary all of the proposed short list options/ scenarios have a significantly improved lifecycle/environmental impact over the existing baseline.

Table 3.11 Summary of Characterised Environmental Impacts

Impact Assessments	climate change: GWP 100a	acidification potential: average European	eutrophication potential: generic	freshwater aquatic ecotoxicity: FAETP infinite	human toxicity: HTP infinite	resources: depletion of abiotic resources
Scenario	**kg CO2-Eq**	**kg SO2-Eq**	**kg PO4-Eq**	**kg 1,4-DCB-Eq**	**kg 1,4-DCB-Eq**	**kg antimony-Eq**
Baseline - Landfill	111,529,326	4,092	29,352	240,407	2,213,360	4,753
Option A - MT SRF off island	-20,181,224	-397,581	-8,473	-3,707,763	-35,827,613	-272,673
Option B - ATT	-15,982,407	-348,559	-10,228	-3,275,133	-31,929,450	-242,019
Option C = MT WtE on island	-20,871,713	-401,720	-9,013	-3,861,531	-37,539,165	-277,837
Option D - WtE	-22,117,519	-459,091	-8,791	-3,936,997	-33,182,662	-278,481
Option C MT WtE & with CHP	-28,230,957	-420,950	-10,785	-4,058,440	-38,581,656	-325,520
Option D WtE with CHP	-30,961,687	-482,200	-10,921	-4,173,638	-34,435,503	-335,785

Residual waste going to landfill has a fairly similar tonnage across all the proposed options, and therefore the preferred option in terms of minimal environmental impact has been determined largely on the ability of the scenario to offset the use of fossil fuels through recovery of electricity and heat. As a consequence scenarios incorporating WtE generally provides the best environmental outcome particularly where the option also incorporates combined heat and power.

Use of a Materials Recovery Facility to treat dry mixed recyclables (DMR) appears to not score a highly as options without this facility, this is potentially due to the relatively small tonnages of mixed recycling expected to be collected against the impact of running a MRF facility. Similarly options that have segregated yard and food kerbside collection with treatment using an open windrow composting or anaerobic digestion (AD) (for the food) have higher environmental impact than those without.

3.6 Short List Options Appraisal Outcome

Using the results of the economic, performance and lifecycle assessment Amec Foster Wheeler adjusted the unweighted option appraisal scores used for the long list analysis for the following criteria and applied these to the short listed options.

- Whole lifecycle costs;
- Short term cost/funding;
- Lifecycle Impacts;
- Recycling Potential;
- Clean/Renewable Energy Generation; and
- Carbon Impact.

This generated the short list option appraisal results shown in Figure 3.7 and these have been used to construct the Reference Project. However the separate collection of food waste and treatment in an anaerobic digestion has been omitted from the Reference Project for the following reasons:

- The amount of food waste that could be recovered by providing kerbside collection is comparatively low and the tonnage will not result in a commercially viable anaerobic digestion facility (a waste composition study has been commissioned by CIG and will investigate this position);
- The collection of kerbside food is likely to require the introduction of a separate fleet specialised waste collection vehicles; prompting a disproportionate capital outlay in relation to the amount of food waste collected; and
- The disposal of digestate from the wet-process anaerobic digestion plant will be difficult on Grand Cayman. There is very little agriculture and a shallow water table, as such the application of digestate to land is unlikely to provide practical benefit and could give rise to groundwater and surface water pollution (note that dry anaerobic digestion was screened out at the long list stage as this would be need to fed by mixed yard and food waste collections).

Figure 3.7 Performance of the Short Listed Options

3.7 Optimism Bias Adjustment

Optimism bias relates to the demonstrated and systematic tendency for project appraisers to overly optimistic when considering project benefits and costs.

HM Treasury guidance uses optimism bias adjustment to account for impact of uncertainty in project costs stating that there is little evidence to suggest that either conventional and PPP approaches to procurement deal any more or less effectively with project cost uncertainty. However, there is evidence that the clear allocation of risks established under the PPP approach does reduce the impact of optimism bias on the procuring entity.

In accounting for optimism bias the HM Treasury guidance differentiates between two key stages of the investment decision;

- Pre Final Business Case (FBC); and
- Post FBC.

For the procurement of the ISWMS for the Cayman Islands preparation of the FBC would co-inside with the award of contract. The pre optimism bias adjustment provides for an increase in estimated costs or shortfall in estimated income between the OBC and FBC stages (i.e. during the course of the procurement). Optimism bias adjustment post FBC accounts for increases in costs or shortfalls in income between award of contract and the completion ISWMS infrastructure and the operational phase of the contract.

The HM Treasury optimism bias spreadsheets require inputs for both pre FBC and post FBC percentage adjustments for CapEx, lifecycle costs, OpEx, transaction costs and third party income. Table 3.12 summarise the optimism bias adjustment factors for the project.

Table 3.12 Optimism Bias Adjustment Assumptions

Cost Element	Overall Optimism Bias (%)	Pre-FBC Bias (%)	Post-FBC Bias (%)
CapEx	43	15	28
Lifecycle	48	13	35
OpEx (non-employment)	20	8	12
Transaction	30	10	20
Third party income	30	20	10

It is evident from Table 3.12 that the optimism bias adjustment estimated using the Treasury spreadsheet falls within the accuracy of the cost estimation applied by Amec Foster Wheeler (threshold of +/- 50%). In addition the confidence intervals presented for risk transfer in the Financial Case (Section 8) provide an indication of the effect at higher confidence intervals.

4. Procurement Strategy and Reference Project (Commercial Case)

This section describes the reference project and the procurement options available for the delivery of an ISWMS. The section also examines the potential options for the packaging of services for procurement and identifies the outline specifications for the delivery of the services.

4.1 Reference Project

Description

Following the completion of the short listed options evaluation the Reference Project for the ISWMS has been constructed and comprises the following elements:

- Waste collection (based on three stream (residual waste, recyclables and yard waste collected weekly);
- Waste reduction measures – including waste education and pragmatic waste minimisation initiatives (e.g., home composting/ material return schemes such as bottles);
- The reuse and refurbishment of bulky waste;
- Community recycling depots and HWRC recycling facilities;
- Transfer and bulking facilities (one per island);
- The windrow composting of yard/garden waste from landscaping operations and HWRC's;
- The recycling of construction and demolition (C&D) waste;
- The potential landfill mining of waste;
- The potential introduction of kerbside yard and garden waste collections (post 2020);
- The potential introduction of kerbside dry recyclable collections with a Materials Recovery Facility (post 2020); and
- The treatment of residual waste in a Waste to Energy Facility (CHP enabled).

The details of the reference project components are shown in Table 4.1.

Table 4.1 Reference Project – Facility Details

	Facility Location	Maximum Facility Capacity (tons)	Facility On line Date
Waste to Energy facility with CHP	Grand Cayman	53,000	2019/20
Materials Recovery Facility	Grand Cayman	11,400	2019/20
Windrow Facility	Grand Cayman	34,900	2017/18
Household Waste Recycling Centre	Grand Cayman	5,400	2016/17
Recycling Depots	Grand Cayman	1,300	2016/17

	Facility Location	Maximum Facility Capacity (tons)	Facility On line Date
Bulking and Transfer Station	Grand Cayman	4,100	2019/20
Waste Transfer Station	Cayman Brac	3,600	2019/20 Will include areas for segregation of recyclables
Windrow Facility	Cayman Brac	600	2019/20 Will be built to take kerbside green waste collected
Waste Transfer Station	Little Cayman	300	2019/20 Will include areas for segregation of recyclables
Mechanical Treatment of Mined Landfill Waste	Grand Cayman	11,400*	2019/20

Note- " subject to proven feasibility

The majority of the waste collected on the sister islands would be transferred to Grand Cayman for treatment or for bulk haulage to off-island treatment/ markets. It is assumed that the waste transferred from the sister islands will be transported to the relevant waste management facilities on Grand Cayman. The third waste transfer station is on Grand Cayman and will be used for the reception of sister island wastes and potentially for the bulking of recyclates; waste requiring export and wastes that have been segregated (i.e. metals, gas canisters and chemicals).

It has been assumed that as far as practicable kerbside collection of waste will be achieved using the existing waste collection resources and vehicles; by altering operational practices and collection frequencies.

To size the HWRC, it is assumed half of the recyclables that are currently separated for recycling on Grand Cayman will be taken to the HWRC, along with 10% of the recyclables that are forecast to be captured in the future.

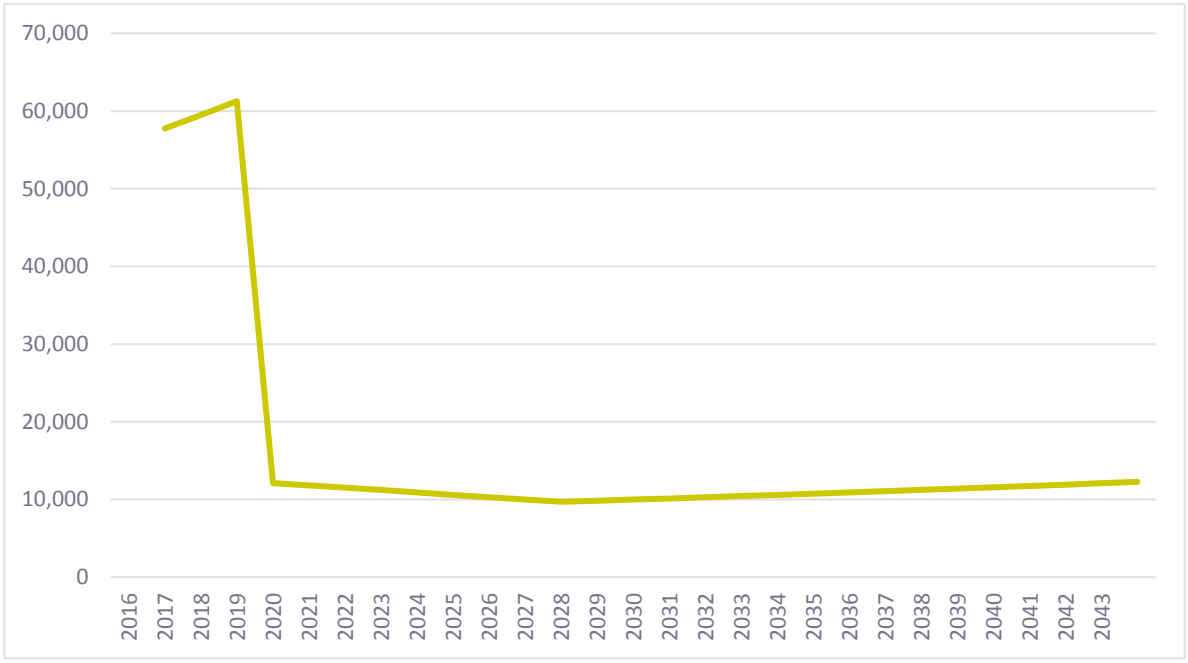
To size the Recycling Depots, it is assumed 10% of the recyclables that are forecast to be captured in the future will be via the Recycling Depots.

Landfill

Some waste will continue to be sent to landfill as not all wastes are suitable for recycling or thermal treatment. A fraction of the incinerator bottom ash (IBA) that cannot be reused in the construction industry will need to be sent to landfill. There will also be Air Pollution Control Residues from thermal treatment that will need to be sent to a separate hazardous landfill cell.

These tonnages result in the landfill requirement tonnage profile shown in Figure 4.1.

Figure 4.1 Landfill requirement profile (tonnage per year)



IBA that can be reused would be managed in a specialised IBA recycling facility to produce material that can be used in road building and construction products.

Potential Landfill Mining

The reference project contains an 11,400 ton per annum mechanical pre-treatment facility and this is costed to be built in 2019/20. However it should be noted that the efficacy of landfill mining and any reuse of mined landfill material has not been proven and would be subject to a detailed assessment to prove its viability if implemented as part of the ISWMS..

Cost and Performance Analysis

This section provides the comparative summary of the costs and environmental performance of the chosen Reference Project. These are provided on comparable basis to the Economic Case (Section 3). The baseline cost data have been used and augmented (for example with landfill remediation and waste collection costs) for the Financial Case (Section 8) which provides a full Net Present Value model of the Reference Project.

Cost summary

Figures 4.2 – 4.6 below provide the gross cost comparison of each of the components. The error bars represent the level of confidence in the figures (i.e. 50%). These costs represent costs over 25 years, as that is the general industry standard accepted life of waste facilities.

Figure 4.3 shows the summarised costs for elements of the Reference Project for the ISWMS that could potentially be introduced early by the CIG in advance of the procurement of the main elements of the Reference Project. Please note that the cost of these early elements are included in the Financial Case (Section 8).

Figure 4.2 Summary Cost for WtE (cost in CI$)

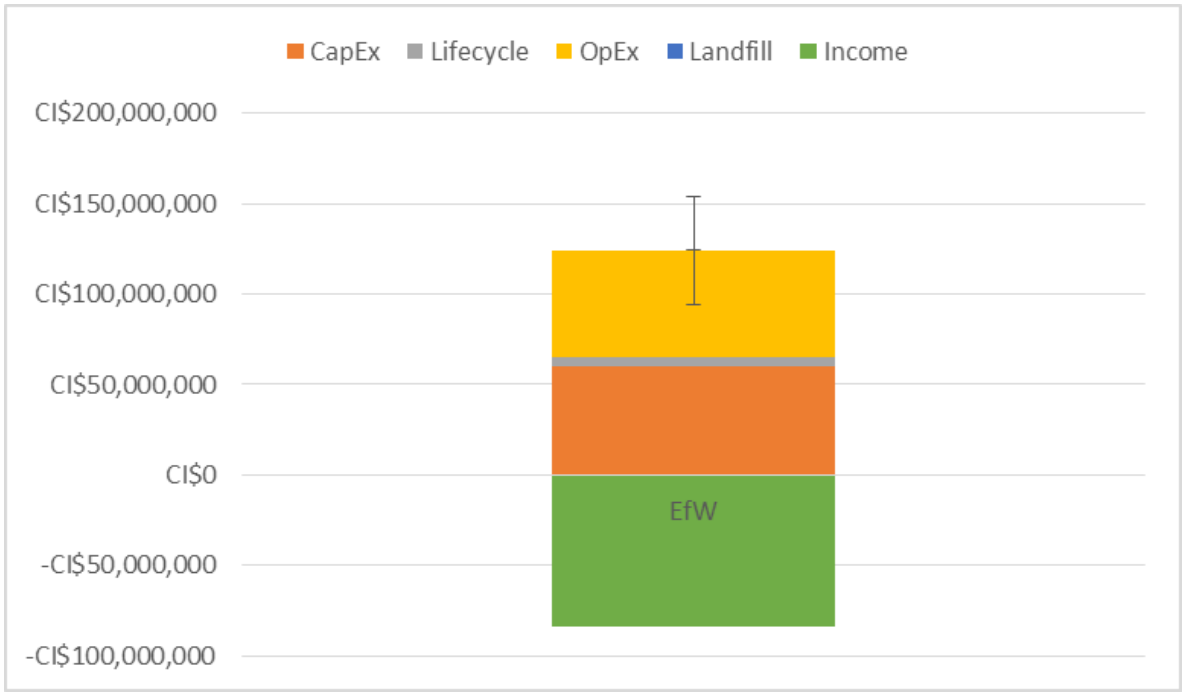


Figure 4.3 Summary Costs for Early Introduction Elements (cost in CI$)

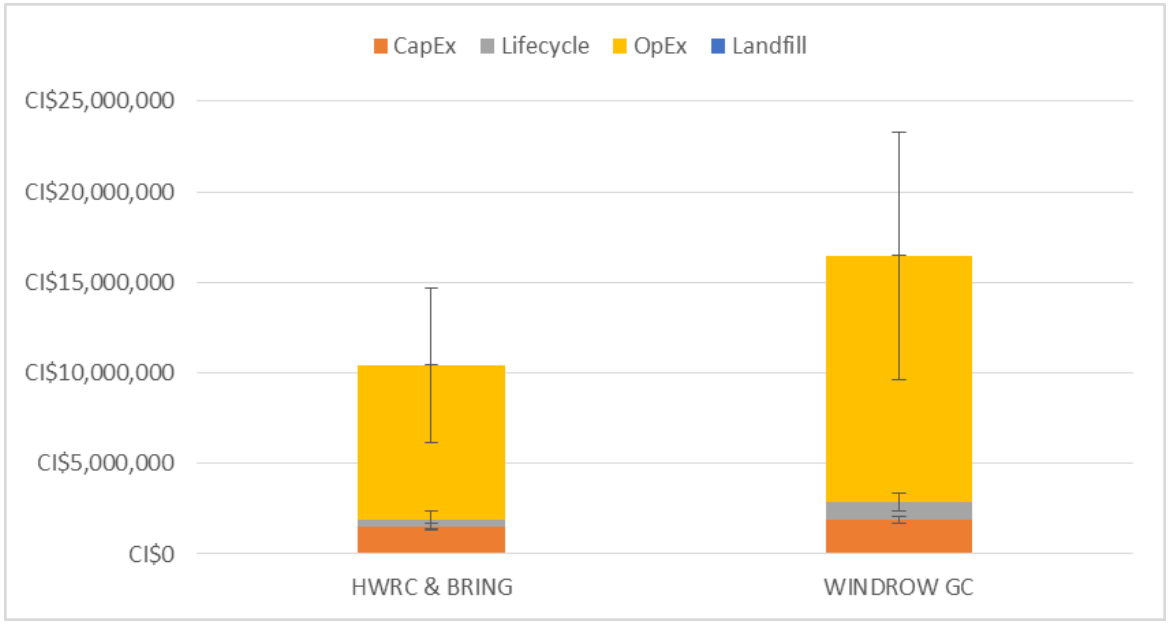


Figure 4.4 Summary of costs for Cayman Brac and Little Cayman Composting Facilities (cost in CI$)

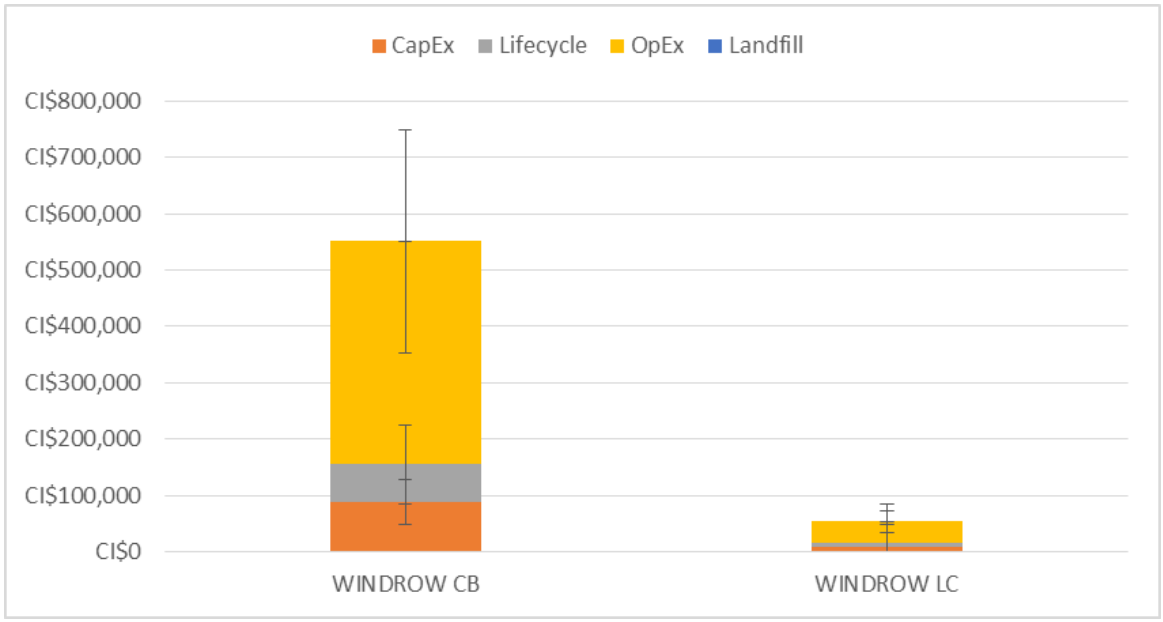


Figure 4.5 Costs for other Facilities that are part of the Reference Project (cost in CI$)

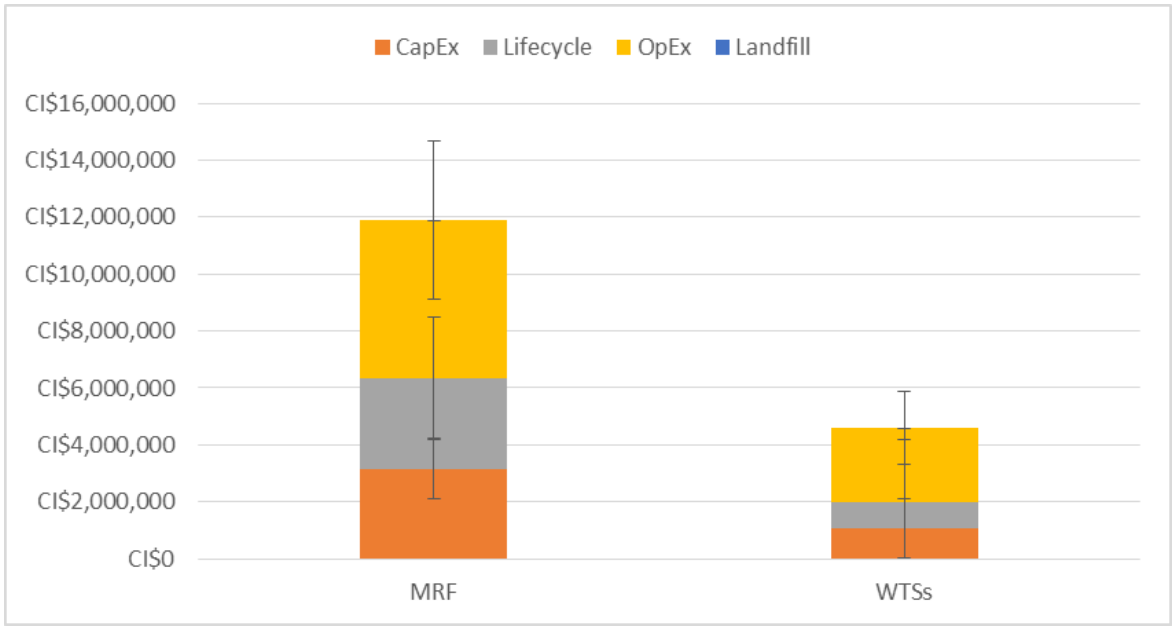
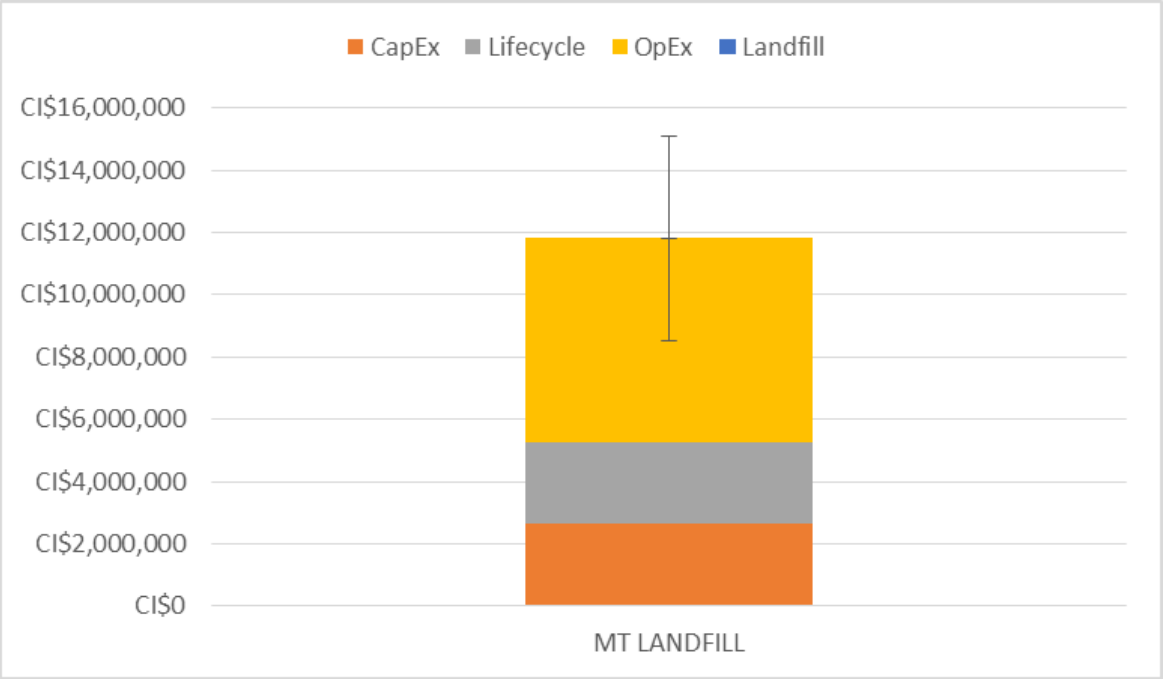


Figure 4.6 Costs of Mechanical Treatment of Mined Landfill Waste (cost in CI$)



The smaller facilities are generally lower costs due to lower throughput, despite having higher CI$/ ton costs. The operating costs are high as they occur each year for the life of the facility.

Total costs of the Reference Project are summarised in Table 4.2.

Table 4.2 Reference Project Base Costs (CI$)

	Capex CI$	Lifecycle CI$	Opex CI$	Income CI$	Total CI$
Early introduction elements Grand Cayman HWRC Bring banks Windrow on Grand Cayman	3,384,370	1,320,044	22,209,408	-	26,913,822
Reference Project WtE facility MRF WTS	64,332,985	8,907,460	68,057,969	-83,833,362	57,465,052
Landfill	19,721,128	-	28,895,562	-	48,616,690
Landfill Mining MT	2,631,256	2,631,256	6,543,726	-	11,806,237
Total	90,069,739	12,858,760	125,706,665	-83,833,362	144,801,801

The costs and revenues are nominal (i.e. it has not been indexed) and no uplift has been added to the UK base costs that the estimates are derived from. These cost estimates have been used as inputs to the more detailed financial modelling described in the Financial Case (Section 8).

Environmental performance

Figure 4.7 below shows the environmental benefit of the reference project excluding the mechanical treatment of mined landfill waste. This covers 28 years, from 2016/17 to 2043/44, encompassing early elements of the ISWMS introduced by CIG and procurement and operation of the ISWMS over the long

term. This therefore covers the time when the HWRC, bring banks and windrow composting on Grand Cayman will be introduced, as well as the larger facilities that will be operational from 2019/20. The performance is shown as 100% of all waste arising, and views the whole waste lifecycle from cradle to grave looking at waste sent to recovery, as well as any resultant Incinerator Bottom Ash (IBA) being beneficially used and that which can't be used being sent to landfill.

Figure 4.7 Environmental Performance of Reference Project Over 25 Years Excluding Mechanical Treatment of Mined Waste

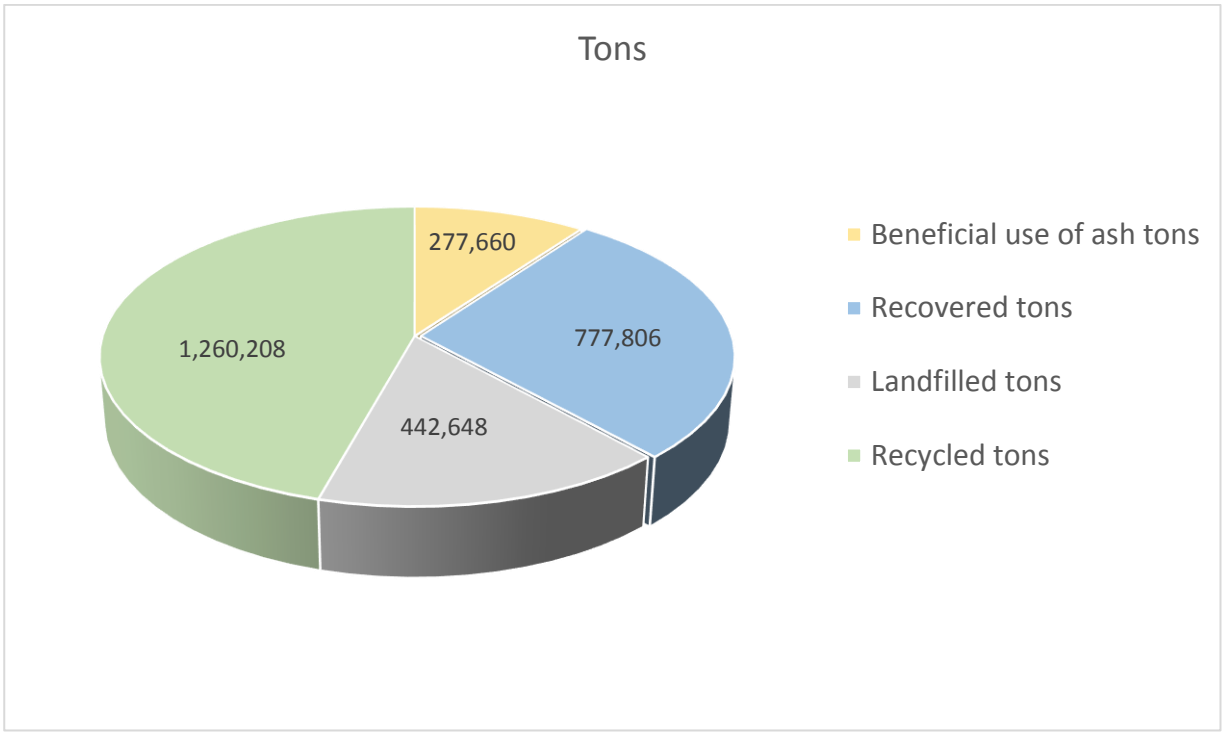
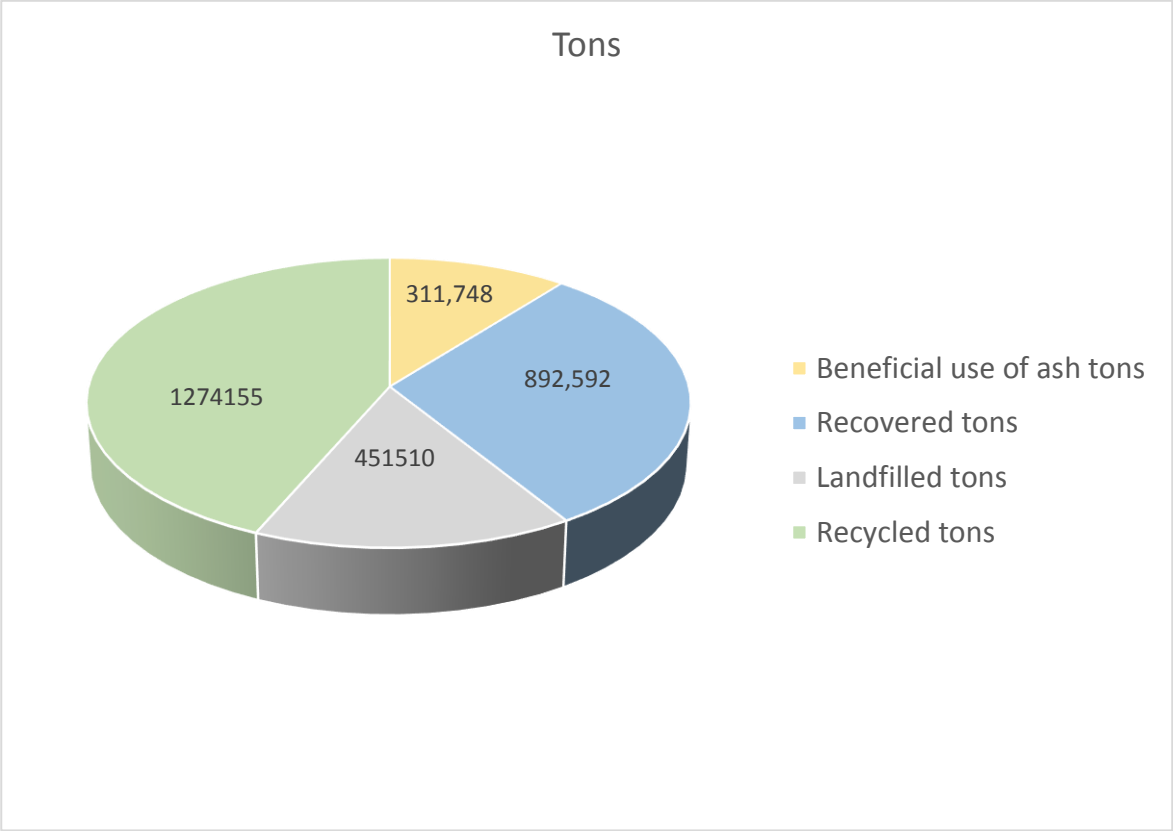


Figure 4.8 shows the environmental performance, as per Figure 4.7, but with the addition of the mechanical treatment of mined landfill waste. This increases the amount of waste being managed but the recycling rate is reduced, as the proportion of waste recycled does not increase linearly with the total increase in waste. The addition of the MT does divert more waste from landfill due to the thermal treatment of the mined and mechanically treated waste. The use of the mined waste in the thermal treatment facility will generate electricity and off-set fossil fuel use, whilst using any spare capacity. There is also an environmental benefit of remediating the existing landfill site. Note that the viability of mining the current landfill at George Town has yet to be proven.

Figure 4.8 Environmental Performance of Reference Project Over 25 years Including Mechanical Treatment of Mined Waste



4.2 Service Packaging and Contracting Options

Package of Services to be Tendered

A range of services and works are required by the CIG in order to implement the NSWMS and deliver the ISWMS. These include:

- Waste collection services;
- Waste and recyclate haulage services;
- The servicing of recycling depots;
- The marketing of recyclates and compost (wherever possible the use of local markets will be encouraged);
- Recycling of construction and demolition wastes;
- The construction of several new waste treatment facilities (see Table 4.1);
- The operation and maintenance of the new waste management facilities; and
- The provision and operation of landfill disposal for residual waste.

These services and works can potentially be packaged for procurement or delivery in a number of ways. Significant factors in determining the most appropriate package for CIG will include:

- CIG's desire to maintain direct delivery of some services (e.g. waste collection);

- Delivering value for money;
- The procurement schedule in relation to service requirement deadlines;
- Market interest in the packages;
- Differentiation in services that could be delivered by on island contractors (e.g. recycling centres and transfer stations) or would need off island technology providers (e.g. waste from energy);
- Existing contracts (e.g. for the disposal of used tyres);
- Effective risk management (through good competition and contractual risk transfer); and
- Delivery schedule.

The range of services to be tendered and the treatment of assets is a fundamental step in determining the most appropriate tendering route and impact on the procurement timetable. A clear decision will be required from the CIG prior to any issue of a Request for Proposals (RfP) notice concerning the services/works to be packaged and procured together or separately. This process could be informed through a soft market testing exercise i.e. preliminary consultation with interested parties to gauge interest.

Some of the primary alternatives for the packaging of works and services for the delivery of the ISWMS are explored in Table 4.3 alongside key strengths and weaknesses of the approach. Please note that these alternatives are not exhaustive but are intended to identify the primary variants available. These primary options can be further tailored and refined to fit with the CIG's requirements.

Key operational areas where the CIG is minded to retain delivery responsibility are:

- The operation of waste transfer stations on Little Cayman, Cayman Brac and Grand Cayman;
- The operation of HWRC's; and
- The collection of waste on Cayman Brac and Little Cayman.

The construction of the facilities associated with these services would then be subject to procurement through a separate Design. Bid and Build (DBB) model, as would the remediation of the landfills on Little Cayman, Cayman Brac and Grand Cayman.

Where operational services are transferred to the private sector the CIG would seek to protect the employment and employment rights of service delivery staff. This would be accomplished by ensuring that the relevant staff are transferred to the contractor as a contractual obligation, so long as equivalent staff requirements continue to be required for service delivery.

For the purpose of developing the Financial Case (Section 8), it has been assumed that a fully integrated package of services and infrastructure based on the Reference Project will be procured.

Table 4.3 Main Options Service and Works Packaging

Option	Strengths	Weakness	Opportunities	Threats	Practical Viability	Package Procurement Option
Option 1 Full Integration (Design Build Finance and Operate (DBFO/PPP) see Table 4.1.	No capital outlay/investment required by the CIG. No service interface risks (all transferred to the contractor). Optimum transfer of performance and delivery risk. Single contractor land therefore low CIG effort/resources needed for contract management. Low overall CIG risk profile (although there may be some residual risk associated with minimum tonnages). Lends itself to simple gate fee and/or unitary charge payment structure. Single co-ordinated contract. Single procurement exercise. The contract would have the magnitude that is likely to attract major international waste management companies. Compatible with PPP approach.	The option could squeeze out local contractors in areas of service delivery. An integrated package may restrict the market to larger waste companies or require niche service contractors to develop consortia or sub -contracting structures. Lack of a local market capable of delivering a complete solution. Potential requirement to transfer existing DEH staff to the contractor. A long contract period required so that major capital investment can be written down. CIG tied in for long period.	New opportunities for training and employment. Gain or revenue share possibilities available (e.g. of electricity and recyclate income). Major potential service innovation and improvement through partnering approach. Potential for consortia bids.	The geographic location of the Cayman Islands and lack of local knowledge may deter some larger waste management companies. Bidders are likely to endeavour to pass some risks to the CIG (e.g. tonnage guarantees, change in law,). Larger waste management companies do not have experience of local Cayman law. Inclusion of residual waste landfill may introduce issues concerning historic and future liabilities. Complexity of procurement may pose a risk to the CIG delivery timetable. Potential conflict with existing private waste collection and recycling companies active on the islands.	A viable option for the CIG.	Likely to be a complex procurement with significant areas of risk lending itself to Competitive Dialogue or the Competitive Procedure with Negotiation. Procurement timetable may conflict with CIG requirements.

Option	Strengths	Weakness	Opportunities	Threats	Practical Viability	Package Procurement Option
Option 2 Substantial Integration (DBFO/PPP) with the segregation of some peripheral service operations (e.g. waste collection, landfill, transfer stations etc.).	No capital outlay/investment required by the CIG Compatible with the CIG existing service delivery and would enable direct control over these services (e.g. waste collection, landfill). Optimum term of peripheral service contracts can be flexible. Provides some opportunity for local suppliers, niche providers and the CIG to be involved in peripheral service delivery.	Will not result in full performance risk transfer, the CIG will retain some interface risks for operational services Ongoing investment in and maintenance of peripheral facilities and services may be required from the CIG. Extensive contract period required for main DBFO/PPP contract so that investment can be written down. The CIG will be tied in to the main DBFO contract for a long period. Requirement for the CIG to manage both main contractor and peripheral service contractors. Method for payment/financing of peripheral services required resulting in increased complexity. Potential for multiple procurement processes and periodic re-procurement of peripheral services.	Opportunity to retender and market test peripheral services and prove value for money. Some opportunities for training and employment. Gain or revenue share possibilities available (e.g. of electricity and recyclate income). Potential use of Lots may reduce the need initially multiple procurements. Potential for consortia bids. Provides opportunity for local suppliers and the CIG to be involved in peripheral service delivery.	The geographic location of the Cayman Islands and lack of local knowledge may deter some larger waste management companies. Bidders are likely to endeavour to pass some performance risks to the CIG. Larger waste management companies do not have experience of local Cayman law. Complexity of main procurement may pose a risk to the CIG delivery timetable. Ongoing investment and costs for peripheral services may remain with the CIG. Potential use of Lots may complicate evaluation and slow down Contract Award. Service standards for peripheral services could be subject to gradual erosion and the CIG may need to monitor. Historic landfill liabilities and future provision lie with the CIG. Potential conflict with existing private waste collection and recycling companies active on the islands.	A viable option for the CIG.	Will include a complex procurement with significant areas of risk lending itself to Competitive Dialogue or Competitive Process with Negotiation. Peripheral Service Contracts let through or Open or Restricted Procedures. Direct delivery by the CIG of some peripheral services possible.

Option	Strengths	Weakness	Opportunities	Threats	Practical Viability	Package Procurement Option
Option 3 Design and Build for facilities with separate operational contracts.	CIG would ultimately control design and build process. The CIG would control infrastructure and assets. Compatible with the CIG's existing service delivery and would enable direct control over these services (e.g. waste collection, landfill). Term of operational contracts can be flexible. Provides opportunity for local suppliers and the CIG to be involved in construction and service delivery.	Requires the CIG capital outlay for construction of facilities. Planning and permitting requirements will lie with the CIG. CIG would need to specify facilities and construction requirements. Some design risk may lie with the CIG although a significant portion of this can be transferred by good contracting structures. The CIG will be responsible for lifecycle and maintenance costs for facilities. Limited performance risk transfer through operational contracts. The CIG will be exposed to service interface risks. Requirement for input specification's from the CIG. The DEH and existing on island contractors of insufficient size and capability to deliver all required services and operations. Need for periodic re-procurement of operational contracts. Multiple procurements process required. Requirement for substantial contract and construction monitoring and management by the CIG.	Will deliver employment opportunities associated with construction and operation of facilities, CIG would receive revenue from sale of secondary materials (e.g. electricity). Re-procurement of operational contacts may improve value for money. Provides opportunity for local suppliers and the CIG to be involved in the operation of peripheral service delivery.	CIG exposed to facility and service interface risks. Limited opportunities for risk transfer. The CIG is required to maintain investment in facilities and services. Re-procurement of operational contacts may erode value for money. Multiple procurement processes may be difficult to co-ordinate and resource. Multiple procurement processes may be incompatible with the CIG procurement schedule. Historic landfill liabilities and future provision lie with the CIG. Local market for some services may be limited impacting on the delivery of value for money. Approach may not attract large established waste management companies form bidding. Market for the operation of major waste management facilities may be limited. There are no local suppliers on the Cayman islands.	Unlikely to be a viable option for the CIG due to the need to produce detailed specifications, specify technologies and undertake multiple procurement simultaneously.	Mixture of Works and Service Contracts. Work contract would be with specialist technology providers/EPC company. Use Open and Restricted, Procedure or Competitive Process with Negotiation. Direct delivery by the CIG of some peripheral services possible.

Option	Strengths	Weakness	Opportunities	Threats	Practical Viability	Package Procurement Option
		CIG inexperience of waste treatment operations delivery.				
Option 4 Total Delivery and Operational Service Disaggregation (Separate DBFO for each facility and separate operational contracts for peripheral service).	Treatment costs can be a simple gate fee payment structure (all revenue expenditure). Optimum term of contract (s) can be flexible. No major capital outlay/investment required by the CIG Compatible with the CIG existing service delivery and would enable direct control over these services (e.g. waste collection, landfill). Provides opportunity for local suppliers, niche providers and the CIG to be involved in facility and service delivery.	Will not result in high level of performance risk transfer, CIG will retain substantial interface risks. Ongoing investment in and maintenance of peripheral facilities and services may be required from the CIG. Extensive contract period required for major plant (e.g. WtE). Substantial contract management and co-ordination requirement for the CIG. Payment/financing of system is likely to be complex. Need for multiple procurement processes and periodic re-procurement of peripheral services. The CIG is exposed to service interface risks. Need for periodic re-procurement of operational contracts. Multiple procurements process required.	Re-procurement of peripheral service contacts may improve value for money. Provides opportunity for local suppliers and the CIG to be involved in peripheral service delivery. Use of local companies and niche suppliers may contribute to value for money.	Number of procurements would pose a high risk to the CIG schedule. Periodic re-procurement of operational contacts may erode value for money. Multiple procurement processes may be difficult to co-ordinate and resource. Multiple procurement processes would be incompatible with the CIG procurement schedule. Service standards for peripheral services could be subject to gradual erosion and the CIG may need to monitor. Local market for some services may be limited impacting on the delivery of value for money. Historic landfill liabilities and future provision lie with the CIG. Approach may not attract large established international waste management companies from bidding.	Unlikely to be a viable option for the CIG due to the need to undertake multiple procurement simultaneously and high level of interface risk.	Will include a complex procurement with significant areas of risk lending itself to Competitive Dialogue or Competitive Process with Negotiation. Peripheral Service Contracts let through or Open or Restricted Procedures. Direct delivery by the CIG of some peripheral services possible.

Table Key

CIG	Cayman Islands Government
DFBO	Design, Build, Finance and Operate facilities
DB	Design and Build facilities
EPC	Engineering, Procurement and Construction
PPP	Public Private Partnership

Amec Foster Wheeler and KPMG have evaluated a range of potential strategy implementation, contracting and procurement options available to the CIG through which it could deliver the objectives of the NSWMS and implement the delivery of an ISWMS serving the requirements of Cayman Islands.

Principal Contracting Options

Table 4.4 outlines some the principal contracting options available to the CIG. The most appropriate of these for any particular procurement exercise will depend on several factors. These include:

- The components of the ISWMS that the CIG may wish to deliver directly as operational services;
- The cost and affordability of the required services and infrastructure; and
- The specified contractual requirements.

Table 4.4 Principal Contracting Options

Contracting Options	Type of Contract	Notes
1	Operational Service Contract/Agreements	Projects procured in this way typically make use existing waste management infrastructure to provide a service. In return for the service the service users (including the CIG) would pay a monthly sum or a gate fee per ton. The Government would set out in detail the specification for service (an input specification) to be delivered by the contractor as part the contract documents.
2	Design and Build (DB)	This option involves the construction of facilities as capital projects usually procured under Public Works Contracts. As such the CIG would finance the capital project from internal budgets/reserves or through borrowing. The CIG would define in the specification the detail for the required works and contract directly with a construction company for the delivery of the works. The CIG may then operate the facilities or source a separate operational contractor for the delivery of the associated service.
3	Design Build Finance, Operate and Maintain (DBFOM)	This option involves projects where the contractor is required by the CIG to finance the capital investment required to facilitate all works needed to deliver the services. This may be done on balance sheet or through project finance and appropriate bank loans. CIG would set out outline service requirements (as an outline specification) and the contractor (normally a waste management contractor) would design and build facilities required to deliver the service requirement (usually sub-contracting the engineering, procurement and construction part of the works to specialist suppliers). The contractor will then operate (and maintain) the facilities and provide the relevant services, for which service users (including the CIG) would pay a monthly sum or gate fee). Due to the period required for the payback of capital investment, DBFO contracts may typically have periods of between 15 and 30 years (depending on the scale of the capital investment for facilities being constructed).
4	Public Private Partnering	This option involves the selection of contractor who will be required to deliver service requirements that are likely to change and evolve with time. The CIG, in selecting such an approach, primarily seek to identify the contractor who it considers it can work with most effectively to deliver such changes without re-sought to further procurement. Such contracts are often based on DBFO type contract documentation, augmented by appropriate controls over contract variations to ensure value for money is maintained (e.g. open book accounting, agreed profit levels, service benchmarking etc.).

Contracting Options	Type of Contract	Notes
5	Hybrid/Refinanced	Several recent waste management procurements have been agreed on a conventional DBFO approach but with planned refinancing (e.g. using CIG borrowing) of the capital element of the project at planned point in time), accompanied by the transfer of asset ownership. This has typically planned for Service Commencement following the construction and commissioning of the relevant facilities. This approach offers the potential to provide overall cost efficiencies (by reducing the period of private sector borrowing), improved allocation of risk, improved revenue sharing and enhanced operational flexibility/ public sector control.

Note variants of these primary options have been employed elsewhere (e.g. design, build and operate).

4.3 The Procurement Process

Introduction

The alternative procurement procedures discussed in this Section should be viewed as generic approaches and these have been largely based on European standards. Furthermore, some of the processes (such as Competitive Dialogue) have an inherent level of flexibility that enables the exact shape of the process to be tailored to the specific circumstances or needs of the procuring entity, in this case the CIG.

The direct delivery of services by the CIG (e.g. waste collection by DEH) would not necessarily require procurement and is therefore not addressed in this Section.

Procedures

There are a number of generic procurement procedures that can be used for the award of the contract(s):

- The Open Procedure;
- The Restricted Procedure;
- Competitive Procedure with Negotiation;
- Competitive Dialogue; and
- Negotiated Procedure (without prior publication).

The adoption and use of the Open and Restricted procedures are generally used for relatively simple procurement exercises where the works and services being procured can be specified in detail or the services are being re-procured without substantial change. The Competitive Procedure with Negotiation and Competitive Dialogue procedures are generally employed in circumstances where the procuring entity is unable or does not wish to fully specify its requirements and/or where there is considerable risks and uncertainty on how the project may be delivered and/or financed. Although once a more commonly used approach, the Negotiated Procedure is now only used in very limited circumstances, for example where the initial approach to a procurement has failed. This is primarily because the approach tended to result in lengthy and protracted negotiations late in the process once a single bidder had been selected.

With the exception of the Negotiated Procedure these procurement routes are discussed further below.

Open Procedure

The Open Procedure (OP) allows all interested parties to submit fully priced bids. It has been widely used on waste projects for relatively simple services such as landfill and haulage services, and those which are typically evaluated solely on the basis of gate fees (e.g. clinical waste disposal).

To facilitate the use of the open procedure the procuring CIG must have assembled a detailed input specification and all necessary information for supply to bidders at the point of tender. This information

needs to be sufficiently precise and comprehensive so that bidders can accurately price the CIG's requirements. There is no restriction on the number of bidders that can submit tenders for evaluation.

The OP does not allow for any negotiation or dialogue with bidders during the course of the procurement with engagement being limited to clarification only. As a consequence, the OP offers virtually no flexibility optimise specifications, shape bidder solutions, adjust risk allocation or modify price in relation to affordability.

The open procedure can, subject to legal compliance checks, be combined with minimum pass thresholds in order to ensure that the bidder is suitable in technical, financial and legal terms.

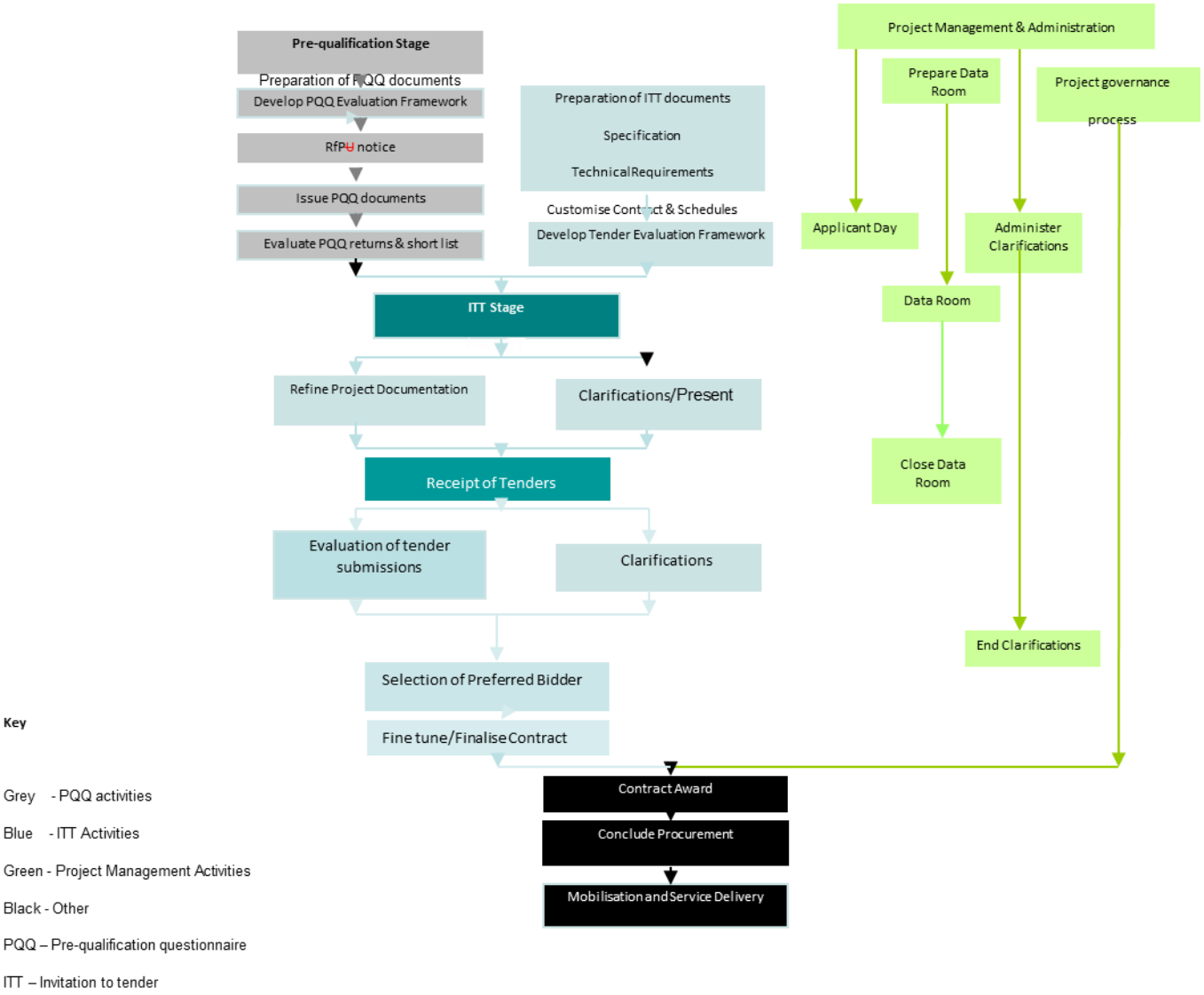
Restricted Procedure

The Restricted Procedure (RP) requires bidders to pre-qualify (through the completion and evaluation of Pre-qualification questionnaire – PQQ) in order that they can demonstrate appropriate levels of financial standing and track record/experience in delivering projects of a similar nature (the Pre- Qualification Stage). The short listed bidders (usually a minimum of five, where five organisations or consortia are capable), are then invited to prepare their tender against the specification prepared by the procuring entity. The two stages can be combined into one, whereby a joint PQQ and Tender is received from bidders. Where this alternative is employed PQQ and Tender are separately packaged with the PQQ being opened and evaluated before the short listed Tenders are opened.

Similarly to the OP, RP does not provide for negotiation or dialogue with bidders. As a consequence, the RP also offers virtually no flexibility to optimise specifications, shape bidder solutions, adjust risk allocation or modify price in relation to affordability.

Similar to the OP, the procuring entity using the procedure must have assembled a detailed input specification and all necessary information for supply to bidders at the point of tender. This information needs to be sufficiently precise and comprehensive so that bidders can accurately price the procuring entities requirements.

Figure 4.9 Summarised Approach to a Restricted Procedure



Competitive Procedure with Negotiation

The Competitive Procedure with Negotiation (CP+N) is a relatively new procurement vehicle and therefore has seen limited deployment to date in the waste management market. CP+N is essentially a hybrid of the RP and Competitive Dialogue procedures designed to provide a more efficient alternative to Competitive Dialogue that limits the scope negotiation, whilst giving more flexibility than the RP.

CP+N procedure, similar to the RP, can make use of a pre-qualification process to identify bidders with an appropriate level of financial standing and track record/experience in delivering projects of a similar nature, whilst also limiting the number of bidders that will be invited to negotiate.

The procuring entity must have assembled a detailed input specification and all necessary information for supply to bidders at the point of tender that establish its minimum requirements, These minimum requirements cannot be subject to negotiation and this effectively limits the scope of the negotiation phase.

Bidders are invited to submit initial tenders that as a minimum fulfil the minimum requirements and these initial proposals are then used as the basis of entering into negotiation. The negotiations may cover several cycles and involve the re-issue of the procurement documentation and subsequent bidder submissions. Following the closure of the negotiations bidders are required to submit their final tender for evaluation.

The procuring entity can award the contract on the basis of either the initial or final tender.

Competitive Dialogue Procedure

The Competitive Dialogue (CD) procedure is reserved for relatively complex projects, recognising a need for dialogue with bidders to develop the final solution that meets the CIG's procurement objectives and affordability requirements.

CD processes usually make use of pre-qualification stage in order to identify bidders with an appropriate level of financial standing and track record/experience in delivering projects of a similar nature, whilst also limiting the number of bidders that will be invited to participate in dialogue (ITPD) to manageable and pragmatic level.

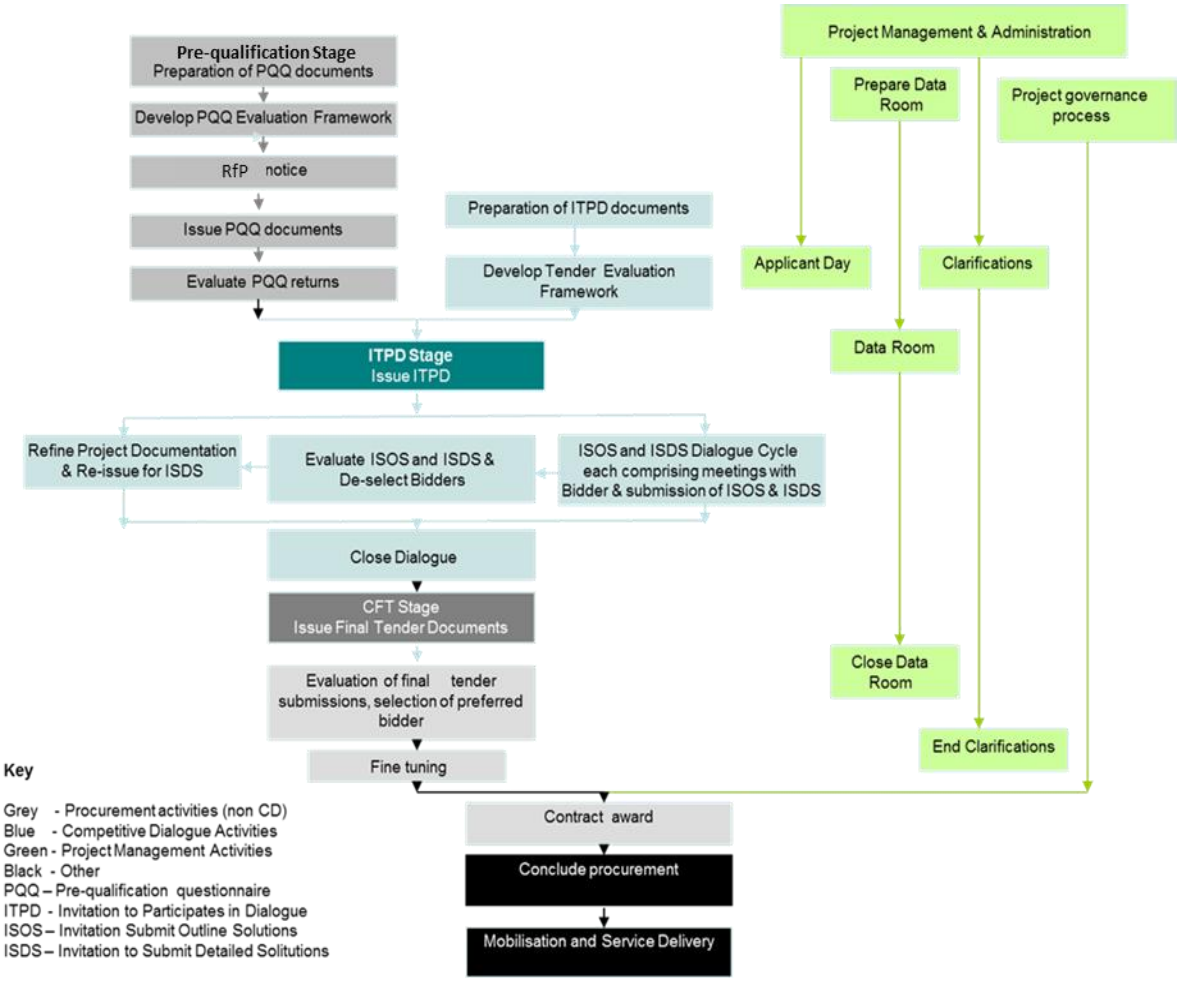
The CD process is conventionally conducted in a series of stages that allow a competitive process and bidder solutions to evolve up to the 'final tender' stage (ideally with at least 2 bidders remaining in the process to retain competitive tension). Deselection can be exercised at each stage which is commensurate with increasingly detailed solutions being submitted for evaluation. There is no limit to the number of dialogue events that are held during each stage although there is always a need to be fair an equable to all bidders.

Being the most flexible procedure CD allows solutions, pricing and risk allocation to evolve through dialogue, although this can take time. As a consequence, the service specification will be more output in nature. The procedure is best suited to situations where the procuring entity, at the outset of the tender process, cannot objectively define the technical means of satisfying it needs/objective, wishes to remain technologically neutral at the outset and or cannot specify the detailed legal or financial make- up of the project.

A typical CD process is summarised in Figure 4.10. This can involve several cycles of dialogue each of which can involve several meetings with short listed bidders. Figure 4.10 shows two main stages; the Invitation to Submit Outline Solutions (ISOS) and an Invitation to Submit Detailed Solutions (ISDS). The deselection of bidders can occur at the conclusion of each stage up to the submission of final tenders.

A key feature of CD is that it allows the procuring entity to drive up the technical content and quality of proposals during the dialogue phase so that they all meet a high or acceptable standard prior to close of dialogue. As consequence, price should be the main criterion determining the award of contract at the final tender stage.

Figure 4.10 Summarised Approach to the Competitive Dialogue Procedure



Key Procurement Documents and Processes

Specification

The production of an appropriate specification setting out the CIG's service and works requirements is a key aspect of the contracting process. All such specifications must be set out in the contract documents. The specification for the tender documents should provide an appropriate description of the contract work (e.g. for keeping, treating and disposing of waste).

The specification can take one of two general forms that lend themselves more appropriately to different contracting options:

- Outcome driven/non-prescriptive solutions (output specifications); and
- Input driven/prescriptive solutions (input specifications).

Both options are commonly used in waste management contracts. Service Contracts and Design and Build Works contracts are often supplemented by detailed input specifications (i.e. are input driven). This reflects a clear vision from the procuring entity on what service or works it requires and exactly where and how these are to be delivered, or the clear requirements for a particular type of facility. In such circumstances the Open and Restricted Procedure can provide a suitable procurement procedure.

However, where a DBFO or partnering contract is required and the procuring entity cannot specify the solution or desires to remain technologically neutral, output driven specifications are more commonly

employed. This approach provides greater flexibility, allowing potential contractors to innovate and propose alternative method(s) or facilities to deliver the services as part of the procurement process. Additionally, the CIG can seek to transfer the full risk of the delivery methods and facilities failing to meet the output specification to the Contractor. In practice the transfer of this risk may have practical limitations and the optimum transfer of risk may be impacted by affordability and value for money considerations.

Procurement Schedule

The selection of the most appropriate contracting option will be influenced by the deadlines for the commencement of the services and the practicalities of procuring a particular form of contract. One or a mixture of the following factors may drive and influence contracting deadlines:

- Maintenance of service provision – such as at the end of life of existing facilities (e.g. the existing landfills);
- Funding and financing of a solution;
- The achievement of strategic targets – service improvements, efficiencies and modernisation;
- External project influences (e.g. identifying and procuring suitable sites, political elections); and
- The delivery of the CIG commitments and policies – service maintenance and improvements.

Procurement programmes and their duration vary according to nature and approach to contracting taken by the procuring entity and are influenced by legislative requirements. Service contracts of limited scope, value and duration and with a will generally well-defined input specification can often be let quickly (i.e. within a small number of months). However, DBFO and Partnering Contracts traditionally take longer to negotiate/dialogue and award (particularly where third parties such as banks are involved in funding capital investment). For example, it not uncommon for complex DBFO contracts to take 12 months or more to reach award.

Length of Contract

The determination of the contract duration is a critical issue for both the procuring entity and for bidders. The most appropriate contract length will generally be a balance of contract requirements (works and services) and their practical delivery, the scale of capital investment required and the delivery of value for money (VFM).

The CIG will need to establish the appropriate contract length for each element of the ISWMS being procured. Relatively simple services (such as waste haulage) that do not require substantial capital outlay by the contractor and have a liquid market, can be let with a relatively short contract period that enables frequent market testing in order to demonstrate the delivery of value for money. Where moderate investment may be required, for example in mobile plant such as waste collection fleet then the contract duration can be aligned with the typical lifecycle of the plant, mirroring the period over which the capital value of the plant can be written down. In such circumstances contract periods of 7 to 10 years are typical.

Where there is substantial capital investment by the contractor, particularly in new waste management facilities, long term contracts (between 15 and 30 years depending on the scale of investment) will normally be appropriate. This period of the contract in such circumstances enables for the capital investment to be written down whilst maintaining a viable level of unitary charge or gate fee to be levied by the contractor for provision of the facilities and service.

For the development of the Financial Case (Section 8) it has been assumed that a contract with a 25 year optional period would let by the CIG.

Tender Evaluation Criteria

The criteria on which the contract will be awarded should be clearly stated in the documents that accompany the request for proposals (RfP) or an invitation to tender (ITT). This provides for an open, transparent procurement process and allows for the demonstrable equal treatment of bidders, ensuring that “the goal posts” do move during the procurement.

Pre-qualification as part of the RP, CP+N an CD procedures, can be used to select and short list bidders prior to the tender stage, based on their business and professional status, their economic and financial standing, and their technical ability and capacity based on track record. This can significantly reduce both the time and effort on behalf of the procuring entity and unsuccessful bidders that are not short listed.

Contracts can be awarded on the basis of the:

- Lowest price; or
- Most economically advantageous tender (MEAT).

The vast majority of waste management contracts are awarded on the basis of the MEAT. The MEAT evaluation will combine a mixture of price and quality criteria that are set out in clear and transparent tender evaluation framework that is applied at each deselection stage of the procurement process and for award of contract

The primary criterion of Quality will often comprise number of underlying tiers of pre-determined and weighted sub criteria that reflect the contract specification. Examples include: service mobilisation, works, environmental management and quality assurance.

The primary Price criterion can also be cascaded in a number of sub-criteria for example short term contract cost impact and long term contract cost.

It is good practice for the procuring entity to make the tender evaluation framework available, in its entirety, at the start of the tender stage and to provide the reasons as to why unsuccessful bidders have been deselected. Deselection and contract award must be transparently justifiable in relation to the established award criteria. This process will often involve a direct debriefing.

Procurement Process Administration

The procurement process will require careful administration with the timely delivery of information and the reply to questions and queries. In addition, there are likely to be requirements for interviews, dialogue and meetings with potential contractors and potentially site visits to be organised and fairly administered. The clarification of some issues may require input from technical, financial and legal specialists and this will have to be efficiently administered to ensure that a response can be given.

Request for Proposals and Pre-qualification Questionnaire

When employing the restricted, competitive process with negotiation, or competitive dialogue procedures the contracting body will generally issue a pre-qualification questionnaire (PQQ) to potential tenderers responding to the RfP (or associated advertisements). This questionnaire requires the submission of basic information to enable short listing of potential tenderers and any relevant CIG standing orders to be fulfilled (e.g. requirement for non-discrimination such as equality policies). The PQQ is normally issued alongside basic information concerning the procuring entity’s requirements for the contract and other matters that may be relevant to a potential bidder’s judgement of the opportunity.

Short-listing Potential Tenders

Information submitted in the PQQ is subjected to a series of pre-defined rudimentary tests to enable a ranking of potential tenders to be compiled. This information can then be used to draw up a short list of bidders who will be issued with the Invitation to Tender/Invitation to Participate in Dialogue (ITT/ITPD).

Tender Submission

The tender process under both the competitive process with negotiation (CP+N) and competitive dialogue (CD) process can comprise a number of discrete phases designed to optimise effort and resources, identify and focus on the best proposed solutions and enable the progressive short listing of companies.

Key stages for CP+N can include:

- Invitation to Submit Initial Tender;
- Invitation to Submit Negotiated Tender; and
- Final Tender.

Final Tender Key stages for CD can include:

- Invitation to Submit Outline Solutions (ISOS);
- Invitation to Submit Detailed Solutions (ISDS); and
- Final Tender.

Each of these elements requires the issue of appropriate documentation and instructions by the procuring entity at each stage.

Tender Documentation

The tender documentation will need to be developed and agreed prior to the issue of an invitation to tender and must be supplied either with the RfP or invitation to tender. Draft documents will need to undergo technical and legal review by the CIG prior to their endorsement and authorisation for issue.

The tender documents will normally include:

- Invitation to tender (or participate in dialogue);
- Background Information (and if used access details for a data room);
- Instruction to tenderers (including submission schedule, submission requirements);
- Administrative forms (e.g. certificate of non-collusion);
- Project agreement (i.e. conditions of contract;
- Technical specification;
- Pricing schedules & bid forms;
- Payment mechanism;
- Evaluation criteria and framework; and
- Risk Allocation Matrix.

Clarification of Queries and/or pre tender submission meeting

There is likely to be a series of queries and questions posed by potential service providers prior to the submission of their tenders. The CIG will be expected to deal with these promptly and fairly. It is generally good practice to set a final date for clarification questions so that sufficient time is available for the CIG to respond prior to submission deadlines.

Return of Tenders

The date for the return of tenders must be specified in the documents issued with the invitation to tender legislation. The receipt of tenders and official opening of these documents may need to comply with any

standing orders set by the CIG. This could require an official legal representative or procurement officer to be present.

Tender Evaluation Process

It is if high importance that the evaluation of tenders adheres to the pre-defined evaluation criteria and is conducted in a fair and even manner. This requires the development and sign off of a completed evaluation framework as part of the tender documents. Amec Foster Wheeler recommends that the method and personnel to be used in tender evaluation process is established before the RfP is issued and the evaluation team receive instruction and training in application of the evaluation framework prior to the receipt of tenders. The administration of the evaluation process must ensure that the evaluation is both open, transparent and auditable.

Procurement Options

Table 4.5 examines the potential procurement options in terms of their strengths, weaknesses, opportunities and threats (SWOT) as well as their practical viability.

For the purpose of this OBC and the development of Financial Case (Section 8) it has been assumed that the ISWMS would be procured as a collective and entire system (with the operation early introduced elements transferred as part of the procurement process) and that this would be delivered by a single primary contractor. It has also been assumed that the procurement strategy and procurement timetable will follow a competitive dialogue procedure.

Table 4.5 Summarised Procurement/Delivery Options

Option	Strengths	Weakness	Opportunities	Threats	Practical Application
Direct CIG Delivery	The CIG controls delivery of the services. Compatibility with existing service delivery in some areas. Experienced workforce in place for some services (e.g. waste collection).	Requirement for on-going CIG investment in resources and services. CIG will be responsible for performance and interface risks. CIG responsible for managing and monitoring service delivery. Require detailed input specification and all data from outset. The CIG's inexperience in waste treatment and management of external waste contractors	Potential to drive re-use and recycling rates. Continuous improvement service management and delivery.	Historic liabilities (e.g. landfill). Service delivery failure (e.g. industrial action). Specification and performance requirements are fixed for Contract term.	Viable, Could be used for waste collection, waste transfer operations, recycling depot servicing, Household Waste Recycling Centre Management and Landfill. Unlikely to be viable for waste treatment (e.g. WtE)
Open Procedure	Relatively straight forward and well used procedure. Suitable for procurement or re-procurement of established or well specified services.	Inflexible procedure No restriction on type of bidders submitting tenders No opportunity to negotiate or dialogue on solutions. Requires detailed input specification and all data at issue invitation to tender.	Can clarify bids.	No opportunity for market innovation. Risk that it may produce an unacceptable outcome resulting in non-award. Specification and performance requirements are fixed for Contract term. Large number of bids could consume resources and extend procurement timetable. Bids from unacceptable and inexperienced companies accepted.	Limited. Could be used for straight forward service procurement (e.g. waste haulage, recycling depot servicing).

Option	Strengths	Weakness	Opportunities	Threats	Practical Application
				Historic liabilities (e.g. landfill).	
Restricted procedure	Relatively straight forward and well used procedure. Pre-qualification stage used to screen bidders. Pre-qualification can be applied to short list number of bids at tender stage. Suitable for procurement or re-procurement of established or well specified services.	Inflexible procedure No opportunity to negotiate or dialogue on solutions. The PQQ stage extends procurement timetable.	Can clarify bids.	No opportunity for market innovation. Risk that it may produce an unacceptable outcome resulting in non-award. Historic liabilities (e.g. the three existing landfills).	Could be used for straight forward service procurement (e.g. waste haulage, recycling depot servicing, and Design and Build contracts).
Competitive Procedure with Negotiation	Pre-qualification stage used to screen bidders. Pre-qualification can be applied to short list number of bids at tender stage. Increased flexibility. Process can evolve in negotiation phase. Allows negotiation and innovation in some areas. Staged deselection possible. Areas beyond “minimum requirements” can be shaped to the CIG’s requirements.	“Minimum requirements” must be established and specified for issue of ITT. Must be capable of accurate pricing by bidders. The PQQ stage extends procurement timetable. Continuous improvement of minimum requirements constrained. Timetable for negotiation can be open ended.	Provides opportunity for market innovation in some areas. Unlikely produce an unacceptable outcome. Not fully compatible with a technology neutral approach. Opportunity to negotiate key areas/services. Can clarify bids. Outcomes can be partially shaped to meet the CIG requirements.	Limited application in waste management market to date may deter some bidders. Increased intensity of effort for both procuring entity and bidders. Successive stages of negation may threaten the CIG procurement timetable. May constrict some aspects of partnering.	Could be used for the procurement of core facilities and services.

Option	Strengths	Weakness	Opportunities	Threats	Practical Application
Competitive dialogue	Highly flexible procedure. Process can evolve. Maximises opportunity for innovation Compatible with technology neutral approach. Staged deselection possible. Tracked record of success for procurement complicated waste management solutions. Solution can be shaped to meet the CIG's requirements. Suited to output/performance based specification. Well suited to a partnering approach.	The PQQ stage extends procurement timetable. All aspects potentially open to dialogue. Timetable for dialogue. Can be open ended.	Suitable for partnering approach allows for continuous improvement. Can clarify and dialogue bids. Unlikely produce an unacceptable outcome. Can reopen dialogue if final tenders are not acceptable. New information and data can be developed during the process. Allows for solution and service evolution over time.	Resource intensive on both procuring entity and bidders. Successive stages of dialogue may threaten CIG procurement timetable. Historic liabilities (e.g. the three existing landfill).	Could be used for the procurement of all core facilities and services, integrated solution(s) and partnering.

Key

CIG	Cayman Islands Government
PQQ	Pre-qualification questionnaire
ITT	Invitation to tender
WtE	Waste to Energy

4.4 Output Specification

Introduction

The Specification for the integrated solid waste management services and infrastructure is key document for the procurement and contracting process. The production of an appropriate specification setting out the CIG's service and works requirements is a key aspect of the procurement and contracting process. All such specifications must be set out in the contract documents. The specification for the tender documents should provide an appropriate description of the contract work (e.g. for keeping, treating and disposing of waste).

The specification can take one of two general forms that lend themselves more appropriately to different contracting options:

- Outcome driven/non-prescriptive solutions (output specifications); and
- Input driven/prescriptive solutions (input specifications).

Both options are commonly used in waste management contracts. Service Contracts and Design and Build Works contracts are often supplemented by detailed input specifications (i.e. are primarily input driven). This reflects a clear vision from the procuring entity on what service or works it requires and exactly where and how these are be delivered and/ or clear requirements for a particular type of facility. The information provided needs to sufficient to enable an accurate price to be prepared by bidding companies.

However, where a Design Build Fund and Operate (DBFO) or partnering contract is required and the procuring entity cannot necessarily specify the final solution, or desires to remain technologically neutral during the procurement process, output driven specifications are more commonly employed. This approach provides greater flexibility, allowing potential contractors to innovate and propose alternative method(s) or facilities to deliver the services as part of the procurement process. As a consequence, the price and transfer of risk for proposed solutions will usually evolve, and can be potentially shaped to meet affordability constraints, up until the final tender stage.

For the purpose of developing this OBC it has been assumed:

- That the CIG will seek to procure a fully integrated package of services (encompassing the collection, treatment and disposal of all waste streams and the delivery and management of all facilities);
- That the CIG will seek to procure with a single entity or partner for the delivery of DBFO solution;
- That the CIG take a technologically neutral approach to the procurement and develop a largely output based specification; and
- That a flexible procurement procedure (such as competitive dialogue) will be adopted that will enable the specification to evolve in response to bidder submissions.

These assumptions will be subject to decisions and confirmation by the CIG.

Scope of Service

The service to be provided by the successful contractor is to receive and treat all Contract Waste. The precise definition for Contract Waste will be developed in tandem with output specification as part the procurement process. However, the definition will encompass municipal solid waste collected from households and trade waste collections undertaken by DEH, as well as the management of waste which is delivered into the Cayman Islands waste management infrastructure from householders and the operators of commercial waste collection services.

Framework to the Service Specification

Introductory Section

This introductory section will not formally comprise part of the service specification. It will be discarded post procurement when the Specification is contractualised.

Table 4.6 Proposed Contents

Element	Description	Comment
CIG Objectives and Aims	A clear expression of what the CIG wants to achieve from the service provision; both hard objectives and softer aspirations.	Hard objectives should be embedded in the individual Service Outputs (SO's).
Scope of Service (geographical)	A description of the service scope as it pertains to each island.	Will encompass geography, demographics and characteristics. (Will cross reference background information set out in the procurement documents for greater detail.
Scope of Service (delivery)	A summary of the services to be delivered.	For the purpose of the OBC the scope will be assumed to be a fully integrated package (including collection, treatment and disposal of all solid waste streams). This can be adjusted subject to the CIG.
Structure of Specification	A description of how the service specification is structured.	
Definitions	Cross reference to an Appendix to the Specification.	This will initially be developed as an Appendix to the Specification but this will need to be harmonised and merged with other Contract and procurement documents and appended as a single set of definitions (as a Schedule to the Contract).
Specification	Set out as a series of Parts and Outputs covering all of the services during the works, commissioning and operational (service delivery) stages.	See Table 4.7.

Service Specification – Outline Structure

Table 4.7 Proposed High Level Structure of Specification

Part	Service Output Ref	Service Output	Description	Comment
PR 1 Works Requirements	SO 1	Mobilisation	To cover all aspect of how the Works are to be mobilised from contract award through to Service commencement. To include a works and construction programme.	To include detailed works and construction programme, provision for the discharge of any pre commencement conditions.
	SO 2	Site, Planning and Design	This will set out requirements for the delivery of appropriate sites the approach to securing planning permission (for example compliance with regulations, EIA etc.) for those sites and any key design requirements.	This may include architectural aims and objectives.
	SO 3	Sites and Resources	Provisions for the practical aspects of the accessing the sites (e.g. highways works, times of work)Measures for assessing and dealing with any site contamination, existing building and underground structure, To include work force and sub-contracting requirements (e.g. selection process, controls).	This will address management structures and organisational responsibilities.
	SO 4	Standards	Regulations, standards, guidance and codes of practice to be applied to works and construction process.	This will include relevant building standards, permitting requirements and quality standards.
	SO 5	Environmental Controls and Health and Safety.	Environmental standards and systems to be put in place during the works phase. It will also include provisions for health and safety (e.g. reporting accidents and near misses, compliance with international standards and codes of practice).	This will encompass provisions for fire safety.
	SO 6	Public Relations and Communications	To include required protocols for communication with press and public. Reporting and meeting requirements.	

Part	Service Output Ref	Service Output	Description	Comment
PR2 Commissioning Requirements	SO 7	Cold Commissioning	The tests, responsibilities and timetable to be applied for cold commission.	
	SO 8	Hot Commissioning	The tests, responsibilities and timetable to be applied for hot commission.	
PR 3 Service Delivery Requirements (operations)	SO 9	Integrated Waste Management	How the service outputs are to be delivered as an integrated service for all three islands with cross service efficiencies. This will include performance targets (e.g. for recycling, diversion, energy recovery/efficiency).	To include requirements for a waste flow and/ resource model. Overarching / cross SO requirements for the service e.g. emergencies, ad hoc requirements.
	SO 10	Collection of Residual Waste, Recyclable Materials, Garden Waste and Other Waste	The collection of Contract Waste including the collection of Residual Waste, Garden Waste and Recyclable materials. Will encompass Bulky Wastes, Clinical Waste, Commercial Waste, and Assisted Collections.	Any emphasis on Bulky waste reuse, e.g. linked to Social Value? Provisions for waste receptacles. Commercial/trade waste.
	SO 11	Assets, Vehicles and Depots	Requirements for the fleet of vehicles to be deployed for the service and the depot(s) they will operate from.	Are existing assets transferring? If so will require an Asset list. Technology requirements (e.g. in cab systems, CCTV.
	SO 12	Abandoned and End of Life Vehicles	The collection, storage and disposal/recycling of Abandoned Vehicles and End of Life Vehicles.	
	SO 13	Waste Reception, Storage Transfer, Processing and Disposal	Arrangements for the delivery of Contract Waste to all Facilities, for the reception, storage, transfer, processing, treatment and disposal of Contract Waste. This will encompass lifecycle and maintenance requirements and provisions for Non Contract Waste (these could include industrial wastes).	Requirements relating to the delivery of Residual Waste, Recyclables and Garden Waste all facilities. This will include household waste recycling centred, recycling depots and transfer stations. Provisions for landfill require consideration.
	SO 14	End Markets for Secondary Materials and Products	The marketing and delivery to final markets and end users for all secondary materials and products derived from Contract Waste.	Requirements in relation to marketing of electricity, heat and recyclables.
	SO 15	Education, Communications and Service Promotion	The Contractor shall develop, implement and operate a Service that ensures effective community liaison including stakeholder consultation, educational, promotional and awareness activities, Service User feedback and appropriate measures for dealing with all communications.	The CIG will need to consider education and promotional activities it may wish to retain responsibility for itself, versus those assigned to the contractor.

Part	Service Output Ref	Service Output	Description	Comment
	SO 16	Integrated Service Management Monitoring and Reporting	Measures required for an effective service management system, consistent with the principle of total quality management that will integrate all plans, legal and contractual requirements, good management practice and provide an effective monitoring and reporting system for both the Contractor and the CIG.	Need to consider interaction with IT requirements.
	SO 17	Employment and Staffing	Responsibility for employment and staffing in undertaking all and Services.	To include organisational requirements and sub-contracting structures.
	SO 18	Health & Safety	Conducting the services in accordance with all relevant health and safety requirements.	Needs to encompass guidance and standards, including fire safety. Will need input and review from the CIG H&S officer.
	SO 19	Quality and Environmental Management	Operation of all aspects of the Services to a defined quality management system and environmental management system. Requirements for an Environmental control plan.	To include any requirements for carbon management and reporting. Measures for addressing and minimising environmental impacts.
	SO 20	Mobilisation	Measures to be carried out for effective and successful mobilisation of the operational service.	To include individual requirements for the mobilisation of each element the operational service. To include a mobilisation plan.
	O 21	Contingency Planning	Setting out contingency arrangements to be put in place to ensure delivery of continuous Service at all times.	To address closure of delivery points, non-availability of assets etc.
PR 4 Expiry and Handback Requirements	O 16	Contract Expiry	Requirements to enable effective and smooth handover at the end of the Contract period.	To address licences permits, assets. IP etc. To include the condition of plant equipment on expiry/handback.

Structure of Individual Service Output Requirements (SO's)

Each individual service output will have the following outline structure:

- Output Area/Service: Title;
- Service Outputs and Targets – expressed for each aspect of the Output-Specification (sub section);
- Service Requirements (*inputs*) - expressed for each aspect of the project;
- All sub sections to be numbered; and
- All paragraphs to be numbered.

Performance Standards

The key Performance Standards in the draft Output Specification will ensure that CIC exceeds its policy and significantly reduces the dependence and need to landfill waste.

The following list sets out some of the key Performance Standards to be included in the draft Output Specification:

- Waste reduction performance;
- Guaranteed reuse rate (%);
- Guaranteed recycling and composting rate (%);
- Waste recovery performance (%);
- Diversion of waste from landfill (%);
- Carbon Performance (kg CO2 equiv.);
- Facility availability;
- Turnaround times for collection vehicles;
- Minimum number of collection vehicles that can access the plant in any one hour during the working day; and
- Opening hours of the facility to receive Contract Waste.

It is anticipated that in addition to the above the output specification will also include that, in the event that the residual waste treatment facility is not available to accept Contract Waste, the CIG will be compensated by the contractor for disruption costs. The CIG will also give due consideration to proposals from its advisors with respect to alterations to the draft Output Specification.

There is an opportunity for the inclusion of other waste streams such as medical wastes. Where there is acknowledgement that financial benefits can be realised through the economies of scale that a larger facility will achieve. It will therefore invite bidders to propose solutions that can accommodate non-contract waste on the basis of securing a value for money solution.

5. Risk Management and Allocation

This section examines the project delivery risks in detail and how these can be mitigated. It also sets out the basis for contractual risk allocation between the procuring entity and contractor(s).

5.1 Introduction

The Technical sub-committee (please see Section 6.3) working with external advisers has identified project/ procurement risks' (risks associated with the procurement process and wider project), and contractual risks' (risks associated with the delivery of the services, which will either be retained by the public sector, transferred to the private sector, or shared between both parties). It is the intention that these risks will continuously monitored during the course of the project, their impact assessed and mitigating actions put in place to reduced their impact on the CIG and successful delivery of the ISWMS.

5.2 Contract Risk Allocation

A keys factor in delivering value for money and a successful procurement project is identifying the optimal level of risk transfer between the public sector and the private sector partner for the right price. In principle contract risks should be allocated to the party that is best able to manage and effectively mitigate the risk. It is therefore important for the CIG to appropriately allocate contract risks in an effort to generate value for money for its stakeholders.

Risk events that may occur over the life of the contract should be identified (as far as is practicable), and either allocated to one of the contracting parties (e.g. the CIG or the private sector contractor) or shared between the two parties. It is an accepted principle that value for money will be maximised when risk is transferred to the party best able to manage it.

Each risk, once identified is scored against the likelihood of occurrence and the severity of the risk if it occurred.

Risk Allocation Matrix

The first step in the contract risk allocation process is to identify and define key specific risks that may arise during the delivery and operation of the ISWMS. A list of over 80 risks was compiled by Amec Foster Wheeler, covering categories related to policy, strategic planning and service delivery. These risks are listed in Appendix C. An initial risk allocation workshop was then carried out with Technical Sub-committee and the specialist external advisors (as defined in Section 6.3) on April 20th 2016. This workshop defined the magnitude, impact and optimal allocation for each identified risk. The results of the workshop are shown in Appendix C and these were used in the value for money analysis undertaken by KPMG and described further in Section 8.4 and 8.5.

The positions set out in the Risk Allocation Matrix will be reflected in the Output Specification and are divided into categories of risk which are discussed very briefly below, but reference should be made to the detail provided in the Risk Allocation Matrix (Appendix C).

Design Risk

The transfer of design risk will mean the contractor is responsible for the following risks:

- Not delivering performance targets due to poor design;
- The need to amend the design to fulfil service objectives;
- The design process itself taking too long;

- Latent defects; and
- Regulatory compliance and building standards

The design will be subject to appropriate guarantees and warranties supplied by the contractor and their sub-contractors.

Site and Construction Risks

The transfer of construction risk will include time and cost overrun (and any resulting failure to meet performance as a consequence of latent construction defects and inadequate design). The allocation of site condition risk will depend on the sites selected for the delivery of ISMWS facilities. If these are provided by the CIG then the condition of the site and the risk historic liabilities site will ultimately pose a risk to the CIG, although these may partially mitigated through the procurement and contracting process. New site risks arising during the operational period of the contract will lie with the contractor unless these arise from actions of third parties.

Where sites are provided by the contractor then all site risks will lie with the contractor.

Planning Risk

The contentious nature of large waste management facilities increases the risk of both not securing a satisfactory planning permission and/or there being a delay to the project. The contractor will be expected to obtain planning permission for its chosen design and also to obtain all necessary licences, consents and statutory authorisations to enable it to operate the facilities. The cost of the planning process and compliance with planning conditions will in principle be a contractor risk. The contract will define satisfactory planning permission (SPP). If despite using all reasonable endeavours a SPP is not obtained, additional planning costs and compliance with conditions will be incurred.

In addition, there is a risk of timing delays or failure to obtain permission where the contractor has demonstrated that it used all reasonable endeavours to obtain the relevant consent. This might include requiring the contractor to provide an interim solution (“interim services”), deferring service delivery targets and/or placing a responsibility on both parties to work up an alternative solution if consents are not granted (“revised project plan”). It will also be necessary for the CIG to accept a force majeure (“no fault”) termination and compensation process if no suitable alternative can be identified.

Operational Risk

There will be substantial risk transfer through the Payment Mechanism, which will link payment and performance deductions to the delivery of the Output Specification and associated Key Performance Indictors (KPI’s). Any additional costs above those estimated in the price (including lifecycle costs) will be borne by the contractor, who will also bear the risk of obtaining licences and complying with regulations. Ultimately, failure to perform (whether this is due to an operational failure or otherwise) would allow the CIG to terminate the contract and either “sell” the project to a replacement contractor (provided there is a liquid market) or procure an estimate of the value of the contract. The comfort for the CIG would be that the contractor (and its funders) would only be compensated to the extent of the value of the project in this re-tendered or determined scenario.

Where appropriate, incentives will be considered and implemented in order to ensure the delivery of high performance standards, continuous service improvements and deliver operational cost efficiencies.

Residual Value Risk

If the assets have been funded specifically for this project the CIG will have the option, provided it has access to the land (either by way of ownership itself or a continuing lease from the contractor) to require that the facilities are transferred to it at nil value. There is a risk here that the assets are in a poor condition and are not required at the end of the project. The contract will require the contractor to maintain the assets throughout the contract period and 18 months prior to expiry CIG will have a right to conduct final surveys and require any rectification works to be undertaken if necessary (or to withhold if such works are not carried

out). The CIG will include a requirement that the facilities must have a design life which extends beyond contract expiry in order that residual value is maintained and the assets have a useful life and can continue to treat the CIG's solid waste for a further period of time. This will facilitate service continuity at the end of the Contract.

In addition, the Financial Case (Section 8) has made allowance for the accumulation of a capital sum over the 25 year operational period of the contract (equivalent to the initial capital cost of the project) that will be available to the CIG for re-investment in the ISWMS upon contract expiry. This is considered prudent as it will enable the ISWMS to be updated and refreshed to reflect modern requirements at the time of contract expiry (i.e. in 2044/45).

Financial Risk

The CIG's financial and technical advisers will undertake due diligence of the technical aspects of tenders and the financial model to ensure sufficient funds will be available to the contractor to run the project. Once the contract has been awarded, the contractor will bear the risk of running the project and paying back its loans and the calculation of its bid price will have taken this into account.

The CIG will however, be exposed to interest rate fluctuations prior to financial close and, given the nature of the waste industry, where key components will be purchased from abroad, this will include, exposure to foreign exchange rate fluctuations prior to financial close.

Performance Risk

The CIG will set out certain contractual performance targets (expressed as KPI's) and other requirements in the Output Specification and will require that the ISWMS facilities are available to the CIG to receive solid waste. The contractor will be required to meet such targets and comply with such requirements. Failure to do so could result in deductions through the Payment Mechanism and could ultimately lead to termination, though this is subject to certain "saving" provisions where, for example, the failure is due to a defined 'relief events' or a breach by CIG.

Demand Risk

There is a risk that the volume of demand for the waste services provided by the contractor will change. This may occur, say, due to demographic factors, or simply to people producing less (or more) waste. This risk can be shared, for example, by the contractor being paid in bands according to tonnage delivered and accepted. However, the ISWMS facilities will have a limited design capacity and should waste arising's exceed the design capacity then this may need to be augmented during the period of the contract. This may be accommodated by encouraging the consideration of modular designs in the Output Specification and providing for a controlled contract change mechanisms. Nevertheless, the CIG will be exposed to some price risk in the event that design capacities are exceeded for circumstances that are beyond the contractor's ability to control.

A common issue is the early years of the operational period is the situation where the design capacity of the facilities is under used and inevitably the allocation of the demand risk for this period. This would be explored further with bidders during the procurement process but may pose a risk to the CIG.

Technology/Obsolescence Risk

The long term nature of the contract (an operational period of 25 years or more) is necessary in order to provide sufficient time for the contractor to recover its significant capital investment costs. This need to make a long term financial commitment means that technology could progress significantly during the period of the contract. Provided the CIG does not require a change to the Output Specification, this is a contractor risk.

Substantial upgrading that would require a change to the Output Specification would be dealt with through the contractual change mechanism.

Legislative Risk

The risk of changes in law affecting the project will be allocated in accordance with the type of change in law incurred and is identified in risk allocation matrix (Appendix C). This allocates specific waste law changes to the CIG but passes general changes (e.g. employment law) to the contractor.

The contractor will be responsible for meeting existing regulatory requirements (at the time of financial close) and for the associated testing of facilities, plant and equipment. However, Amec Foster Wheeler identified as part of the NSWMS, a clear need for the CIG to develop an independent regulatory function and regime appropriate for the ISWMS. The risk and costs associated with these requirements will lie with the CIG.

5.3 Project/Procurement Risk Management

The pre-procurement and procurement phases of the project will be exposed to a specific set of risks that reflect the resourcing of the project, the status of the waste management market and other internal (e.g. the decision making process) and external influences (e.g. lack of competition) on the project.

A pre-procurement risk workshop will be undertaken by the Technical Sub-committee and the specialist external advisors prior to the commencement of the procurement process. The workshop will establish a comprehensive project definition statement that can be used as a basis for identifying, evaluating and developing response plans to risk events that have the potential to threaten the success of the procurement project. The propensity for risk events to materialise and their potential impact upon the project objectives can be assessed to permit comparison and prioritising of the project risks and their commensurate response action plans. The resultant risk register with associated action plans will be integrated into the overall project plan and responsibilities assigned. This risk register is continually under review and updated.

Examples of some of the key initial risks that may be identified are listed below:

- Senior officers are not engaged in the project in terms of time, resource and effort;
- Lack of market appetite and liquidity; and
- Loss of key members of the technical sub-committee and steering committee (e.g. due illness).

Project Risk Register and Management

A project risk register will be produced that identifies all the foreseeable project risks and potential consequences and identifies a strategy for managing out and mitigating those risks. The project risk register will be reviewed and updated as new risks emerge or exiting are risks closed out, but will be formally assessed as part of gateway review process at each key stages of the project delivery. These gateways will include:

Gateway 1 – Business justification;

Gateway 2 – Procurement decision;

Gateway 3 – Investment decision;

Gateway 4 – Readiness for service; and

Gateway 5 – Benefits evaluation.

6. Project Team and Governance (Management Case)

This section demonstrates that the ISWMS will delivered in line with best practice and that the CIG recognise the importance of effective and efficient project governance and appropriately resourced project and programme management. It sets out appropriate measures for change management, project monitoring, evaluation and contingency plans.

6.1 Introduction

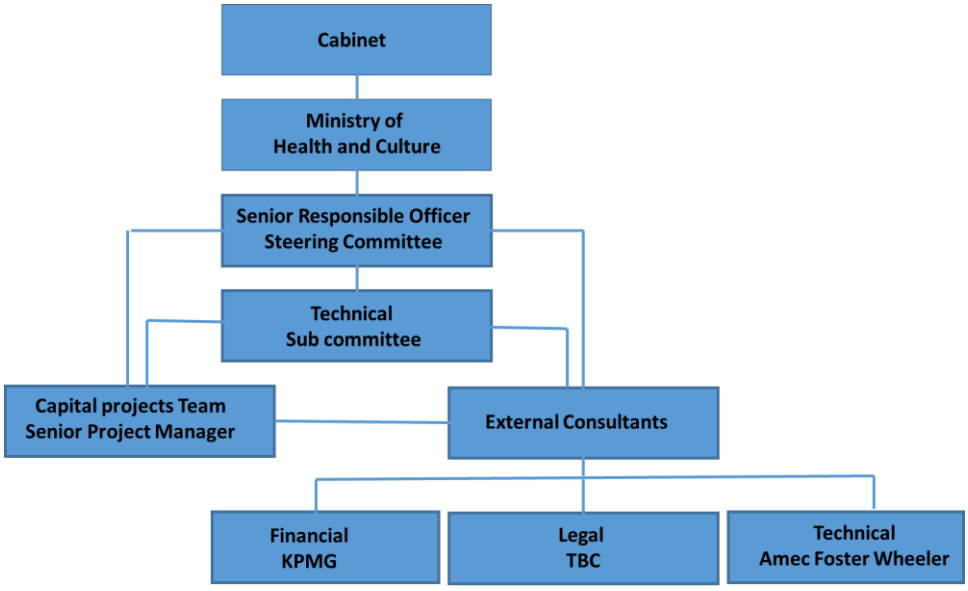
The CIG understands that a major procurement project such as this requires a knowledgeable, experienced and dedicated team with a range of specialist skills. The CIG has formed such a team and is confident that the appropriate project management and governance arrangements have been put in place to deliver a successful procurement project.

6.2 Project Management and Governance

The project management and governance arrangements during the procurement phase are intended to provide high level officer and governmental oversight of the project, while facilitating rapid decision-making and shorter lines of communications. This will enable what will be largely practical, commercial, management and organisational issues to be dealt with at officer level. Stage plans will be developed throughout the procurement process to identify, control and monitor project activities. In appointing staff to the various roles and setting budgets, care has been taken to consider the need for flexibility and contingency should staff changes occur and to ensure continuity from procurement into the contract management phase.

The project management and governance structure is shown Figure 6.1.

Figure 6.1 Project Management and Governance Structure



Project governance will be reviewed and revised towards the end of the procurement stage and at each gateway review to ensure that the future needs of contract mobilisation and contract management are adequately covered.

6.3 Project Team

The project team is led by Ms Jennifer Ahearn, the Chief Officer Ministry of Health and Culture, as the Senior Responsible Officer. The management of the project on a day-to-day basis is undertaken by Mr Jim Schubert, a Senior Project Manager in the Public Work Department who provides waste management and contractual expertise in liaison with other members of the project team.

The work of the Technical Sub-committee is both directed and overseen by the project Steering Committee. Technical Sub-committee will deliver reports and recommendations at key phases of the project (including each gateway) to the Steering Committee for open discussion and direction. The project Steering Committee includes senior officers from other Government departments, the Water Authority and a non–governmental representative.

Major decisions during the execution of the project will be made by the CIG Cabinet.

The Government Officers making up the Technical Sub-committee are set out below along with those making up the project Steering Committee:

Technical Sub-committee

Ms Jennifer Ahearn – Chief Officer, Ministry of Health and Culture;

Mrs Nancy Bernard – Deputy Chief Officer, Ministry of Health & Culture;

Mr Jim Schubert – ISWMS Senior Project Manager, Department of Public Works;

Mr Mark Rowlands – Assistant Director of Solid Waste, Department of Environmental Health; and

Ms Natasha Powell – Acting Policy Advisor, Ministry of Health and Culture.

TBD – Central Tender Committee.

Steering Committee

Ms Jennifer Ahearn – Chief Officer, Ministry of Health and Culture;

Mrs Nancy Bernard – Deputy Chief Officer, Ministry of Health & Culture;

Mr Jim Schubert – ISWMS Senior Project Manager, Department of Public Works;

Mr Mark Rowlands – Assistant Director of Solid Waste, Department of Environmental Health.

Mr Roydell Carter – Director, Department of Environmental Health;

Ms Gina Ebanks-Petrie – Director, Department of the Environment;

Ms Wendy Williams – Environmental Assessment Officer, Department of the Environment;

Mrs Gelia Frederick-van Genderen – Director, Water Authority;

Mr Ron Sanderson – Assistant Director, Department of Planning;

Mr Hendrik-Jan van Genderen – Engineer, Water Authority;

Ms Denise Stabler – Senior Project Manager, Department of Public Works;

Dr Samuel Williams - Clinical Head of Department (GPS), Health Services Authority;

Dr. Maysson Sallam - Former Assistant Director of Solid Waste, Department of Environmental Health;

Dr. Kiran KumarAlla - Director of Primary Health Care, Health Services Authority;

Mr. Nathan Dack - Sustainable Development Officer, Department of Environment;

Mrs. Catherine Crabb - Senior Development Control Technologist, Water Authority;

Mr. Haroon Pandohie - Director of Planning, Cayman Islands Government;

Mrs. Niasha Brady - Project Manager, Public Works Department;

Mr. Alva Suckoo - Ministerial Councillor, Ministry of Home & Community Affairs;

Mrs. Anne Owens Senior Assistant Financial Secretary, Ministry of Finance and Economic Development;

Mr. Max Jones – Director, Public Works Department;

Ms. Antoinette Johnson - Laboratory Manager, Department of Environmental Health; and

Mr Ray Farrington - Private Sector Representative, Butterfield Bank (Cayman) Ltd.

Specialist External Advisers

Technical Advisor – Amec Foster Wheeler Environment and Infrastructure UK Ltd. (Amec Foster Wheeler);

Financial Adviser – KPMG LLP. (KPMG); and

Legal Adviser – TBD.

7. Sites and Planning

This section addresses the approach to provisions of appropriate sites within the Cayman Islands for the development of facilities required for the delivery of the ISWMS. It also address responsibilities for the securing of appropriate planning approvals.

7.1 Approach to Sites

The identification of a suitable site capable of securing planning approval is critical to the successful delivery of any waste management project. The CIG will identify and offer a suitable site for the delivery of the core infrastructure needed for the ISWMS. Details of this site will be made available to potential contractors engaged at the outset of the procurement process. However, these potential contractors will also be invited to bring forward their own site proposals. These proposals will be subject to rigorous examination as part the tender evaluation process to ensure that the proposed sites are deliverable and are fully consistent with all requirements of the planning process and regulatory requirements.

Facilities for the bulking and transfer of solid waste will also be required on Cayman Brac and Little Cayman. The remediation of the existing landfills located on the islands may offer appropriate plots of land for this purpose although alternative sites brought forward by bidders for the ISWMS will also be considered.

The future need for landfill will be significantly reduced through the implementation of the ISWMS (as solid waste is diverted through recycling, waste to energy and other means of treatment). This landfill requirement will met by the design of new engineered facilities that are accommodated within the present boundary of the George Town landfill.

7.2 Planning

The successful contractor will be required to undertake all supporting work) and make all appropriate applications to secure planning consent for the waste management infrastructure comprising the ISWMS. In doing so, the successful contractor will comply with the requirements of the National Conservation Law (2013) and, pursuant to Section 43 of the law, the direction of the National Conservation Council to prepare an Environmental Impact Assessment.

The Central Planning Authority (CPA) on Grand Cayman and the Development Control Board (DCB) on Cayman Brac and Little Cayman will determine the planning applications. The Department of Planning is the governmental body responsible for supporting the CPA and DCB in regulating all forms of physical development in the Cayman Islands. The department is divided into four main sections:

- Building Control;
- Current Planning;
- Policy Development; and
- The Petroleum Inspectorate.

The Building Control Unit (BCU) reviews applications for building permits and inspects the structural, plumbing and electrical components of buildings and structures to ensure that there is sufficient compliance to relevant codes. BCU is anticipated to have important role in ensuring that the facilities comprising the ISWMS meet the required standards and codes of practice.

The Current Planning section (CP) is responsible for processing of development applications for presentation to CPA and DCB. Permission from Current Planning is required for a range of developments such as houses, apartments, commercial buildings and other structures. It is fully anticipated that the proposed development of the infrastructure comprising the ISWMS will be subject to rigorous assessment (including requirements for the provision of Environmental impact Assessments where appropriate) by the CP.

The Policy Development section (PD) is responsible for policy preparation and long-range planning issues such as land-use policies, conducting special studies, making revisions to the Development Plan, processing rezoning applications and preparing proposed amendments to the Development Plan.

7.3 Design and Sustainability Issues

Sustainability

The CIG is committed to ensuring that all new waste management development is designed to minimise its impact on the environment. The CIG's approach to design reflects the central principles of sustainable development which include:

- The need to reduce emissions of greenhouse gases as well as other forms of pollution;
- Reduce levels of energy and water consumption;
- To minimise waste; and
- To reuse or recycle materials.

This can be achieved by a variety of means, for example by:

- Renewable energy technology;
- Orientation and layout of buildings to maximise solar and other natural benefits;
- Energy management systems;
- Grey water recycling systems;
- Sustainable drainage systems;
- Energy efficient plant and equipment;
- Avoidance of air conditioning where appropriate; and
- The use of non-toxic, recycled or recyclable building materials (e.g. secondary aggregates).

Design

Contractor proposals for ISWMS solutions will be required to demonstrate that they have been designed to ensure impact on the environment is minimised by appropriate measures to:

- Reduce greenhouse gas emissions and other forms of pollution;
- Minimise levels of energy and water consumption;
- Minimise production of waste; and
- Maximise the re-use or recycling of materials; and protect and enhance the character and quality of an area.

However, it is important to balance design aspirations against cost and affordability. An allowance within the capital cost of the project will be made to ensure a suitable architecturally enhanced design is achieved. Design quality will be achieved by establishing clear principles and a good iterative process with the bidders. The principles will encompass design and architectural issues, based on the site location, managed stakeholder input and best practice.

8. Cost, Budgets and Financing (Financial Case)

This section presents the Financial Case for the delivery of the Reference Project and develops Net Present Value analysis for the project. It assess the value for money offered by alternative means delivering the Reference Project through the development of a Public Sector Comparator (based on a Design, Bid and Build approach) and a Public, Private Partnership (P3) model (based on a Design, Build, Finance, Operate and Maintain contract). It also identifies the funding requirements for the ISWMS, highlighting the Availability Payments required to fill the affordability gap.

8.1 Introduction

In assessing the overall financial requirements and affordability of the Reference Project this section of the OBC encompasses:

- An assessment of whether the Reference Project is better executed through a traditional Design, Bid, Build ('DBB') model or a Design, Build, Finance, Operate and Maintain ('DBFOM') business model. This requires:
  - Qualitative impact assessment of the DBB and DBFOM business models;
  - Project risk assessment, including risk workshop(s) with the Technical Sub-committee (see Section 6.3); and
  - Value for money analysis ("VFM"), which compares the risk-adjusted costs of delivering the Reference Project under each model and identifies the arrangement that provides the most value for money.
- The development of a set of financial statements, including balance sheet, cash flow and income statement, for the Reference Project;
- As part of the VFM analysis the following matters have been considered and are included in Appendix B:
  - Potential sources of revenue that could be tapped by the Reference Project – This is based on an analysis of user models implemented in comparable jurisdictions. These sources of revenue could help address the affordability gap of the Reference Project.
  - Potential funding structure – based on discussions with the Core Project Officer Team and Steering Committee, the financial analysis primarily contrasts the DBB and the DBFOM models. Further detail on various funding structures, potential debt/equity ratio, minimum debt service coverage ratio etc. have been addressed.

8.2 Background to the Public Private Partnership (P3) Business Case

What is a P3 Business Case?

A public private partnership (P3) business case is an important tool that assists in analysing the feasibility of using a P3 delivery model to execute a project. It identifies and compares the total project costs, risks and qualitative impacts associated with delivering a project under a traditional approach (i.e., design, bid, build) as well as various P3 delivery models. By identifying the costs, risks and qualitative impacts under each delivery model, project sponsors are able to determine if any of the P3 delivery models provide an opportunity to generate better VFM and other qualitative improvements compared to a traditional delivery model.

Why Consider P3 Delivery Models?

There are multiple options available to finance a project, including using available cash flow, reallocating funds, or taking out additional debt. Alternatively, there is an opportunity to use a P3 delivery model to leverage private sector investment. P3 delivery models are usually structured so that the public sector ultimately retains ownership of the asset whilst sharing many of the project risks with the private sector.

A P3 delivery model may be beneficial when there are constraints on the public sector, such as scarcity of funding, lack of budgetary commitments, or lack of expertise, that are preventing the CIG from achieving its objectives. Essentially, P3 delivery models enable the public sector to undertake projects that may not be timely, efficient, or even possible under conventional financing approaches. These delivery models allow the CIG to share the risks of a project while at the same time facilitating greater accountability for performance.

Having the option to transfer responsibilities, such as design and construction or ongoing operations and maintenance, allows government ministries or agencies to focus internal resources on their “core business” while overseeing the project and setting policy throughout the project life cycle.

Additionally, the transfer of responsibilities generally implies a transfer of risks, which limits the CIG’s exposure to cost overruns and other unexpected risks that may occur. In order to maximise return on investment, private sector partners have incentives to make appropriate up-front and life cycle cost trade-offs and take advantage of commercial opportunities. With appropriate performance-based contracts it is in the private partner’s best interest to pursue innovations that will improve the efficiency of the asset’s operations and enhance the services offered to end users.

An important characteristic of P3 delivery models is that the CIG can benefit from private sector efficiencies while retaining public ownership of an asset and ensuring that performance is maintained at the required standard.

Overview of Potential Delivery Models

The traditional delivery model for long term public sector projects is the Design Bid Build (DBB) model. For the Reference Project, however, the CIG is also exploring the possibility of delivering the Reference Project through the Design Build Finance Operate and Maintain (DBFOM) model.

It should be noted that these arrangements are illustrative in nature and have been used for the development of a VFM analysis as it relates to the OBC. The actual implementation of the ISWMS may adopt different delivery arrangements such as a different form of P3 arrangement or different packaging of services. This will be addressed during the procurement and implementation phases of the ISWMS project.

Salient features of each of the alternative delivery models are described below.

Traditional Design Bid Build Delivery Model

In a Design Bid Build (DBB) model, design and construction responsibilities are awarded to two separate private sector parties through two distinct contracts. By structuring the contracts separately the CIG retains a significant degree of control over the project as it manages both contracts. However, several financial risks and potential inefficiencies are absorbed by the CIG in a DBB procurement. For example, in this delivery model, the CIG retains design risk because the construction contract is based on the tendered design.

Once construction is complete the asset is handed over to the CIG to maintain and operate. This means that the design and construction contractors have no obligations for the asset’s long-term performance. The result is that the design and construction contractors might not make important trade-offs that can improve an asset’s lifecycle costs and performance.

Design Build Finance Operate Maintain (DBFOM)

The DBFOM delivery model awards a contract to a single private sector entity or consortium (the contractor) to design, build, finance, operate and maintain the asset for a prescribed period of time. Whilst the asset would be ultimately owned by the CIG, the contractor would assume responsibility for operation and maintenance of the project during the contract period, in accordance with a performance output specification.

The contractor is compensated through performance-based availability payments, which are linked to performance of the asset and the quality of operations. In addition to seeking efficiencies in design, construction, financing, and maintenance to lower the overall cost of the asset, the private partner also has a vested interest in the asset being delivered so that it works effectively during operations. The private sector contractor analyses the trade-offs between upfront cost and the efficiency and effectiveness of the asset.

In a DBFOM contract, the CIG would have less direct control over the delivery of services. As such, careful consideration must be taken to design a contract that holds the private partner accountable for appropriate standards of service through availability and bonus/penalty performance management structures.

At the end of the contract period, the private partner hands-back control of the asset to the CIG under agreed terms and conditions, known as hand-back conditions. The hand-back conditions would explicitly outline the expected condition in which the assets must be returned to the CIG and a stipulated life-expectancy beyond the term of the concession (e.g. 5 years post-contract). The contract would allow for damages if the hand-back conditions are not met.

8.3 Project Description and Risk Transfer

Project Description

As set out in Section 4 of the OBC, the Reference Project is made up of the following:

- Waste reduction measures – including waste education and pragmatic waste minimisation initiatives (e.g., home composting/ material return schemes such as bottles);
- The reuse and refurbishment of bulky waste;
- Community recycling depots and Household Waste Recycling Centre (HWRC) facilities;
- Transfer and bulking facilities (one per island);
- The windrow composting of yard/garden waste from landscaping operations and HWRC's;
- The potential introduction of kerbside yard and garden waste collections (post 2020);
- The potential introduction of kerbside dry recyclable collections with a Materials Recovery Facility (post 2020);
- The treatment of residual waste in a Waste to Energy (WtE) Facility (CHP enabled); and
- The remediation of the existing landfills on Grand Cayman, Cayman Brac and Little Cayman

The details of the Reference Project components are set out in Table 8.1:

Table 8.1 Reference Project Details

	Facility Location	Maximum Facility Capacity (tons)	Facility On line Date
Waste to Energy facility with CHP	Grand Cayman	53,000	2019/20
Materials Recovery Facility	Grand Cayman	11,400	2019/20
Windrow Facility	Grand Cayman	34,900	2017/18
Household Waste Recycling Centre	Grand Cayman	5,400	2016/17 Upgrade to existing facility

	Facility Location	Maximum Facility Capacity (tons)	Facility On line Date
Recycling Depots	Grand Cayman	1,300	2016/17
Bulking and Transfer Station	Grand Cayman	4,100	Already in use, but to be upgraded with another contract
Waste Transfer Station	Cayman Brac	3,600	2019/20 Will include areas for segregation of recyclables
Windrow Facility	Cayman Brac	600	2019/20 Will be built to take kerbside green waste collected
Waste Transfer Station	Little Cayman	300	2019/20 Will include areas for segregation of recyclables
Mechanical Treatment of Mined Landfill Waste	Grand Cayman	11,400	2019/20 This will produce c.5% recyclables and ta solid recovered fuel for treatment in spare capacity in the WtE facility.

Project Scope

As it relates to this OBC and the Reference Project, Table 8.2 sets out the allocation of responsibilities under each delivery model.

Table 8.2 Reference Project Responsibility under the Differing Delivery Models

Activity	Traditional	DBFOM
Design	CIG	Private Partner
Construction	CIG	Private Partner
Financing of construction costs	CIG	Private Partner
Maintenance of new facility	CIG	Private Partner
Operations*	CIG	Private Partner
Major maintenance / lifecycle for new facility	CIG	Private Partner
Payment Mechanism Structure	The CIG pays contractor as and when milestones are achieved.	The CIG pays all operations, maintenance and lifecycle costs over the project life through availability payments. No lump sum payments are made for capital expenditures.

Note – *the CIG may retain responsibility for the direct delivery of some service operations please refer to Section 4.2

For the Reference Project, the following activities would fall under the design, build, and finance category:

- Design of the facilities required to implement the ISWMS based on design output specifications and requirements issued by the CIG;
- Construction of the facilities on a fixed price and date certain basis; and
- Financing of the Reference Project under a long-term agreement.

For the Reference Project, the following activities would fall under the maintenance category:

- Maintaining and renewing the facility and providing “hard” facility management services, including mechanical and electrical plant operations;
- Utilities management; and
- Lifecycle management.

For the Reference Project, the following activities would fall under the operations category:

- Facility operations and service delivery’;
- Insurance;
- Security services; and
- Administrative support such as contract management, interfacing with various parties etc.

Qualitative Considerations

The qualitative analysis focuses on the following aspects of the Reference Project:

- Technical impacts;
- Maintenance and lifecycle impacts;
- Acceptability impacts;
- Implementation impacts;
- Timing impacts; and
- Financial Impacts.

It should be noted that the relative importance of each category may differ and that assessing the relative merits of each delivery model requires professional judgment based on a thorough assessment of all available facts and circumstances. To the extent possible qualitative impacts provide a context to help assess the relative importance and linkages among individual impacts.

While this section identifies some negative impacts associated with the various delivery models, none of these impacts appear significant enough to eliminate a delivery model from further consideration. These potential issues would, however, need to be addressed in further planning for the project depending on the delivery model selected.

The results of the qualitative analysis are largely driven by consultation with the Core Project Officer Team with input from the specialist external advisers (Amec Foster Wheeler and KPMG) and reflect the team’s professional judgement based on market knowledge and experience with similar projects in other jurisdictions. As shown in the following sections (with the output summarised in Tables 8.3 to 8.8), the process involved posing a series of questions to the Technical Sub-committee for each qualitative category and using the answers to those questions to determine the potential impact under each delivery model. It should be noted that not all questions result in an “impact” – rather, in some cases the question leads to the identification of opportunities and challenges that should be considered as the CIG proceeds with a given delivery model.

Technical Impacts

Technical impacts refer to the potential challenges and opportunities for designing and constructing the Reference Project. Regarding technical impacts the following questions were asked in order to assess impacts under each of the business models:

- Are there major technical challenges in design and construction for the project?
- Are there any challenges that would prove difficult for the contracting community to manage? and
- Can any of these challenges be better-addressed by the Public Sector versus the Private Sector?

Table 8.3 Technical Assessment

	Traditional	DBFOM
Technical challenges for design and construction	Low impact; proven technology will be used in building and installation requirements.	Low impact; proven technology will be used in building and installation requirements.
Public versus Private	Medium impact: While CIG currently provides waste management services, it has limited experience in certain components of the ISWMS such as the operation of a WtE facility.	Low impact: There are several industry participants that provide integrated waste management services worldwide and in the Caribbean.

Maintenance and Lifecycle Impacts

Maintenance and lifecycle impacts refer to the potential challenges and opportunities, on a technical level, for maintaining the facilities and performing requisite major maintenance/lifecycle work. Regarding maintenance and lifecycle impacts the following questions were asked in order to assess impacts under each of the business models:

- Are there major technical maintenance and lifecycle challenges for the project?
- Can any of these challenges be better-addressed by the Public Sector versus the Private Sector? and
- What is the potential impact of budgetary constraints on maintenance and lifecycle activities?

Table 8.4 Maintenance of Lifecycle Assessment

	Traditional	DBFOM
Technical challenges for maintenance and lifecycle	Low impact; proven technology will be used in building and installation requirements.	Low impact; proven technology will be used in building and installation requirements.
Public vs. Private	Medium impact: While the CIG currently provides waste management services, it has limited experience in certain components of the ISWMS such as the operation of a WtE facility.	Low impact; Operator community experienced with similar projects.
Potential impact of budgetary constraints	High impact; potential to defer major maintenance for budgetary reasons.	Low impact; maintenance and lifecycle are private partner requirements under contract.

Acceptability Impacts

Acceptability impacts refer to the potential opportunities and challenges associated with stakeholder impacts and perceptions under each delivery model. This is a particularly important category given that CIG has not previously undertaken a P3 approach for waste management. Regarding the acceptability impacts the following table identifies items of potential concern to each stakeholder based on the assessment of the CIG and the Ministry of Health representatives to the Technical Sub-committee.

Table 8.5 Acceptability Assessment

	Traditional	DBFOM
Local residents and support groups	Low-medium impact; the CIG currently provides waste management services. ISWMS technology will be required to demonstrably comply with modern waste management and environmental standards.	Low-medium impact; stakeholder groups may question a private party's involvement in administering essential infrastructure. ISWMS technology will be required to demonstrably comply with modern waste management and environmental standards.
CIG	Low-medium impact; the CIG currently provides waste management services but will need additional skills to operate ISMWS technologies.	Low-medium impact; there may be some resistance to enabling a private party to administer essential infrastructure. ISWMS technology will be required to demonstrably comply with modern waste management and environmental standards.

Implementation Impacts

Implementation impacts refer to the challenges and opportunities associated with procuring and delivering the Project under each delivery model. Regarding implementation impacts the following questions were asked in order to assess impacts under each of the business models:

- What is the track record for each delivery model (locally and beyond)?
- How complex is the procurement process for each delivery model?
- How complex is project management under each delivery model? and
- What are the capabilities of the contracting market for working within each delivery model?

Table 8.6 Implementation Assessment

	Traditional	DBFOM
Track record	Commonly used delivery model	Commonly used delivery model
Complexity of procurement	Low impact; relatively simple procurement.	High impact; requirement for new procurement and contract documents and procedures; additional complexity for including operations.
Complexity for public sector project management	Low impact; experienced with managing similar projects.	High impact; requirement for project management and governance, team and project management protocols; additional complexity for including operations.
Capabilities of contracting market	Low impact; high degree of familiarity with this model.	Medium-high impact; financing, equity, operations capacity and 25 year commitment can create barriers to entry for some contractors.

Timing Impacts

Timing impacts refer to the potential opportunities and challenges related to meeting project timelines. Regarding timing impacts the following questions were asked in order to assess impacts under each of the business models:

- Will the timeline to opening of the new facilities be impacted by the choice of delivery model? and
- If the delivery model impacts timelines, then how are various stakeholder groups affected by the different timelines?

It should be noted that the risk of delays during the selection process (e.g. higher project development costs and higher construction costs due to increases in material and labour costs due to a prolonged procurement) and the risk of time and cost overruns during construction (e.g. higher construction costs due to increases in material and labour costs during an extended construction period) have been quantified in the risk assessment.

Table 8.7 Timing Assessment

	Traditional	DBFOM
Delivery timelines	Assumed equal in all models.	Assumed equal in all models.
Impact on stakeholders	Low impact (assuming equal timelines).	Low impact (assuming equal timelines).

Financial Impacts

Financial impacts refer to the potential opportunities and challenges from cash flow and cost management perspectives. Regarding financial impacts the following questions were asked in order to assess impacts under each of the business models:

- What are the implications for short-term versus long-term cash outflows? and
- What are the implications for cost certainty during construction and operations?

Table 8.8 Financial Assessment

	Traditional	DBFOM
Short-term vs. long-term cash outflows	Requires largest up-front payment from public funds.	Smaller up-front payment from public funds at completion with balance paid over contract term.
Cost certainty	Some cost uncertainty during construction and operations.	Higher degree of cost certainty for construction, maintenance, lifecycle and operations.

Industry example – Consolidated Water Co. Ltd. ('CWCO')

- CWCO is listed on the Nasdaq Global Select stock market, designs, builds, operates and in some cases finances seawater reverse osmosis desalination plants and water distribution systems in several Caribbean countries;
- CWCO was established in 1973 as a private water utility in Grand Cayman to provide water and sewerage services to the Governor's Harbour residential development on Seven Mile Beach, Grand Cayman;

- CWCO obtained its first public utility license in the Cayman Islands in 1979. The 20 year water production and distribution license was to supply water to the West Bay Beach area of Grand Cayman;
- In 1990, CWCO received a new 20 year potable water production and distribution license from the CIG for the provision of water to Seven Mile Beach, Grand Cayman and expanded its service area into the district of West Bay, Grand Cayman;
- CWCO also sells water to the Water Authority of Cayman ('WAC') on a take or pay basis;
- The license terms require CWCO to pay a royalty to the CIG of 7.5% of the gross retail water sales revenues (excluding energy cost adjustments). The selling prices of water are determined by the license and vary depending on the type and location of the customer and the monthly volume of water purchased. The WAC on behalf of the CIG reviews and confirms the calculations of the price adjustments for inflation and electricity costs; and
- License renewal negotiations have been ongoing since 2010. In February 2011, the Water (Production and Supply) Law, 2011 and the Water Authority (Amendment) Law, 2011 were published and enacted. Under the new laws, the WAC will issue any new license, and such a new license could include a rate of return on invested capital model. The WAC had determined that a rate of return on invested capital model ('RCAM') for the retail license is in the best interest of the public and customers. RCAM is the rate model currently utilized in the electricity transmission and distribution license granted by the CIG to the Caribbean Utilities Company, Ltd ('CUC').

The CWCO example highlights that there is track record of a private party providing essential infrastructure services in the Cayman Islands. It also highlights the procurement related complexities of a P3 arrangement.

8.4 Project Contractual Risk Allocation and Assessment

Overview

One of the keys to the successful delivery of a P3 project is finding the optimal level of risk transfer between the public sector and the private sector partner. While no project can claim that it has the exact optimal level of risk transfer, it is important for the CIG to appropriately allocate project risks in an effort to generate VFM for its stakeholders.

It is essential to assess the probability and impact of each category of risk and determine how each risk will be mitigated or managed. Many ways of categorising risk exist, but the purpose is to clearly define, and subsequently select the appropriate risks to transfer to the private sector.

A successful P3 project will most likely have an efficient allocation of risks. This means:

- Transferring risks that the private sector is in the best position to price, manage, mitigate and/or insure;
- Retaining risks that the CIG is better positioned to manage; and
- Sharing or retaining risks which are outside the control of either party.

An inappropriate allocation of risks will impact the value for money offered by a P3. From the CIG's perspective, transferring risks to the private sector that would be better mitigated by the CIG may result in cost premiums, while retaining risks that should be transferred or shared may reduce the private sector's incentive for innovation and management control.

This section outlines the process used to identify and allocate project specific risks, provides a description of how risks are calculated for use in the development of the OBC, and provides the total retained risks by the CIG under each of the four delivery models.

The Risk Allocation and Assessment Process

The first step in the project risk assessment process is to identify and define a number of key project specific risks. A list of over 80 project risks was compiled by Amec Foster Wheeler. These risks included categories related to legislative compliance, planning and the construction and operation of the Reference Project. For a complete listing of project risks please see Appendix C.

Once the risks had been defined, a risk workshop was conducted on April 20, 2016 with several attendees from the Technical Sub-committee and the specialist external advisers. The workshop was led by Mr. Phil Scott from Amec Foster Wheeler and the participants were:

- Ms. Jennifer Ahearn (CIG);
- Ms. Nancy Barnard (CIG);
- Mr. Jim Schubert (CIG);
- Mr. Mark Rowland (CIG);
- Ms Ashita Shenoy (KPMG) and
- Ms. Natasha Powell (CIG).

The purpose of the risk workshop was to discuss each risk that had been identified for this project and assign an appropriate allocation of each risk between parties, the probability of each risk occurring and the associated cost impacts of the risk occurring. Where individual risks were deemed not applicable or immaterial, the probability and impacts for those risks were not quantified.

Prior to the workshop, a template risk matrix was circulated that provided baseline allocations, probabilities and cost impacts for each risk based on previous experience in the healthcare sector. During the risk workshop, adjustments to the allocations, probabilities or cost impacts of each risk were made (where appropriate) to reflect the unique characteristics of the Reference Project.

For each delivery model, each risk was allocated to one of the following:

- The CIG – it is the responsibility of the government to manage the risk;
- The Private Partner – responsibility for managing the risk is transferred to the private sector; or
- Shared – the CIG and the private partner share responsibility for managing the risk (50/50).

In the case of the P3 models, the goal was to allocate each risk to the party best able to manage that risk. As noted earlier, the appropriate allocation of risks is a key driver in establishing value for money under a P3 approach. Appendix C outlines the allocation of project risks under each model.

Having identified and allocated the project risks, the next task was to establish the probability of each risk occurring and determine the low, typical, and high cost impact of each risk under the delivery models. This information is essential for quantifying the risks for use in the VFM analysis. When assigning probabilities to each of the risks, the working group had to determine the likelihood of that risk occurring and the estimated impact. These impacts were expressed in specific CI$ amounts to allow for easier use in quantifying the risks.

To help put this into context, consider, for example, that previously unknown soil contamination is found on the site during construction. Depending on how contaminated the soil is, there is the potential for the cost impact to be low, typical or high. During the risk workshop, the risk working group determined what the cost impact would be (as a percentage of the cost base) for each of the models. Appendix C provides the probabilities and cost impacts for each risk under each of the procurement models.

Risk Quantification Process

After completing the risk workshop, the outputs from the workshop (risk allocations, probabilities and impacts) were used to quantify each risk under the traditional DBB procurement model and the DBFOM model. The purpose of this quantification exercise was to assign a dollar value to each risk that the project may face for use in the VFM analysis. Each risk was quantified using the following formula:

Risk Cost = Probability of Risk Occurring * Impact of Risk

The components of this formula are explained below:

- **Probability of Risk Occurring** – This refers to the likelihood that the risk identified will occur during the life of the project as determined through the risk workshop; and
- **Impact of Risk** – This refers to the expected cost impact of each risk occurring as determined through the risk workshop.

Since there is usually a degree of uncertainty as to the impact of each risk a statistical technique, known as Monte Carlo Simulation, was used to help reduce that uncertainty. Monte Carlo Simulation is a technique that can be used to predict the most likely value of uncertain variables as defined by their probability distribution. It relies on repeated random sampling to compute the risk results.

To reflect this uncertainty, the Monte Carlo Simulation used the low, typical, and high cost impacts estimated in the risk workshop in a probability distribution (in this case a triangular distribution) to calculate the cost impact rather than using a single definitive value. This was done through the use of simulation software called @RiskTM. For the purposes of this analysis, 10,000 iterations were performed on each risk.

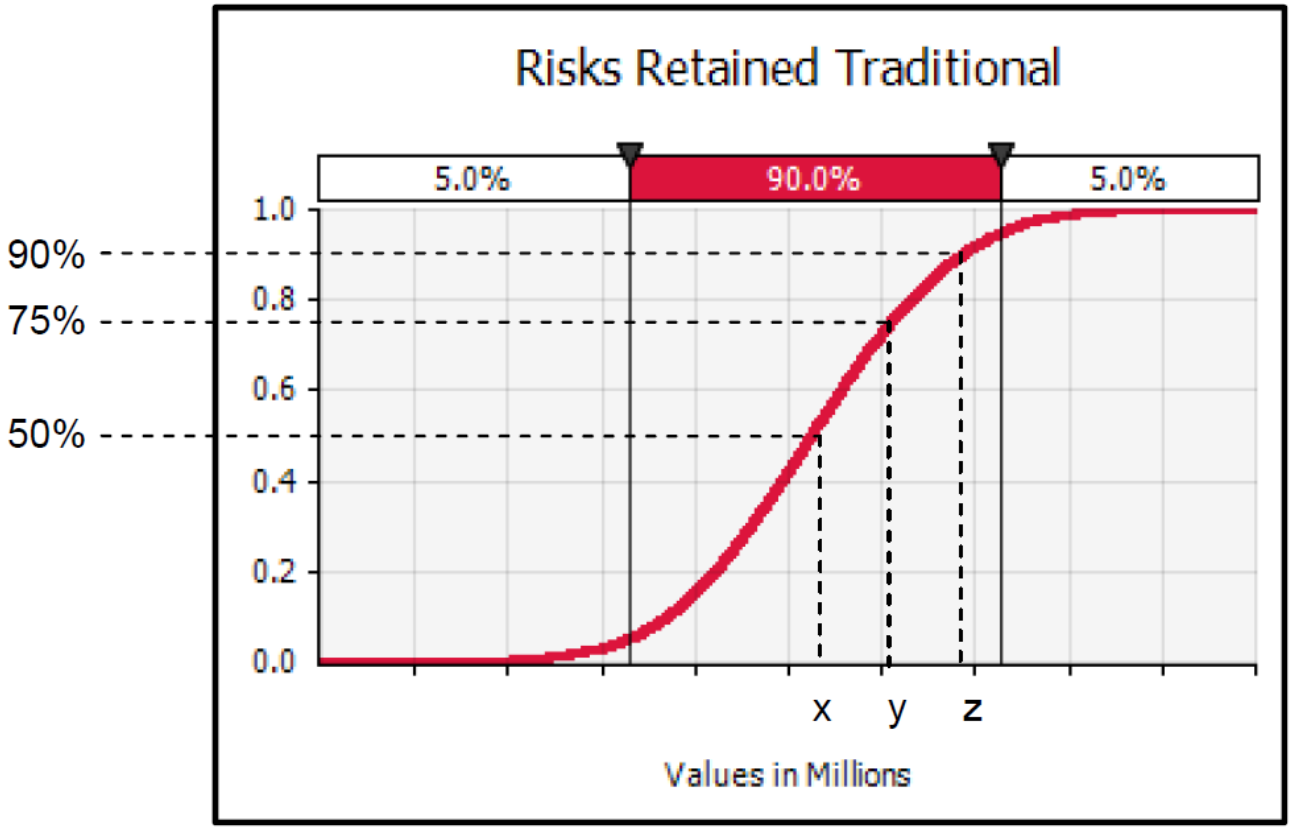
Each risk was quantified then allocated to the appropriate party (the CIG, private partner, or shared) as determined in the risk workshop. In the case of a shared risk, half of the value calculated was apportioned to the CIG, while the other half was allocated to the private partner.

The value of the CIG's retained risks under the traditional DBB model and DBFOM model were then added to the Public Sector Comparator and Shadow Bid models respectively to aid in assessing value for money.

The VFM analysis explicitly accounts for the risks retained by the CIG under each delivery method to ensure a like for like comparison of the delivery methods. The reduction in risks retained by the CIG under P3 delivery, as compared to traditional delivery, is a key driver of VFM. For clarity, the quantification of the retained risks is presented from the CIG's point of view to reflect the value the CIG places on the risks.

Figure 8.1 below is an example of the resulting distribution (as described above) showing the probability of the retained risk values to the CIG in dollars along the horizontal axis and confidence levels on the vertical axis (0% - 100%). This is from the Base Case traditional DBB model.

Figure 8.1 Probability of CIG Retained Risk Value – Traditional DBB Model



With the resulting probability distribution of total risk value, the estimated total risk value at different confidence levels can be calculated. The use of confidence levels allows the CIG to choose the level of risk it is willing to tolerate, which can be applied to the analysis. The Base Case (as described in Section 5) assumes a confidence level of 75%; however, the sensitivities were run on the Base Case using confidence levels of 50% and 90%.

- At a confidence level of 50%, 50 times out of 100 the actual risk value will be below the estimated risk value. This is often referred to as the expected value. In the figure above, at a confidence level of 50%, the value of the CIG's retained risks would be estimated at "x" millions of dollars, corresponding to a 50% probability that the actual cost will be x or less;
- At a confidence level of 75%, 75 times out of 100 the actual risk value will be below the estimated risk value. In the figure above, at a confidence level of 75%, the value of the CIG's retained risks would be estimated at "y" millions of dollars, corresponding to a 75% probability that the actual cost will be y or less; and
- At a confidence level of 90%, 90 times out of 100, the actual risk value will be below the estimated risk value. In the figure above, at a confidence level of 90%, the value of the CIG's retained risks would be estimated at "z" millions of dollars, corresponding to a 90% probability that the actual cost will be z or less.

Summary of Risk Assessment Results

Table 8.9 below presents the CIG's retained risks at various confidence intervals under the Public Sector Comparator (PSC) and DBFOM arrangements:

Table 8.9 Value of CIG Retained Risk at Confidence Levels

Confidence Level	Traditional	DBFOM	Risk Transfer
50%	45,730,883	24,534,964	21,195,919
75%	48,384,484	26,630,749	21,753,735
90%	50,890,197	28,504,229	22,385,968

Detailed risk modelling results are presented in Appendix E.

Table 8.9 shows that by employing the DBFOM arrangement, the CIG is able to allocate a certain portion of the overall variability in the value of estimates to the private sector. This is evidenced by lower retained risk estimates under the DBFOM scenario versus the PSC scenario.

As confidence intervals increase, the risk of variability increases as well. Consequently, risk transfer is higher at higher confidence intervals.

8.5 Value for Money (VFM) Analysis

Overview

An important factor to consider when performing a business case analysis is whether VFM is generated for the CIG by using a P3 delivery model when compared to the traditional procurement option. Generating VFM does not necessarily imply that the option with the lowest base costs should be selected. Since VFM is a combination of whole lifecycle cost and quality to meet the user requirements, one must consider the risk adjusted costs to the CIG over the life of the Project. In simple terms and in the context of P3 procurement, a VFM analysis is a process for developing and comparing the risk adjusted total project costs, expressed in dollars measured at the same point in time, for the following alternatives:

- **Traditional Delivery** – This is the estimated cost to the CIG of delivering the Reference Project using a traditional procurement process. The analysis looks at the total estimated risk-adjusted costs on a net present value (NPV) basis and is referred to as the Public Sector Comparator (PSC). The PSC for this OBC has been assumed to replicate the traditional DBB model; and
- **Public Private Partnership** – This is the estimated cost to the CIG of delivering the Reference Project to the identical specifications using a P3 procurement model. The analysis looks at the total estimated risk-adjusted costs on an NPV basis and is referred to as the Shadow Bid (SB).

The difference between the PSC and the SB on a NPV basis is referred to as the VFM. If the SB is less than the PSC, then this indicates positive VFM by procuring a project using the P3 model. Conversely, if the SB is greater than the PSC then there is potential for negative VFM through using a particular P3 delivery model. This is a standard methodology that is used in other countries around the world such as the United Kingdom, Canada and Australia.

Assumptions

This section outlines the assumptions used in developing the PSC and SB models for the Base Case for the Reference Project for the development of the OBC and VFM analysis. Any adjustments made to the Base Case assumptions while running sensitivities are outlined in the following Section. Please note that KPMG has not audited or independently verified the information, assumptions or inputs to the OBC that have been supplied by other parties and there may be risks and unknown factors that will have a substantial impact on the assumptions and estimates used in this analysis. Given the sensitivity of the estimates to the underlying assumptions and the number of unknown and evolving issues, we strongly recommend that a further update to the estimates be prepared prior to commissioning the Reference Project, and thereafter as circumstances change throughout the life span of the Project and particularly when internal or external factors which may impact the Project change significantly.

Table 8.10 below provides each assumption, the source of each assumption and, when necessary, the rationale for using a specific assumption. All values displayed in the table are in nominal terms, unless stated otherwise.

Table 8.10 VFM Analysis Assumptions and Inputs

Parameter	Assumption	Source
Procurement Start Date	October 1, 2016	CIG
Procurement and Construction Period	48 months	Amec Foster Wheeler
Contract Period	25 years	Amec Foster Wheeler
Base Construction Costs	Waste to energy: CI$ 60.01M Other components: CI$ 41,71M Land: CI$ 4.36M Total: CI$ 106.08M	Amec Foster Wheeler and CIG
Annual operating costs (cumulative over the projection period without adjusting for inflation)	**Export costs**: CI$ 26.13M **Operating expenses**: CI$ 203.2M **Lifecycle costs**: CI$ 22.74M **Barge costs**: CI$ 8.9M **Collection expenses**: CI$ 165.65M **Total**: CI$ 426.52M	Amec Foster Wheeler and CIG.
Annual operating revenues(cumulative over the projection period without adjusting for inflation)	Electricity revenue: CI$ 107.93M Collection fees: CI$ 118.47M Tipping fees: CI$ 41.67M Total: CI$ 269.07M	Electricity revenues derived from CIG and projected by Amec Foster Wheeler indexed to general inflation rate. Collection fees based on empirical data, indexed to growth rate of waste tonnage. Tipping fee based on $40/ ton, indexed to growth rate of waste tonnage.
Inflation	1.6% Building materials annual inflation to be 1% in 2017, 2% in 2018, 3% in 2019 and 4% thereafter.	Selected by KPMG based on the geometric mean of the historical rates published by the Economics and Statistics office ('ESO') for the three most recent years where inflation was positive. Long term rates are not published by the ESO and the most recent period experienced deflation. All streams of income and expenses have been indexed to this rate as the ESO does not publish long term rates for different categories such as fuel, building materials etc.

Notes on assumptions:

- The base construction costs, other facilities include financial provision for the remediation of the existing landfills on the Cayman Islands;

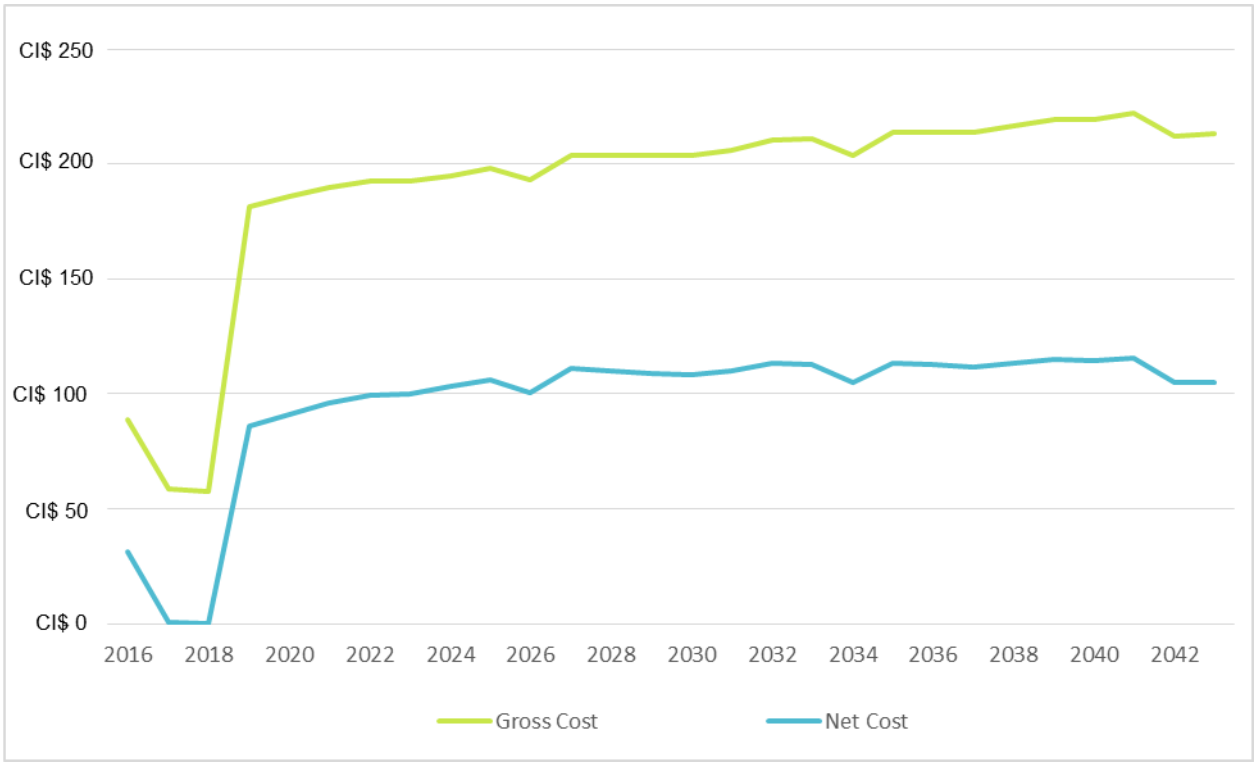
- The revenue streams listed above are indicative rather than comprehensive in nature. Other revenue streams may need to be identified to close the affordability gap identified in our analysis. There are also other streams of revenue such as proceeds from recyclables that are not expected to make a significant contribution to the overall revenue line item and therefore have not been modelled;
- The analysis assumes that the Reference Project will be an output supplier to the CIG rather than a standalone profit centre. Therefore, the Allocable Revenue line item (i.e. the amount of revenue needed from the CIG to close the financing gap) is set to an amount equal to cover the net operating expense plus capital charge;
- The financial analysis contemplates cash funding for the depreciation component. As a result, at the end of the service concession period, the financial statements show an accumulation of cash that approximates to the book value of the capital investment made at the inception of the Reference Project. This accumulated cash can be used to make a substantial completion payment at the renewal of the service concession agreement; and
- The availability payments have been calculated in a manner that includes a return on invested capital and allows for a profit margin on net operating expense as a compensation to the private party for operating the facility. Existing P3 arrangements in the Cayman Islands as they relate to CWCO and CUC are not directly comparable as they have been set up as independent companies with outside investors that have the ability to charge revenues from customers who avail of their service. These are also well established businesses. However, the underlying pricing mechanisms that the CIG has negotiated or is negotiating with these providers appear to take into the account invested capital and a minimum return requirement on such capital. KPMG have followed those principles when developing the analysis.

Summary of Quantitative results

Gross costs have been derived by dividing total operating expenses by the number of tons processed annually. The overall average is approximately CI$190per ton.

Net costs have been derived by reducing operating revenue from gross costs. This graphic is presented to highlight the offsetting impact of growing revenues on the overall processing costs. Net costs average CI$96 per ton.

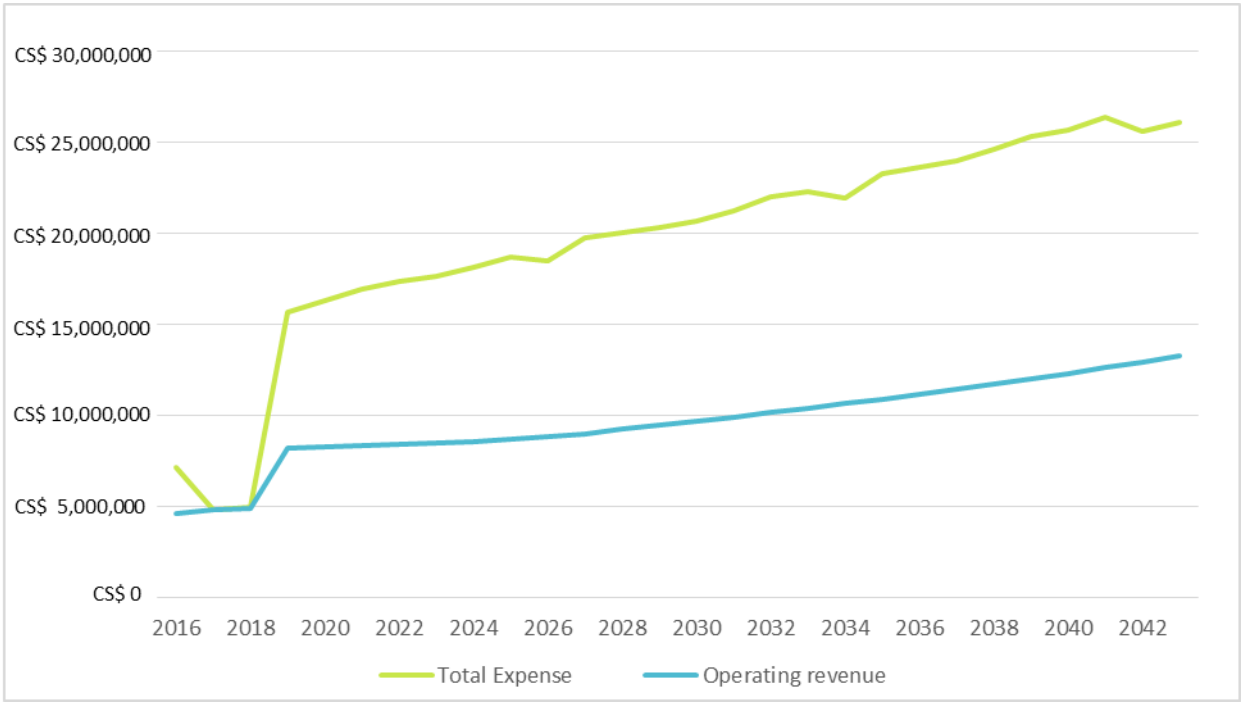
Figure 8.2 Average Annual Operating Cost (CI$) per Ton



Revenue vs. Expense (PSC only)

Figure 8.3 below summarises the total expenses (undiscounted, indexed to inflation) vs. total revenue that is expected to be generated from various sources. The difference between these two will need to be funded by CIG on an ongoing basis. This funding need has been defined as 'Allocable Revenue'.

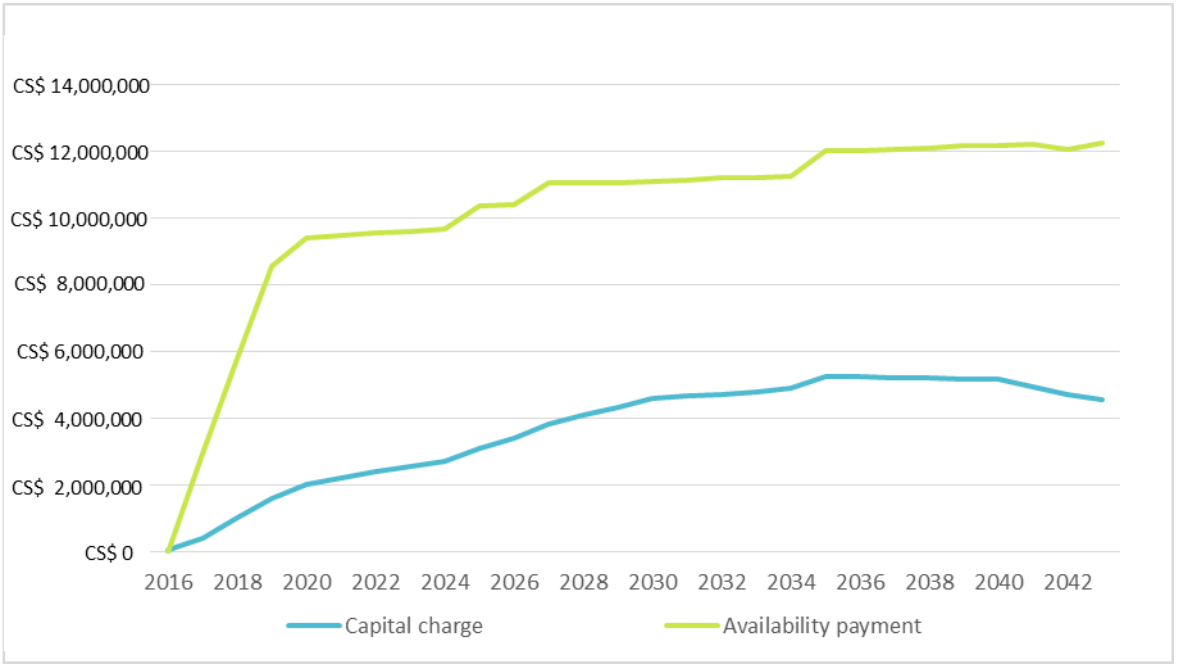
Figure 8.3 Total Expense (CI$) and Revenue over Time



Capital charge versus. Availability payment

The main area of difference between the cash flows for the PSC and SB arrangements arises from the availability payments for the SB arrangement being higher than the capital charge for the PSC arrangement. The difference in these numbers and the corresponding impact on allocable revenue is shown in the Figure 8.4.

Figure 8.4 Capital Charge (CI$) and Availability Payment over Time



It is important to note that this difference should be evaluated in the context of:

- Limited capital outlay for the SB arrangement versus the full funding of capital expenditure under the PSC arrangement; and
- The ability to finance payments annually under the SB arrangement versus lump sum expenses that need to be incurred upfront for capital expenditure under the PSC arrangement.

In other words, while the SB arrangement results in higher cash outlays on an annual basis, it should be evaluated in the context of the flexibility available for funding and financing a project.

Sensitivity tests

It is important to consider sensitivities to the Base Case for the Reference Project when evaluating a long term. As most of the baseline operating and capital cost estimates in the financial model have been derived from Amec Foster Wheeler and CIG the sensitivity tests have been performed on the revenue.

The sources of revenue and related sensitivities shown in Table 8.11 have been identified as relevant:

Table 8.11 Revenues and Sensitivities

	Base case revenue		Sensitivity case	
	Cumulative	**Annual average**	**Cumulative**	**Annual average**
Tipping fee **In the base case this has been estimated at $40/ ton.** **Based on discussions with the CIG, an increase of up to $60/ ton could be construed as reasonable.**	CI$ 41,668,913	CI$ 1,488,175	CI$ 62,503,369	CI$2,232,263
Electricity revenue **In the base case, this has been indexed to the general inflation rate of 1.6%.** **Based on discussions with the CIG and by comparing the fuel costs incurred by CUC to Brent spot prices, indexing this revenue stream to long-term projections for Brent could be considered as reasonable.**	CI$ 145,632,883	CI$ 5,201,174	CI$ 181,737,841	CI$ 6,490,637

Summary of VFM Results

The purpose of a business case analysis is to determine and assess the viability of a project by looking at both the financial and non-financial costs and benefits to the CIG. An essential part of this analysis is the development of the PSC and SB models which allow the CIG to compare the present value of the total risk-adjusted costs across alternative delivery options. If the NPV of the costs under the SB are less than the NPV of the costs under the PSC, then VFM is achieved for the CIG through using the specific P3 model.

This analysis is being performed in the project feasibility stage, therefore it is important for the CIG to test and compare the viability of a range of scenarios. By doing this, the CIG will gain a better understanding of the feasibility of various project structures and can assess the impact of any changes to the base case assumptions.

Using the assumptions presented above, the value for money analysis has been prepared for the Reference Project Table 8.12 below presents the high-level VFM results.

Table 8.12 Summarised VFM Results

Public Sector Comparator (PSC)	
Estimated Cost	
NPV of Construction Cost	CI$ 113,249,519
NPV of Capital Charges	CI$ 59,712357
NPV of O&M Costs	CI$ 328,773,028
Sub Total	CI$ 501,744,055
NPV Procurement Costs	CI$ 2,710.776
Retained Risks	CI$ 48,384,484
Total NPV of PSC	CI$ 552,839,315
Total Estimated Value for Money	
As % of PSC NPV	

Shadow Bid (DBFOM)	
Estimated Cost	
NPV of SC Payment - Land only	CI$ 4,356,000
NPV of Availability Payments	CI$ 173,649.306
NPV of O&M Costs	CI$ 328.491,898
Sub Total	CI$ 506,497,204
NPV Procurement Costs	CI$ 4,441,569
Retained Risks	CI$ 26,630,749
Total NPV of Shadow Bid	CI$ 537,569,523
	CI$ 15,269,793
	2.76%

Sensitivity tests

As noted in the preceding section, it is important to consider sensitivities to the Base Case when evaluating a long term project. The impact of the variability has been evaluated for the following key parameters on the project NPV:

Change in the CIG's borrowing costs by +/- 50bps

Table 8.13 presents this scenario wherein the CIG's borrowing costs change by +/-50bps (Base Points). This demonstrates the SB remains unaffected as fixed rates will be agreed with the Operator at the start of the service concession period.

Table 8.13 Sensitivity to Borrowing Costs

NPV of capital charge in base case	Impact on PSC NPV - CI$ 59.7m VFM as a % of PSC NPV – 2.76%
+50 bps change in borrowing cost	Impact on PSC NPV –CI$ $115.12m VFM as a % of PSC NPV – 7.83%
-50bps change in borrowing cost	Impact on PSC NPV –CI$ 4,32m VFM as a % of PSC NPV – (8.07)%

Change in Operator's financing charge by +/- 50bps

Table 8.14 presents this scenario wherein the operator's borrowing costs and by extension the financing component of the availability payments change by +/-50bps. As shown in Table 8.14 the PSC remains unaffected this does not affect the CIG's borrowing costs.

Table 8.14 Sensitivity to Financing Charge

NPV of availability payments in base case	Impact on SB NPV - CI$ 173.65m VFM as a % of PSC NPV – 2.76%
+50 bps change in borrowing cost	Impact on SB NPV - CI$ 174.47m VFM as a % of PSC NPV –(2.61)%
-50bps change in borrowing cost	Impact on SB NPV -CI $ 172.83m VFM as a % of PSC NPV – 2.91%

Summary of Overall Results

As evidenced by the results of the VFM analysis above, it appears that a DBFOM model would create the greatest VFM in delivering the Reference Project. However, when deciding on a delivery method for the project, one cannot simply look at the results of the VFM analysis when making a decision.

The results of the qualitative analysis also indicate that the DBFOM model creates several opportunities for more efficient and effective delivery of the Reference Project. While there are no qualitative impacts great enough to eliminate a given delivery model, the DBFOM appears most favourable from a qualitative perspective.

With the VFM results and qualitative analysis, several potential benefits can be realised through the CIG proceeding with a DBFOM model for delivering the ISWMS. However, the CIG must consider the added complexities associated with managing a successful DBFOM procurement. Examples include the additional up-front costs for planning and procurement, the resources required for project management and project governance, and the need for detailed external communications. The CIG must also consider the long term requirement for contract oversight with a 25 year DBFOM contract term.

The CIG must consider several risks and opportunities in making a decision on the appropriate delivery model. Ultimately, the CIG must determine which delivery model offers the best combination of VFM and risk transfer while ensuring the high standard of operational performance.

8.6 Accounting treatment for DBFOM arrangement

Basis of accounting

The IFRS Interpretations Committee (IFRIC) is the interpretative body of the IFRS Foundation. Its mandate is to review on a timely basis widespread accounting issues that have arisen within the context of current International Financial Reporting Standards (IFRSs). The work of the Interpretations Committee is aimed at reaching consensus on the appropriate accounting treatment IFRIC Interpretations) and providing authoritative guidance on those issues. IFRIC 12 – Service Concession Arrangements has been identified as relevant guidance that would influence the accounting treatment for a DBFOM arrangement.

In the service concession arrangement context, CIG has been identified as the grantor of the concession (the “Grantor”) and the private party has been identified as the operator of the concession (the “Operator”).

As context for this section, we have envisaged that the DBFOM arrangement would work as follows:

- The Grantor would provide the land on which the facilities relevant to the Project would be situated. This land would continue to be owned by the Grantor throughout and at the end of the service concession period;
- The Grantor controls or regulates:
  - What services the operator must provide with the infrastructure – based on discussions throughout the course of the engagement, it is understood that during the procurement

phase, CIG would draft a detailed list of services that are relevant to the implementation of the Reference Project and include them in the tender documents;

- To whom it must provide them – The Reference Project covers the needs of all residents of the Cayman Islands. It is understood that once the service concession is granted, the Operator would not have discretion over selectively excluding segments of the resident population that it does not want to service; and
- At what price –It is understood that funding and financing sources for the Reference Project are currently under discussion. However, any impact on the public, through fees or coercive revenue, would be at the discretion of the Grantor rather than the Operator. It is also expected that outgoing price changes will be regulated either by the Grantor or a third party.

- The Grantor controls—through ownership, beneficial entitlement or otherwise, any significant residual interest in the infrastructure at the end of the term of the arrangement.

IFRIC 12 covers the Operator's perspective. The Grantors perspective is assumed to be corollary to the Operators perspective. For guidance on the Grantors perspective reference has been made to the "Proposed International Public Sector Accounting Standard – Service Concession Arrangements" issued by the International Federation of Accountants, The following points have been considered to be relevant for the purposes of developing a Base Case financial model:

- Infrastructure within the scope of the IFRIC 12 Interpretation shall not be recognised as property, plant and equipment of the Operator because the contractual service arrangement does not convey the right to control the use of the public service infrastructure to the operator. The operator has access to operate the infrastructure to provide the public service on behalf of the Grantor in accordance with the terms specified in the contract;
- By extension, it is assumed that the Grantor would then recognise property, plant and equipment as fixed assets on its balance sheet. As the Operator bears the construction risk, the timing initial recognition of the service concession asset is set to the point when the asset is placed into use;
- The Grantor shall measure the asset at its fair value. After recognition as a service concession asset, the Grantor shall measure the asset in accordance with the standards pertinent to fixed assets;
- When the Grantor recognizes a service concession asset, the Grantor will also recognize a liability. The liability recognized shall be initially measured at the same amount as the service concession asset. The liability recognized may be any combination of a financial liability and a performance obligation;
- In relation to the selection of the discount rate for fair value measurement, IFRIC 12 indicates that the total consideration receivable by the Operator may be discounted to the amount equal to the total fair value of the services rendered or it may be discounted using a prevailing rate of lending to the Grantor, with the resulting amount allocated in a manner proportionate to the estimated fair values of the services rendered. Based on this guidance, the discount rate used by the Grantor has been set to the rate of return demanded by the Operator to fund and operate the facility. In other words, the discount rate is the rate at which the net present value of the availability payments will equal the book value of the fixed assets at the time of recognition of the fixed assets on the Grantor's balance sheet; and
- The International Public Sector Accounting Standards Board (IPSASB) considered whether the Grantor should recognize operating expenses when calculating the net present value of the performance obligation. The IPSASB noted that if service expenses were recognized then the grantor would also have to recognize annually imputed revenue equal to the annual expense. The IPSASB did not believe this accounting would provide useful information.

Illustrative financial statements

In projecting a set of illustrative financial statements from the Grantor's perspective, the following assumptions were considered to be relevant:

- Property, plant and equipment was recognised at book value in the Grantor's balance sheet as an asset. This balance is depreciated over the service concession period which is assumed to match the useful life of the asset;

  Availability payments have been estimated on a cost plus return basis. For example, the Operator is expected to be reimbursed the net costs of running the facility plus a return on invested capital and a profit margin for operating the facility;

- The liability corresponding to the service concession arrangement has been recorded as the NPV of the availability payments due to the Operator. In recording the liability, only the return on invested capital and profit margin components have been considered as this is potentially the amount that will have to be paid in the event of termination of the contract. This liability is unwound over the life of the contract and reduces to zero at the end of the concession period;

- The timing of recognition of the liability matches the timing of the recognition of the asset. Payments made to the Operator in the interim are recorded on a cash basis as they primarily relate to annual income and expenses;

- The discount rate for calculating the net present value of the liability and unwinding it over time has been set to a rate at which at inception, the net present value of the liability matches the book value of the asset that is recognized. This rate is kept constant over the lifetime of the unwind of the liability; and

- The Grantor's balance sheet shows an accumulation of cash over the lifetime of the service concession arrangement, financed annually through a cash offset for the depreciation charge.

9. Stakeholder Communications

This Sections describes intention of CIG to actively communicate with all stakeholders during the delivery of the ISWMS.

9.1 Stakeholder Strategy

The CIG will be adopting a proactive approach to communications and stakeholder management with the aim of securing understanding and support early on in the project's lifespan. Acknowledging the importance and role of effective communications in successful project delivery, a formal communications strategy will be developed to assist this process.

Identification, engagement and management of the wide range of stakeholders is a key priority. Building on previous consultation work, will help to consolidate and inform communications activity.

The overarching principle of the communications plan is to provide timely, clear, transparent and accessible information to as wide an audience as possible. Initially, the focus is on strategic issues, bearing in mind policy, economic and environmental factors:

- Defining and explaining the need for a long term waste management solution;
- Promoting the importance of enhanced reduce, reuse, recycling and composting activity; and
- Providing the rationale behind technology choices in the context of the waste management strategy.

As the project progresses, there will be a transition from strategic communications to operational activity, which is likely to be within the domain of the contractor rather than the CIG. The strategy anticipates this shift in focus, proposing longer term activity, such as the setting up of community liaison groups. The communications activity falls into the following four stages:

- The identification and analysis of stakeholders;
- Assessment and coordination of partner communications channels;
- Provision and dissemination of information / consultation processes; and
- Evaluation of methodology and adjustment, to meet stakeholder needs, if necessary.

Agreement of key messages is an integral part of this process to ensure clarity and consistency of information. A communications protocol will be created to support the strategy, setting out clear parameters for communications, including approval processes, spokespeople, media enquiry routes and critical incident handling policy.

9.2 Market Interest

The CIG recognises the importance of making this waste project attractive to the market and engaging with the market at the earliest possible opportunity for the procurement to be undertaken successfully. CIG understands the need to demonstrate that its project is at least as 'deliverable' and 'affordable'.

The CIG does not underestimate the effort required to develop and maintain appropriate relationships with the wider waste operator, contractor and technology supplier market. It is also aware of the need to do so in a consistent, coordinated and professional manner recognising competitive sensitivities and commercial subtleties that extend throughout the procurement process.

The CIG also understand that there are special circumstances in the Cayman Islands that emphasise the strategic importance of delivering this project on time. Firstly, there is the known future shortage of landfill

capacity, secondly the existing waste management system and practices are not fit for the future and have been shown to pose a threat to the environment and local amenity.

Soft market testing

A market testing exercise may be carried out to provide information as to the interest of the market. A briefing note and questionnaire could be developed to give details around areas such as:

- Interest in the Project;
- Scale and scope of Project;
- Sites and Planning;
- Technology Options; and
- Contractual Issues.

9.3 Public Engagement

The CIG is committed to active engagement with the residents of the Cayman Islands in delivering the ISWMS Engagement which will be provided through briefings, presentations, copy or new articles for dissemination, interview or whatever is deemed appropriate or useful.

Experience has shown that full and open communications can help provide public reassurance and address uninformed opposition. This approach will provide the basis for useful and open debate with all stakeholder groups. It will also be required in dealing with residents close to the proposed sites.

Offering proactive engagement, providing information and promoting discussion around the waste management issues including recycling, reuse and composting helps to counter some of the misinformation from opposers and to build community influencers and ambassadors for the project who are better informed and useful in countering some of the stronger or mis-informed and unsustainable objections.

The contracting process will require the successful bidder to develop a public communication plan and to consult the public on proposals as part of the planning process.

10. Timetable

10.1 Indicative Procurement Timetable

This Section provides an indication of the proposed timetable for the procurement of the ISWMS.

The indicative timetable has been developed on the basis that approval for the OBC is obtained by the start of September 2016. The main stages and milestones based on a competitive dialogue procurement procedure are shown in Table 10.1. This timetable is considered to be very challenging and is potentially at risk due to delays arising from external market influences.

Table 10.1 Indicative Procurement Timetable

Stages and Milestone	Indicative Date
OBC Consultation	September 2016
Preparation of Procurement Documents	June- October 2016
OBC Approval	October 2016
Request for Proposals Issued	October 2016
Issue Pre-qualification Information and Questionnaire	October 2016
Closing date for Pre-qualification Questionnaires (PQQ)	November 2016
Assess PQQ & Shortlist	November 2016
Invitation to Participate in Dialogue (ITPD) issued	November 2016
Invitation to Submit Outline (ISOS) Proposals stage	November - December 2016
Evaluate ISOS submissions and short list	January 2017
Invitation to Submit Detailed Solutions (ISDS) stage	January – February 2017
Evaluate ISDS and short list	February 2017
Close Dialogue	February 2017
Final Tender Stage	February – March 2017
Evaluate Final Tenders and Select Preferred Bidder	March 2017
Appoint contractor	End March 2017
Contract Commencement	September 2017

11. Conclusions and Recommendations

11.1 Conclusions

Section 4.2 of this OBC examines the main service packaging options available for the CIG for the delivery of the NSWMS and implementation an ISWMS for the Cayman Islands. These options range from procurement of a fully integrated solid waste management solution delivered by a single primary contractor (or consortia), through to the delivery/procurement of a fully disaggregated set of facilities and services that are delivered direct by the CIG or a number of specialised or niche contractors.

Table 4.3 examines the strengths weakness, opportunities and threats posed by these primary packaging options. The analysis suggest that packaging Option 1 (procurement of a fully integrated DBFO/PPP contract) and Option 2 (substantial Integration (DBFO/PPP) with the segregation of some peripheral service) offer the most viable ways forward for the CIG. Options 3 and 4 both involve higher levels of service disaggregation and are likely to result in reduced opportunities for risk transfer from the CIG, greater CIG contract management and monitoring requirements, reduced competition during procurement across all services areas, a high a risk of procurement failure for some services (that cannot be locally sourced) and a need for multiple co-dependant procurement processes.

In the absence of soft market testing data Amec Foster Wheeler consider that:

- Packaging a major design, build, finance, operate and maintain contract (DBFOM) may offer value for money due to the enhanced scale of development and greater degree of works cohesion and co-ordination;
- A substantial DBFOM contract is more likely to attract competition by major overseas companies with robust track record of building implementing and operating integrated wastes management solutions;
- The letting of a main DBFOM/PPP contract will facilitate a high level of risk transfer to the DBFOM partner and reduced CIG internal requirements for contract management and monitoring;
- There may be advantages in packaging some separate operational contracts for peripheral service areas that may be of limited interest to a main DBFOM partner. This may offer enhanced VFM through the direct engagement of local contractors in areas where main DBFO partner may otherwise seek to sub-contract. This would avoid the DBFOM partner applying an additional rate of return on the sub-contracts;
- The identification of some peripheral service areas that lie outside the main DBFOM/PPP contract will open areas for direct service delivery by the CIG (where it wishes to maintain control) and, if subject to separate procurement, deflect adverse criticism that local companies have been “squeezed out” of the market; and
- Where peripheral services are delivered by the CIG or local sub-contractors, the CIG will be exposed to increased interface and performance risks. This will be higher where a greater level of service disaggregation occurs.

Several factors will dictate the most appropriate procedure to be used for the procurement exercise(s) and these are examined in Table 4.5.

It is Amec Foster Wheeler’s view that packaging Options 1 and 2 would be best procured through:

- A streamlined Competitive Dialogue procedure – for the major DBFOM/PPP Contract; and
- The Open or Restricted procedure for any peripheral service contracts.

The Open and Restricted Procedure should be used where a specification for the services/works can be established that enables clear and transparent pricing.

Based on the results of the financial analysis, KPMG conclude:

- A DBFOM arrangement to execute the ISWMS exhibits VFM and presents qualitative benefits to the CIG. The Commercial Case section explores this matter in further detail with consideration being given to the packaging of services, practical viability and Strengths Weaknesses, Opportunities and Threats (SWOT) analyses; and
- Currently identified revenue streams are insufficient to finance the Reference Project on a sustainable basis. This is demonstrated by the growing affordability gap both under the traditional DBB and DBFOM scenarios. This affordability gap will need to be addressed either through ongoing contributions from CIG or by identifying additional revenue streams. Indicative user models implemented in comparable jurisdictions have been described in Appendix B.

It is KPMG's understanding that the affordability gap is a matter of discussion within CIG at the date of issuance of this document. A decision on this matter is expected before the procurement process proceeds as a private partner will expect reasonable clarity on such a significant matter prior to responding to a request for proposal (RfP).

11.2 Recommendations

Packaging of Services

Both packaging Option 1 involving the procurement of a fully integrated DBFOM/PPP contract and Option 2, an approach that enables substantial works and service Integration (DBFOM/PPP) along with the segregation of some peripheral services offer the most viable ways forward for CIG. Option 2 is recommended if CIG wish to control and deliver directly some service areas (e.g. waste collection, landfilling) and /or provide opportunity for local companies in service delivery.

Procurement Route

Amec Foster Wheeler believes the Competitive Dialogue (CD) procedure would be suited to the procurement packages that involve more complex risks and also opportunities that may impact on the delivery of the solution and best value. A streamlined approach would involve to development of detailed and clear dialogue plan that seeks to limit the number and duration of dialogue stages.

The Competitive Process with Negotiation could provide a viable alternative to CD if all areas of uncertainty and requiring negotiation can be defined prior to the procurement.

Length of Contract

The length of contract should be established with reference to the optimum period required for most efficient amortisation of the capital investment associated with mobile and fixed assets. In the case of both Option 1 and 2, a major DBFOM/PPP contract this is likely to be between 25 and 30 years.

Request for Proposals – Pre-Qualification Process

Amec Foster Wheeler recommends that any Pre-qualification Questionnaire (PQQ) exercise should be designed to achieve a short list of:

- Restricted Procedure – 5-6 companies; and
- Competitive Dialogue Procedure – 4-5 companies.

These would be sufficient to generate a liquid (diverse) and robust competition whilst reducing the effort and resources required of the procuring entity to manageable levels.

Tender Evaluation Criteria

Amec Foster Wheeler recommends that any contract is awarded on the basis of the most "economically advantageous offer" to CIG. This should be defined on a basis of price and quality. Quality will be made up from a series of sub-criteria (with appropriate weightings and allocation marks), these as a minimum could include:

- Mobilisation;
- Technical Solution;
- Service Delivery;
- Environmental Management;
- Customer Care;
- Quality Control and Assurance;
- Health and Safety;
- Resources;
- Management and Reporting Systems;
- Contingencies; and
- Contract expiry.

A formal system for evaluating bids (both price and quality) should be developed prior to the issue of tender documents.

Variant Tenders

It is Amec Foster Wheeler's opinion that the CIG should generally allow tenderers to submit variant offers, provided these are justified on the basis of providing economically advantageous solutions. This will enable industry-based innovation to be encompassed within tenders facilitating the delivery of a Best Value.

The introduction of variant tenders however, increases the work associated with tender evaluation and the complexity of this process. To minimise this the scope of any variant offers should be constrained.

Appendix A
Waste Flow Modelling Assumptions

Technical note:
Cayman Islands Revised Modelling Assumptions and Baseline Model Results

1. Introduction

The baseline model is based on a 50 year strategic horizon beginning with the year 2015 and ending in 2065.

Models have been produced for each of the three islands to enable future treatment and transfer facilities to be sized appropriately and to take into account local circumstances.

2. Base Data

The base line data used to develop the model has been provided by the Ministry of Home Affairs, Health and Culture and sourced from the Department of Environmental Health (DEH).

Initially annual data returns for George Town landfill on Grand Cayman and Cayman Brac landfill for the reporting periods of July – June for the following years were used:

- 2011-12;
- 2012-13; and
- 2013-14.

However in March 2015, DHE requested that each and every load entering George Town landfill be weighed to enable the comprehensive recording of tonnage data. It was apparent from the review of the data from March and April 2015 that the historic annual return data were not accurate and may under report actual tonnages by 30 to 50%. This is because the weighbridge was not always staffed to record tonnages of waste being deposited at the landfill.

To address this information was for recorded from March 2015 to February 2016 inclusive providing a full 12 months of tonnage data). This has then been used as the basis for future waste projections for Grand Cayman Island within the model. Table 2.1 shows the pro-rated data for a full year. The model is now 'frozen' to allow the OBC to be developed.

Table 2.1 Amount and Types of Waste Managed at George Town Landfill March 2015 –February 2016

	Tons	Current method of management
Commercial Waste	31,790	Disposed of in Landfill
Construction and Demolition	6,362	Landfill
Construction and Demolition	707	Estimate on recycling (10% of total C&D waste)
Yard Waste	14,710	Disposed of in Landfill
Residential Waste	13,802	Disposed of in Landfill
Pallets	639.32	Disposed of in Landfill
Cardboard	2,514.45	Disposed of in Landfill
Sand	-	Disposed of in Landfill
Food Waste from restaurants	189.98	Disposed of in Landfill
Expired Liquor	24.79	Disposed of in Landfill
Bulk Waste	653.88	Disposed of in Landfill
Special Waste (waste water sludge)	23.27	Disposed of in Landfill
Foam	-	Disposed of in Landfill
Deceased Animals	43.10	Disposed of in Landfill
Medical Waste	120	Diverted through incineration
Chemicals	120.32	Stockpiled for recycling?
Island wide government clean up (Vegetation)	27.64	Disposed of in Landfill
Mixed waste from residential and commercial properties	84.47	Disposed of in Landfill
Metal Waste	1,956.13	Recycled, most likely to be a stockpiled figure
Derelict Vehicles	565.69	Recycled
Tyres	367.14	Recycled
Batteries	22.33	Recycled
Aluminium Cans	6.80	Recycled
Recycling of Oil	-	Recycled
Christmas Tree	4.68	Recycled
Paper recycling	361.57	Recycled
Confidential waste and contraband	90	Diverted through incineration
TOTAL	75,067	

The annual data returns for Cayman Brac landfill were used for waste projections in Cayman Brac as accurate data recording by waste type does not take place on the island and not all waste deliveries are weighed.

As there is no data for waste generation on Little Cayman the waste production rate (kg/ capita/ yr) on Cayman Brac was applied to the assumed population on Little Cayman (170 people).

Although it is acknowledged that the data used for Cayman Brac and Little Cayman is likely to be inaccurate, the tonnages are relatively small in comparison to the data for Grand Cayman. Therefore the effects of any under reporting for the smaller two islands is likely to be easier to mitigate through practical operational and design measures. The following data from the annual reports were used for the development of the baseline waste flow model for Cayman Brac:

- Total waste managed/ incinerated at Cayman Brac landfill (tons); and
- Total infectious waste incinerated / managed at Brac Landfills (tons).

3. Population

Population data for each island was drawn from population reports for 2013 from the Economics and Statistics Office for the Government of the Cayman Islands[1]. This is the most up to date information available at the time of freezing the model for the OBC.

Table 3.1 shows the population distribution between the main towns on Grand Cayman and the Sister Islands.

Table 3.1 Population Distribution

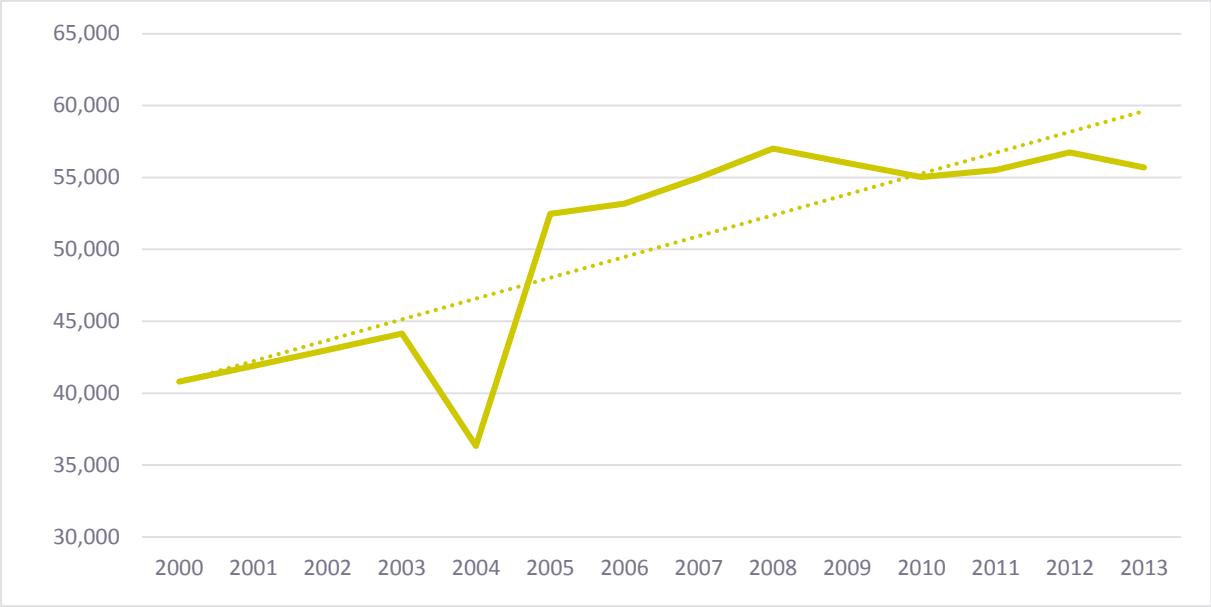
	2013 Population	% of 2013 Population
Sister Islands	1,922	3.45%
East End	1,292	2.32%
North Side	1,361	2.44%
Bodden Town	11,243	20.19%
West Bay	10,728	19.26%
George Town	29,144	52.33%

Within the overall 3.45% of the total population that is located on the sister Islands, 91% is assumed to be on Cayman Brac and 9% on Little Cayman. This is based on the estimated population of 170 people for Little Cayman (http://www.littlecayman.com/our-island/island-history/).

Population data over the previous 13 years shows fluctuations, but a general upwards trend. The large drop in 2004 is due to the relocation of residents directly after Hurricane Ivan and then the rise in 2005 is due to the return of residents.

[1] http://www.eso.ky/populationandvitalstatistics.html

Figure 3.1 Population Trend



4. Waste Growth

The modelled waste arisings were projected in line with forecast increases in population with an additional underlying waste growth rate per capita being applied.

Three waste growth profiles have been modelled based on differing population growth assumptions: low, medium and high, being: 2%, 3% and 4% increases per year respectively. The increases in population are based on the assumptions used by PBS & J in the waste forecasting undertaken for the *'Interim Report of the Waste Disposal Options Review Committee (WDOR)', revised June 5 2003 (*referenced in this report as *'WDOR, 2003 report').*

In the baseline waste flow model, the Grand Cayman waste yield per capita is calculated using the pro-rata tonnage for 2015 and the projected population in 2015. The projected population is based on the known population in 2013 with the growth rate for each profile. The underlying waste growth is applied to the increased population projections.

For Cayman Brac and Little Cayman, the waste yield per capita for 2014 was calculated average of the waste per capita in line with the annual data returns for Cayman Brac for the years: 2011-12, 2012-13, and 2013-14. This was based on known population and waste tonnage data. For 2015 onwards the waste yield is the same for each profile, but as the population increases the total waste for each profile are different.

The various waste growth profiles are provided in Tables 4.1 – 4.3. For the OBC baseline model the medium growth rate profile has been used.

Table 4.1 Waste Growth Assumptions – Grand Cayman

	Population growth	Waste generation per capita (tons/ capita/ year)
High	2%	1.33
Medium	3%	1.30
Low	4%	1.28

Table 4.2 Waste Growth Assumptions – Cayman Brac

	Population growth	Waste generation per capita (tons/ capita/ year)
High	2%	1.43
Medium	3%	1.43
Low	4%	1.43

Table 4.3 Waste growth assumptions – Little Cayman

	Population growth	Waste generation per capita (tons/ capita/ year)
High	2%	1.43
Medium	3%	1.43
Low	4%	1.43

Waste growth projections are provided in Figures 4.1 to 4.4.

Figure 4.1 Grand Cayman Waste Growth Projections (tons to 2065)

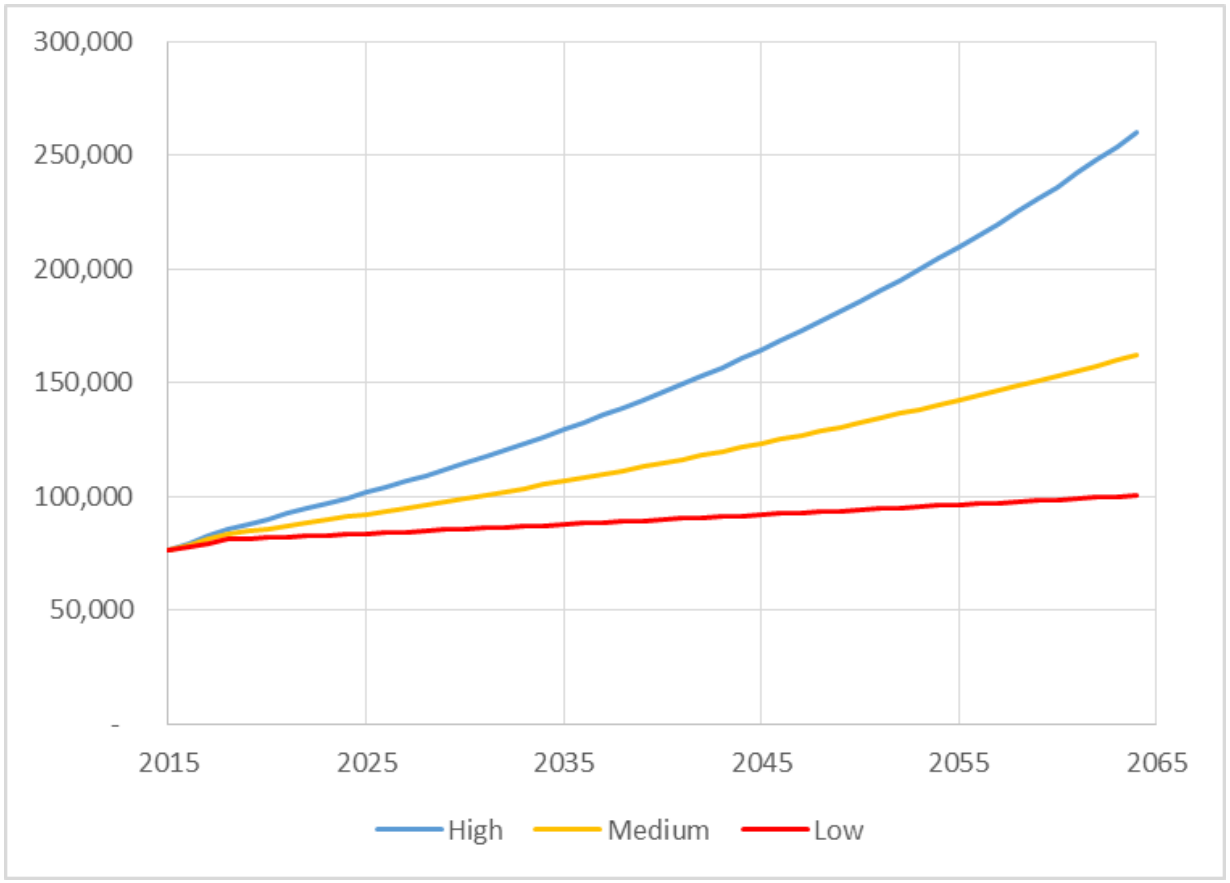


Figure 4.2 Cayman Brac Waste Growth Projections (tons to 2065)

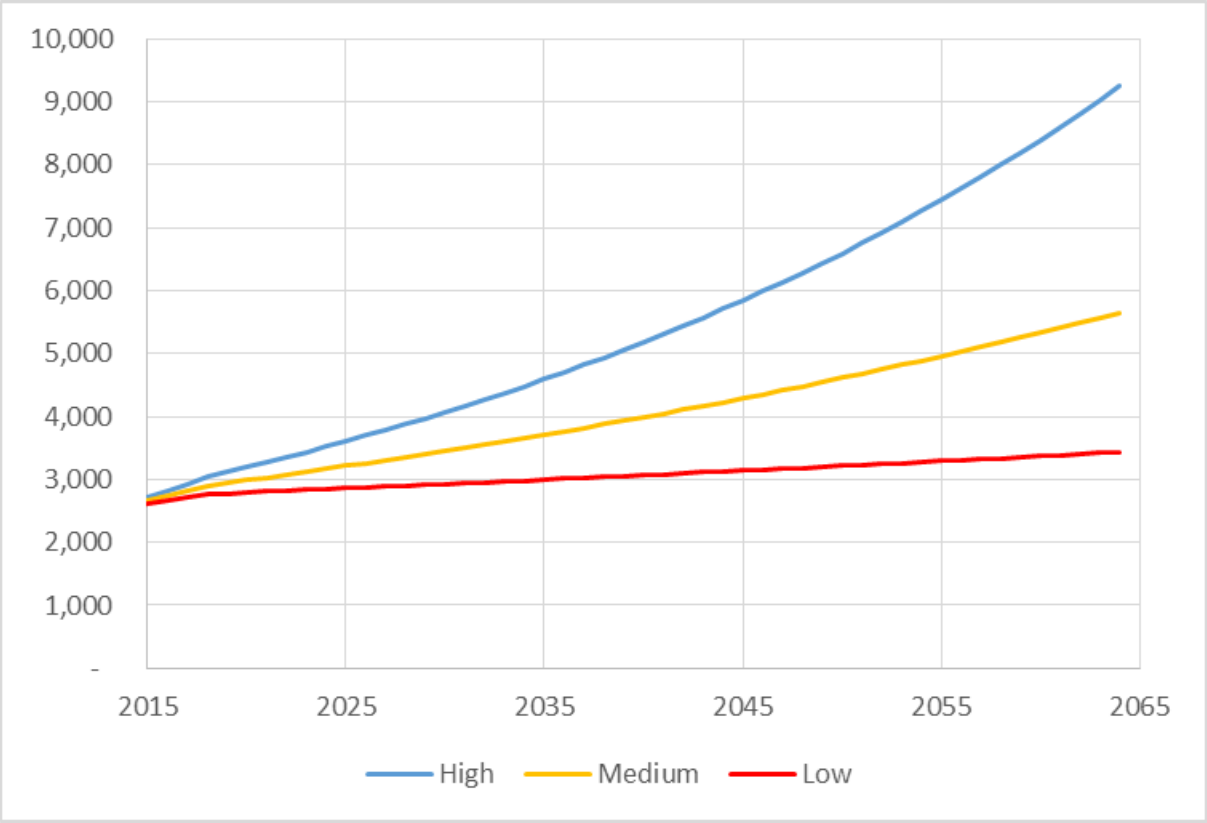


Figure 4.3 Little Cayman Waste Growth Projections (tons to 2065)

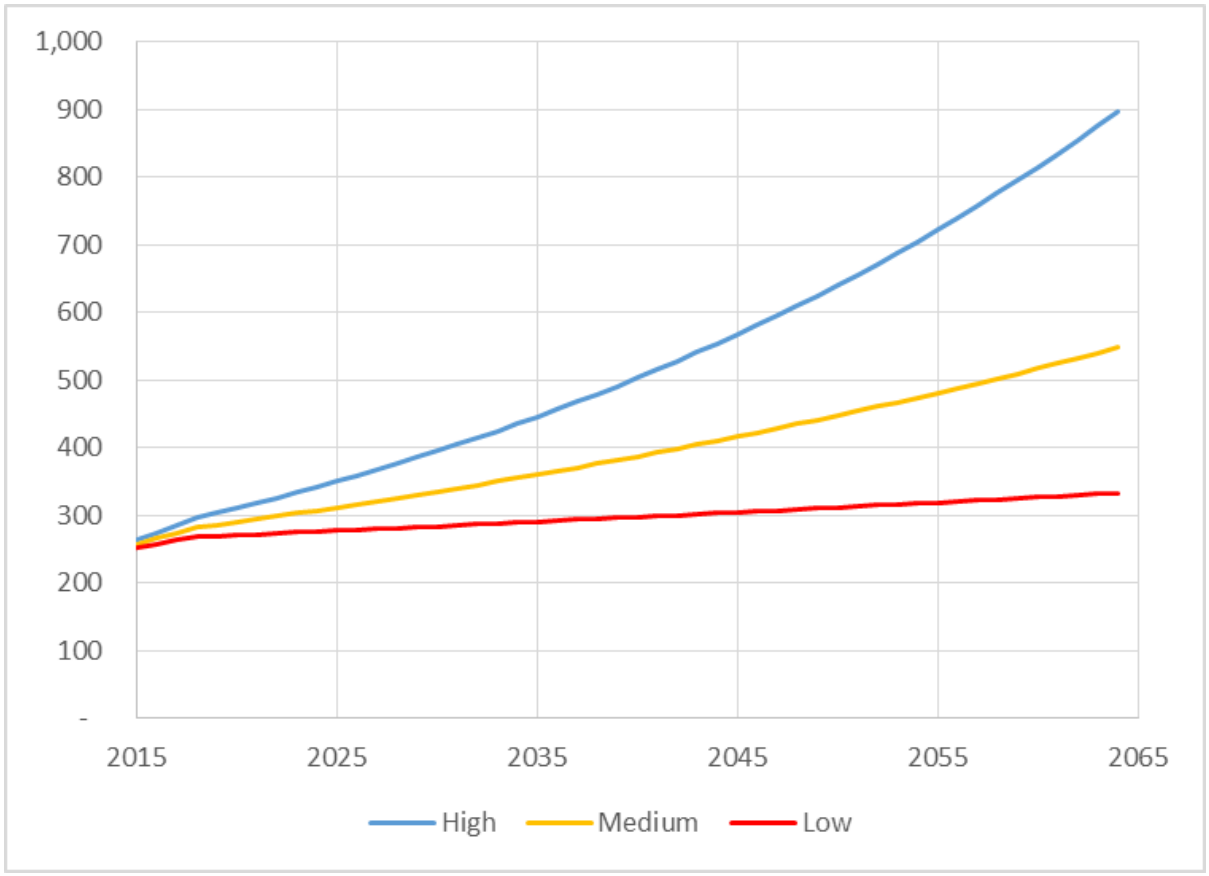
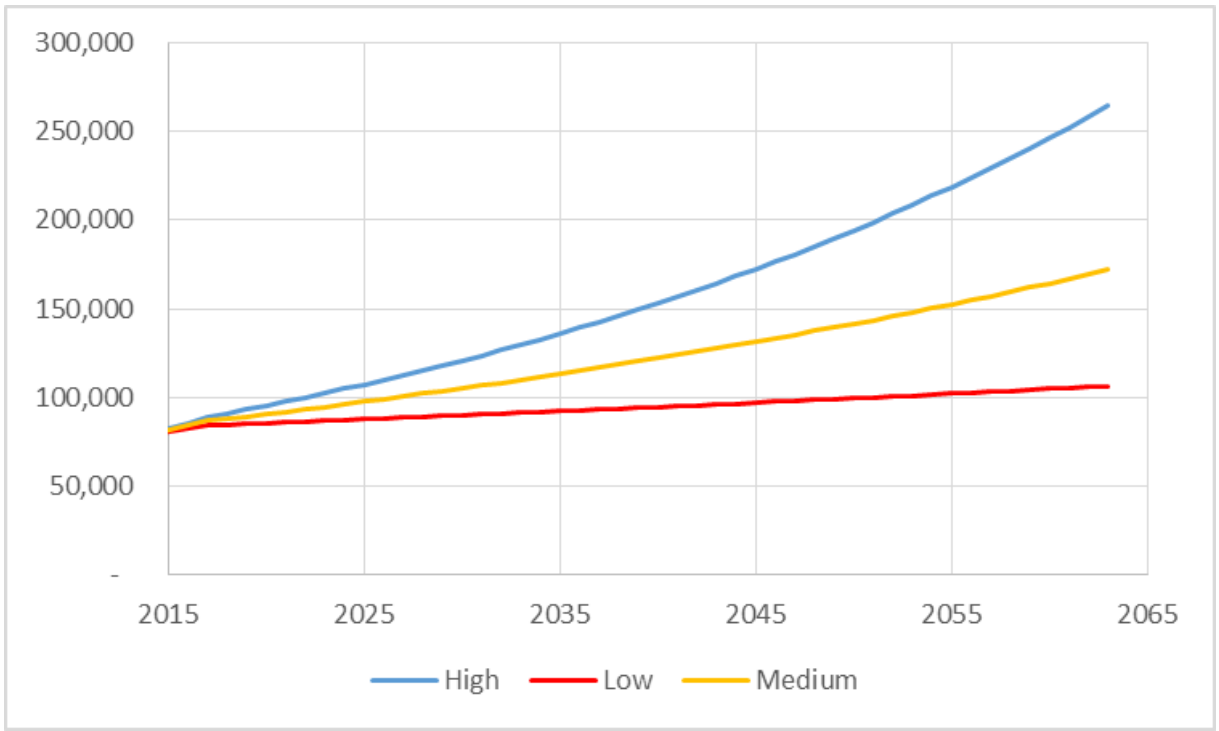


Figure 4.4 All Islands Waste Growth Projections (tons to 2065)



5. Waste Composition

Information on general waste composition was taken from Table 3.0 of appendix 4 of the *WDOR, 2003 report.* These DEH estimates on waste composition, specifically the 'average composition' were generally applied for the production of the baseline waste flow model. However these were supplemented by adjustments made to further divide the categories into sub categories. These were based on comparable splits of waste types derived from data for the Isle of Wight, UK. The composition used in the model is provide below in Table 5.1.

The composition data has been applied to the residential and commercial waste on all islands (where applicable) in the baseline model.

Table 5.1 Waste Composition Used in Baseline Model

	Composition from WDOR. 2003 Report	New categories	Reasoning/ Comment	Composition used
Newsprint	5.0%	Recyclable paper	Newsprint, office paper and half other paper assumed to be recyclable.	13.1%
		Non-recyclable paper	Half other paper assumed to be recyclable.	6.3%
Office paper	1.8%		See above	-
Other paper	12.6%		See above	-
Corrugated cardboard	11.7%	Recyclable card	Based on split seen on Isle of Wight.	11.5%
		Non-recyclable card		0.2%
Glass bottles	2.8%			2.8%
Glass other	0.7%			0.7%
Plastic bottles	1.9%			1.9%
Plastic other	9.1%	Other dense plastic recyclable	Based on the split of these categories found on the Isle of Wight – applied to 9.1% 'plastic other'.	2.2%
		Other dense plastic non - recyclable		1.7%
		Plastic film recyclable		2.2%
		Plastic film non – recyclable		3.0%
Wood	7.3%			7.3%
Dirt, Brick, Rubble	3.7%			3.7%
Yard waste	18.6%		Assumed to be green garden waste.	18.6%
Aluminium cans	0.8%			0.8%
Aluminium other	0.4%			0.4%
Metal cans	2.0%		Assumed to be ferrous cans.	2.0%

	Composition from WDOR. 2003 Report	New categories	Reasoning/ Comment	Composition used
Ferrous metals	2.3%			2.3%
Non-Ferrous metals	0.7%			0.7%
Textiles	5.3%			5.3%
Food waste	5.4%			5.4%
Miscellaneous organics	5.5%			5.5%
Miscellaneous other	2.4%			2.4%

The composition data will be used when options for waste treatment (including recycling, composting and reuse) are modelled. However, Amec Foster Wheeler note that the basis of the waste composition data used for the modelling is both time aged (derived from 2003) and incomplete.

6. Housing Data

Data on housing types is taken from the 2010 Census. This data is not used in the baseline waste flow model but will be applied to determine the impact of waste management solutions that require changes in collection methods.

Table 6.1 Housing Type by Area

	Detached	Semi- Detached	Duplex	Apartment	Townhouse	Studio	One room	Business/ dwelling combination	Boat	Other	Don't know	Total
Sister Islands	715	4	26	170	22	15	55	2	-	13	2	1,024
East End	361	4	32	46	4	12	34	-	-	9	-	502
North Side	409	8	24	85	6	3	5	-	-	-	-	540
Bodden Town	2,402	86	454	571	76	64	147	7	-	3	-	3,810
West Bay	2,178	136	340	1,257	381	98	123	27	4	7	1	4,552
George Town	3,217	336	501	4,180	2,406	481	1,135	55	1	19	1	12,332
TOTAL	9,282	574	1,377	6,309	2,895	673	,499	91	5	51	4	22,760

7. Collections Data

Collection data for Cayman Brac for one month (February and March 2013) was provided by the DEH.

These show that the monthly collection of waste on Cayman Brac could range between 95 and 146 tons. These collections are from various sources as show in Table 7.1.

Table 7.1 Collection Sources

	Commercial	Grapple	Residential
% of monthly collections	30%	33%	37%

Data within the annual returns also provided information on the tons collected on Grand Cayman each year.

8. Summary Flows

Summary baseline flows for Grand Cayman for the years 2015 - 2016 and 2025- 2026 are provided in figures 8.1 and 8.2. A summary flow of the same is provided for all the islands in Figures 8.3 and 8.4. All of these flows are based on the medium waste growth projections.

Figure 8.1 Grand Cayman Summary Flow 2015- 2016

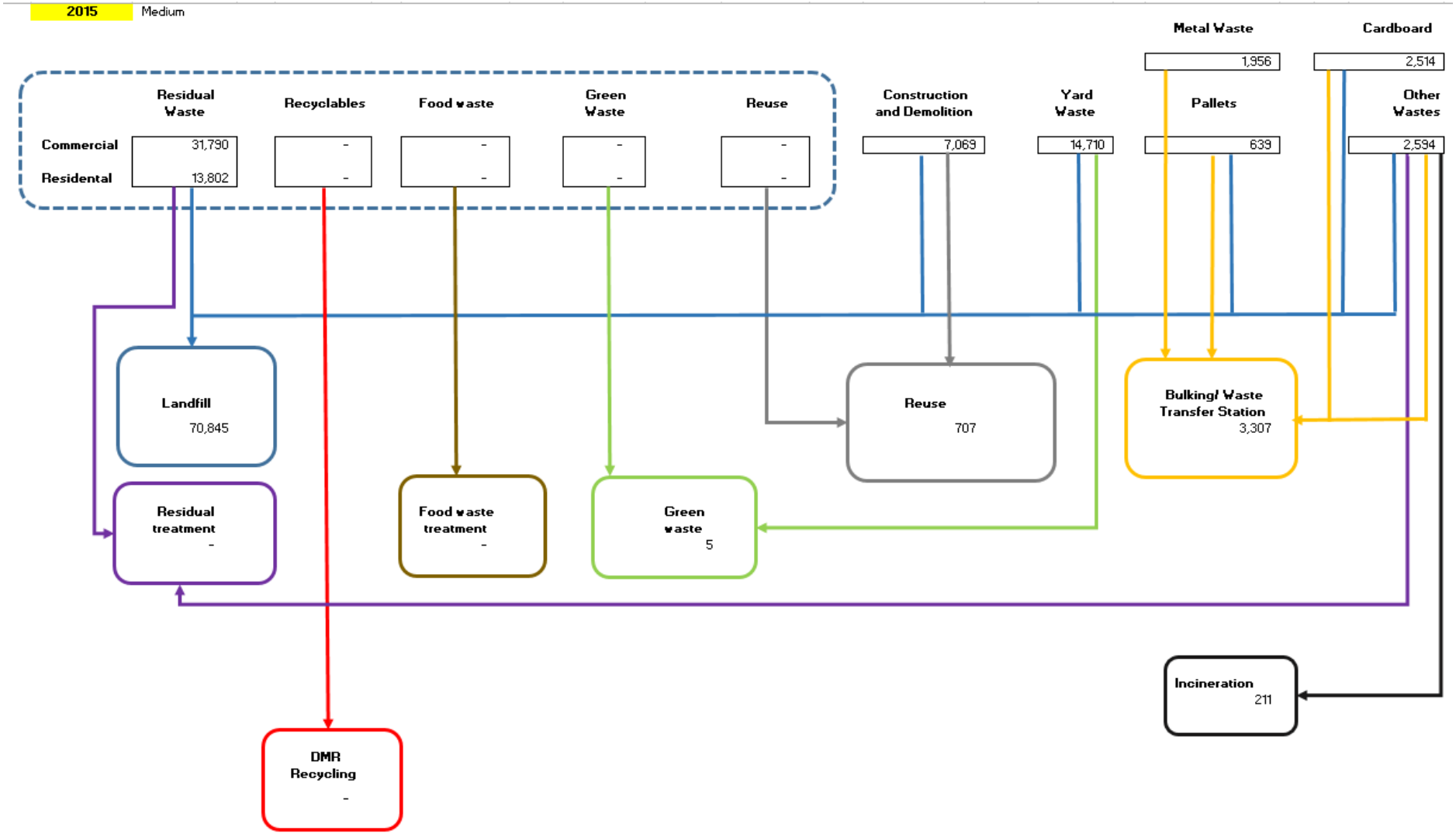


Figure 8.2 Grand Cayman Summary Flow 2025 – 2026

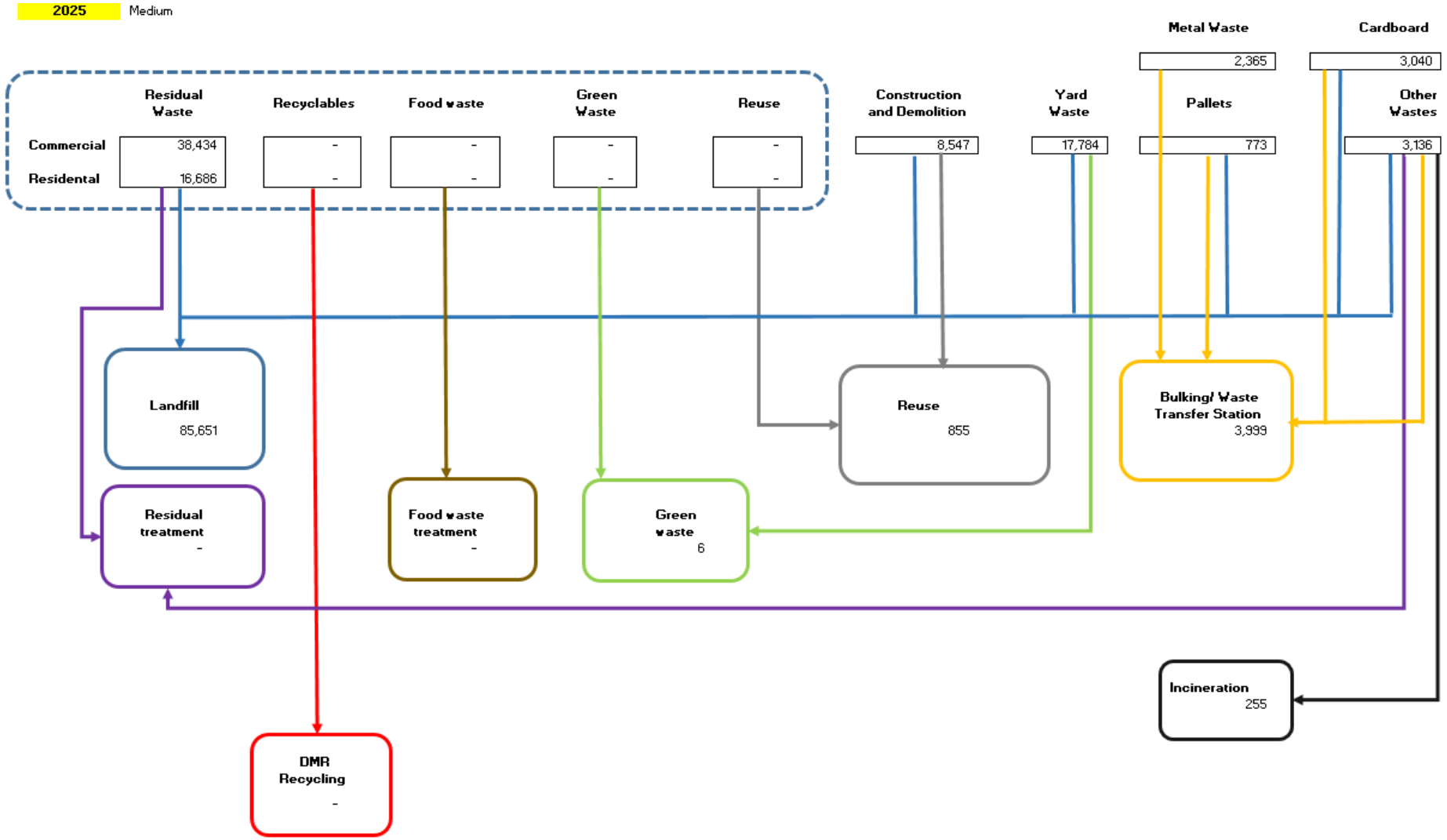


Figure 8.3 All Island Summary Flow 2015- 2016

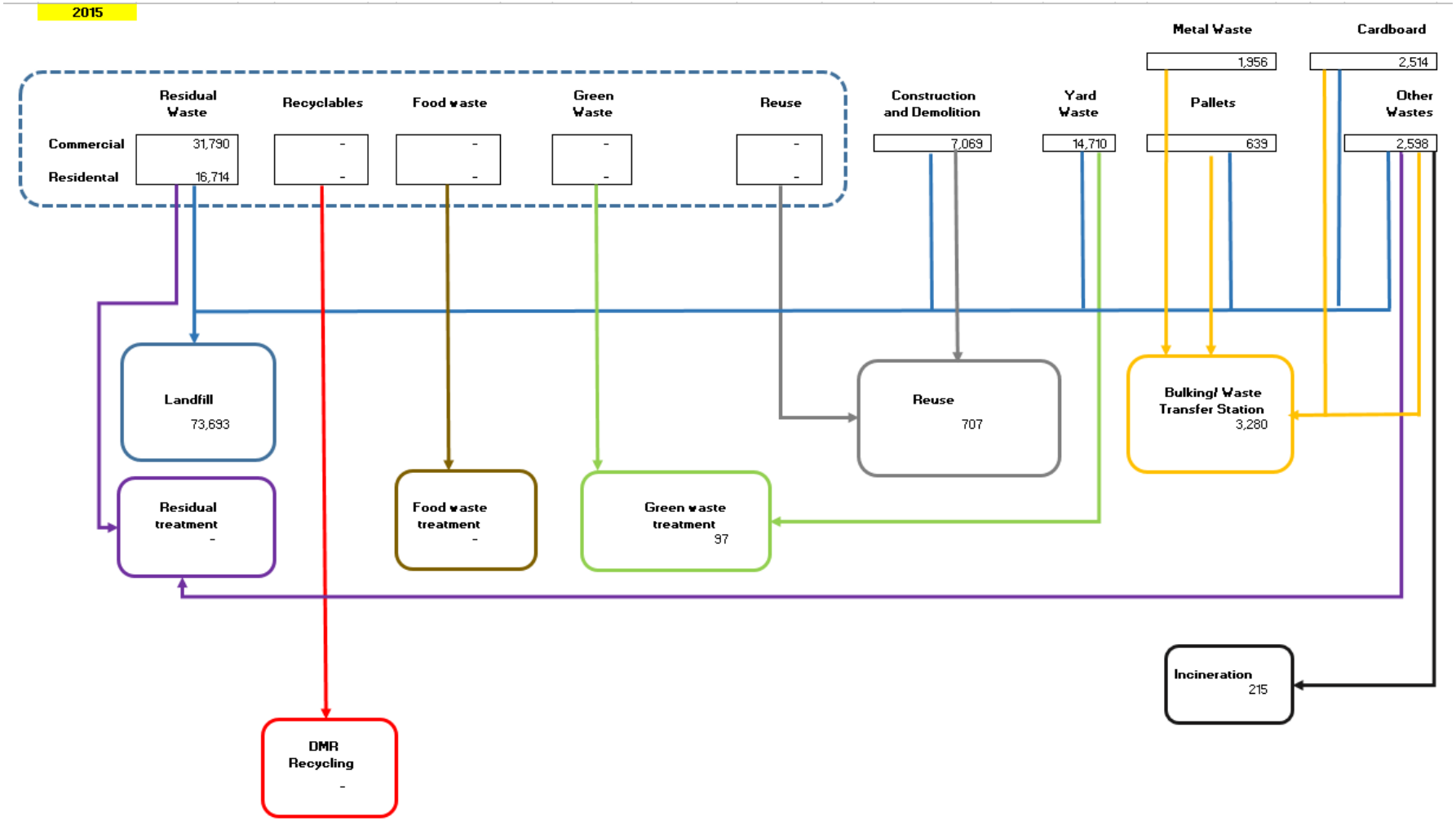
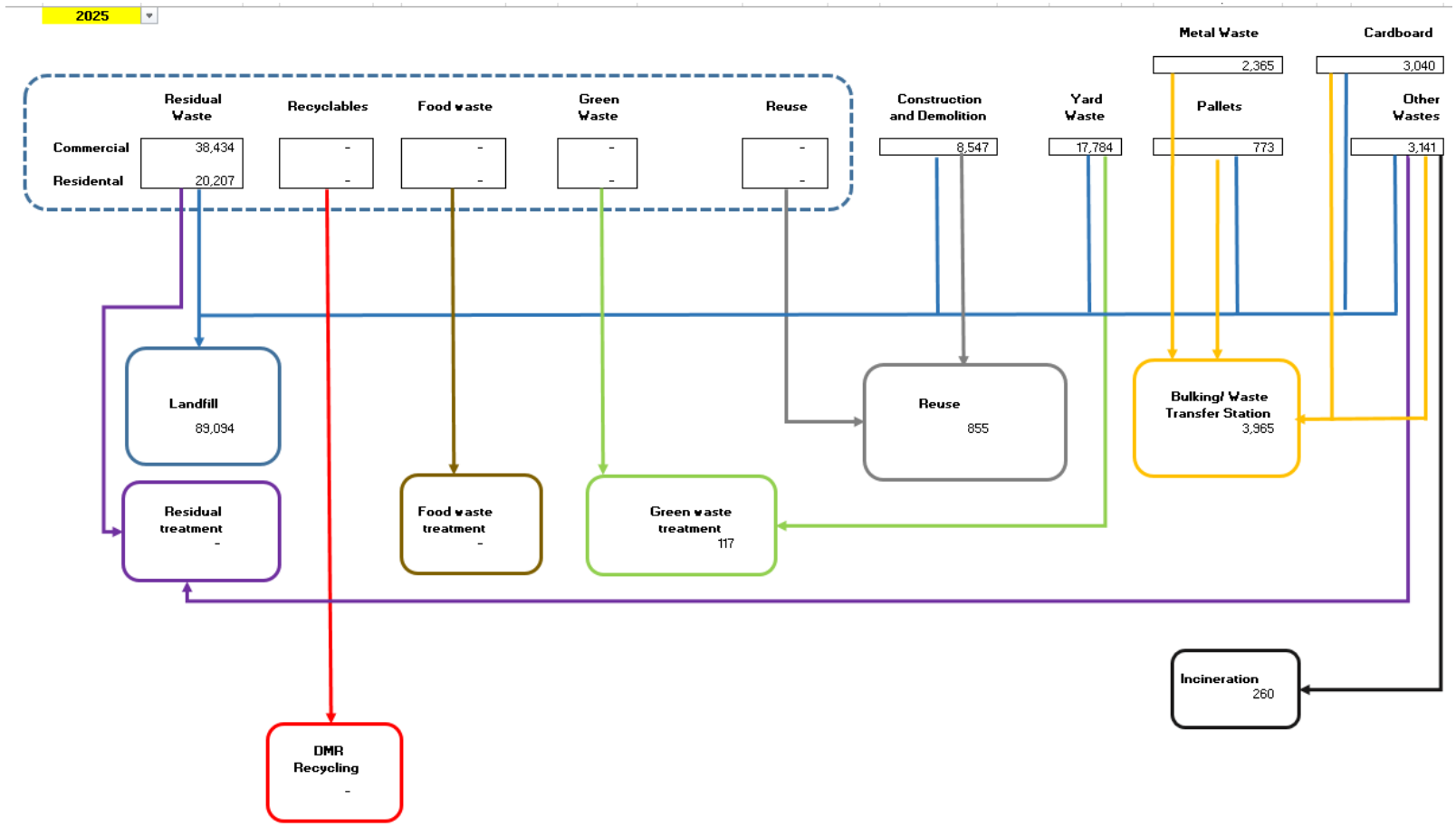


Figure 8.4 All Island Summary Flow 2025 - 2026



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Management systems

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Appendix B
Finance and Funding Options

Appendix B :
Financing and Funding Options

1. Funding

Funding, which is critical to the financing solution, refers to determining the means by which the providers of capital will be repaid, through user fees, government budgeting allocations or other revenue models. Although waste collection and disposal fees are the prime source of funding for waste management companies, these organizations have the ability to generate funding from a variety of other sources. In the following overview, funding mechanisms have been divided into the following categories:

- Direct charges;
- Indirect charges; and
- Revenues from waste treatment.

1.1 Direct Charges

Direct charges include all revenue generated for the activities involved in the waste removal and disposal process. Direct user charges act as incentives to reduce waste generation while providing a revenue source for the waste management entity(ies). Direct charges can be considered to follow the polluter / generator pays concept as the party responsible for producing the waste ultimately bears the cost for the proper disposal of the waste.

1.2 Normal Waste Collection fee

Waste management basic user charges include collection and disposal fees charged to residences and commercial enterprises. Waste collection fees are the charges levied for the pick-up and disposal of waste. Generally, fees would vary based on the type of client (residential, commercial or industrial), amount of waste collected or size of waste bin (small, medium, large or, extra-large), frequency of waste collection and/or the type of waste collected. Normally, general waste collection fees are an ongoing contractual arrangement between the waste management company and the generator of the waste. Fees are remitted to the waste management company on a monthly or annual basis.

1.3 Pay As You Throw (PAYT)

The PAYT model is a type of waste collection fee used by some waste management companies. Under this model, waste is measured by weight or size while units are identified using different types of bags, tags or containers.

There are three main types of PAYT programs:

Full Unit Pricing

Under the full unit pricing model users pay in advance for all the garbage they want collected by purchasing a tag, custom bag, or selected size container.

Partial Unit Pricing

With partial unit pricing the local authority or municipality decides the maximum number of bags or containers of garbage available to users and uses taxes to pay for these collections. Additional bags or containers can be purchased in cases where the user exceeds the permitted number. Similarly, waste management companies can provide garbage containers at a base cost and charge users for additional bags or containers.

Variable Rate Pricing

Waste management companies provide disposal bins on an ongoing basis or for short term usage. Variable rate pricing allows waste management companies to rent containers of varying sizes with the price corresponding to the amount of waste generated.

1.4 Special Waste Collection Fee

Special waste is garbage that requires special handling and disposal in order to prevent contamination. Waste disposal companies provide special waste collection and disposal services for a fee according to the type and amount of special waste presented for disposal. Special waste includes the following:

- Asbestos containing materials;
- Defective food items;
- International waste from ships and aircrafts;
- Pharmaceutical waste;
- Biomedical waste;
- Used tyres; and
- Offal (poultry waste).

1.5 Gate Fee / Tipping Fee

As an alternative to garbage collection, individuals and businesses can opt to drop off their waste at disposal sites or transfer stations. A gate fee or tipping fee is the charge levied by the waste disposal company for the receipt of a given quantity of waste. Gate fees are generally charged per load / ton or are based on the source and type of the waste. Typically, a minimum gate fee applies for the receipt of waste.

1.6 Waste to Energy Gate Fee

Waste to Energy (WtE) is waste recovery method in which solid waste is burned at high controlled temperatures so as to convert it to residue which helps reduce its volume and produce energy. Waste management companies charge a fee to provide this service. WtE gate fees are normally levied based on the amount and type of waste being presented for treatment.

1.7 Recycling Fee

Recycling is the process of collecting, sorting, assembling, transporting and converting waste products into new usable products. Recycling is a key component of an ISWMS and can help to reduce pollution (air and water), reduce volume of waste in landfills, lower greenhouse gas emissions and reduce typical energy usage. Recycling centers charge varying fees depending on the type of item being recycled. Recycling plants typically accept the following list of items for recycling:

- Ferrous and non-ferrous metals;
- Plastics;
- Paper and cardboard; and

- Glass.

1.8 Surcharges

A surcharge is an add-on fee and represents a charge over the basic disposal fee amount. Surcharges can be applied to disposal bills for a variety of reasons including charges for items in excess of the minimum quantity, charges for special items or charges for fuel usage (an indirect charge) to collect waste. Items for which a surcharge is levied vary from country to country but can include yard waste, food waste, hazardous waste and recyclables. Fuel surcharges can be incorporated into the standard waste collection fees and are sometimes tied directly to some fuel index.

1.9 Indirect Charges

Indirect charges provide revenue generated from services that are not directly linked to the garbage disposal or collection process. Many Caribbean countries do not have explicit garbage collection fees for households. Instead, costs are indirectly covered through the collection of government taxes which often are not waste specific. The main indirect funding mechanisms are summarized below.

1.10 Taxes

Government legislation can require taxes or a levy to be added to a general waste disposal fee charged by the waste management company. This fee, charged by the government, may or may not reflect the costs for provision of a service rendered or goods. An example is an environmental tax which can be implemented as a means of discouraging acts that are not environmentally responsible. This fee is usually collected at the landfill facility or can be incorporated into the collection fee bill. On the other hand, the government can mandate that a waste collection and disposal tax be levied as opposed or in addition to billing general waste disposal fees.

1.11 Tariffs

A variation of a tax system is the implementation of a tariff. Waste disposal fees can be included in utility services bill as a tariff. This concept is based on the assumption that the amount of utilities consumed by each household or organization positively correlates with the amount of waste generated. Businesses and larger or more affluent households are expected to consume more utilities and also generate more solid waste. The tariff for the waste collection is typically linked to water or power usage.

1.12 Revenue From Waste Treatment

Solid waste management companies can generate additional revenue by converting the waste collected from consumers to usable products which can be sold; thereby providing tangible returns from the collection and treatment of solid waste. The below outlines two of the main ways that waste management companies access other revenue streams as a result of waste treatment.

1.13 Composting

The aerobic conversion of waste materials into soil additives is called composting. Compost can be created by using biodegradable organic materials from households and businesses. Composting promotes sustainable agriculture and is commonly sold as an organic soil amendment.

1.14 Waste to Energy

Waste to Energy is quickly becoming a widely recognized source for energy. The process involves converting non-recyclable waste items into useable heat, electricity, or fuel through a variety of processes. Thermal treatment in conventional waste combustion plants the most common source of WtE however, a number of other technologies have emerged such as gasification and anaerobic digestion. A listing of common energy products derived from waste are detailed below.

Electricity - steam raised from the combustion of waste can used to drive turbines and produce electricity that can either be supplied in to a national grid network or by direct wire to particular market off take; and

Heat – low pressure steam from the combustion of waste can take off at valve beyond the turbine to be used to supply heat to applications such as a refrigeration plant and desalination facilities. The take-off of the heat will however result in a reduced electrical generation efficiency for the waste to energy plant.

2. Financing Mechanisms

On the high side, estimated capital expenditure for each of the highest cost shortlisted options is over CI$70 million. There are several options for delivery and financing:

Self-financing ("equity") – The government / sponsoring authority uses recurrent revenue and/or cash reserves under a traditional procurement delivery model whereby the public sector is responsible for the capital and operating costs of a project, bearing both construction and operational risk. Public sector revenue or reserves may be sourced from general funds or from specific waste / environmental charges (such as duty on imported goods).

It is understood that this option would not be attractive to the CIG, primarily because the CIG would be required to allocate significant funds upfront to underwrite the Project's capital costs.

Debt – The sponsoring authority uses borrowings such as bank debt or bonds to finance a project under a traditional procurement delivery model as described above. The debt may be undertaken at a central government or sponsoring authority level or issued under a project financing structure whereby the project is ring-fenced from the authority/government. In any case, the government/authority would typically need to contribute a minimum level of equity.

Even if the Project were ring-fenced with no recourse to the CIG and with debt service payment supported by third party user fees, this may not be a viable option given that it is in conflict with the CIG's stated objective in its 2015/16 Strategic Policy Statement not to undertake any new borrowings for the forecast period (which runs through fiscal year 2017/18). However, the Project is assumed to commence outside this timeframe so with the country's improving fiscal situation, the CIG may be willing to consider some debt funding.

Public Private Partnership (PPP) – There is no single definition of a PPP, but it is generally considered to be an arrangement, usually long term, between a government/authority and a private entity to provide a service that would traditionally be provided by the public sector. PPPs contribute private sector resources (capital and expertise) to projects while allocating risks (such as construction, financing, demand/revenue, operational and maintenance expenses) between the government and private party in varying degrees, depending on the form of PPP.

Two commonly used PPP structures are:

1. Build-Operate-Transfer ("BOT")

The private sector builds, designs and operates an asset for the life of the contract and hands control back to the public sector at the end

The public sector finances construction of the asset and retains ownership as well as ultimate responsibility for the provision of the public service

Build-Transfer-Operate ("BTO") is a variation of BOT whereby the private sector hands control of the asset over to the public sector at completion of construction, rather than at the end of the contract.

A BOT model (and its derivations) would require the CIG to finance capital costs itself. As previously noted, such a structure would not be a suitable option as it is not in line with the CIG's debt management objectives or would require self-financing.

2. Build-Own-Operate-Transfer ("BOOT") / Design-Build-Finance-Operate-Maintain ("DBFOM")

The private sector designs, finances, builds, operates and maintains an asset which it owns for the life of the contract after which it hands control and ownership to the public sector.

While the public sector retains ultimate responsibility for the provision of the public service, it does not finance construction of the asset nor does it own the asset until expiration of the contract.

A BOOT or DBFOM model (and the derivations) is more aligned to the CIG's goal of achieving cost neutrality. Depending on the final whole life costing and delivery model selected, funding contributions by the CIG can be limited to a predetermined annual budget allocation supplemented by funding contributions from user fees and other revenues as discussed in the Funding Mechanism section.

If the CIG was to convert its existing annual budgetary allocation for the DEH to a PPP/project finance payment, it is estimated that this could support a debt size of approximately CI$ 23.7 million, based on assumed financing parameters. Including the existing third party revenue could size the debt at an estimated CI$ 49.3 million.

The list of PPP models provided above is not exhaustive as there are other variations to these structures. In addition there are also lease/concession/management contract models under which the government retains ownership of an asset but bears responsibility for its design, build and financing, which may not be suitable for the CIG.

Appendix C
Risk Allocation Matrix

Cayman Islands – Solid Waste Management Outline Business Case

Date: 26/04/16

INITIAL ECONOMIC RISK ALLOCATION MATRIX (V3)

Planning Risks ("PL")

Risk	Description	Risk Allocation			Enter 1 to 5 in each column	
		Government	Private Sector Provider ("PSP")	Shared	Likelihood	Impact
PL 1. Cost estimates for obtaining planning approvals and/or preparing the Environmental Impact Assessment (EIA).	(a) Estimated cost of receiving detailed planning permission and or preparing the EIA is incorrect; (b) Higher cost in satisfying unforeseen planning requirements		√	 √	2 4	2 3
PL 2. Delayed planning permission and site statutory approvals.	A delay in completion of EIA, (including any issues and further studies arising from the EIA), receiving planning permission may have broader cost implications for the project		√		4	3

Risk	Description	Risk Allocation			Enter 1 to 5 in each column	
		Government	Private Sector Provider ("PSP")	Shared	Likelihood	Impact
PL 3. Rejection of planning application and/or EIA.	Rejection of initial planning application or EIA will have knock on effect - delays, cost impact, and possible termination of Contract specification deliverables			√	2	2
PL 4. Planning permission conditions	Planning permission is granted with onerous conditions attached, which will have a knock on effect - delays, cost impact			√	2	2
PL 5. Legal Agreements	Examples: Land Access/Ownership Agreements delayed			√	2	4
PL 6. Judicial Review	Judicial review may lead to overturning of planning consent or if not the process itself leading to delay to the timetable			√	2	2

Design Risks ("DS")

Risk	Description	Risk Allocation				
		Government	Private Sector Provider	Shared	Likelihood	Impact
DS 1. Defaults on Contract specifications (failure to design to brief)	Failure to translate the needs set out in the agreed Contract specifications, into the design		√		1	4
DS 2. Continuing development of design	The detail of the design should be developed within an agreed framework and timetable. A failure to do so may lead to addition design and construction costs		√		1	3
DS 3. Change in project content by the Government	The Government may require changes to the overall service specification - additional design and construction costs may be incurred	√			1	3
DS 4. Change in design required by operator	This is the risk that the operator will require changes to the design, leading to additional design costs		√		3	1
DS 5. Change in design required due to external influences	(a) There is a risk that the designs will need to change due to legislative or regulatory changes. (b) Planning issues and constraints may also lead to design changes.			√	2	4

Risk	Description	Risk Allocation				
		Government	Private Sector Provider	Shared	Likelihood	Impact
DS 6. Failure to build to design	Misinterpretation of design or failure to build to agreed specification during construction may lead to additional design, construction or operational costs		√		1	2

Construction Risks ("CO")

Risk	Description	Risk Allocation				
		Government	Private Sector Provider	Shared	Likelihood	Impact
CO 1. Incorrect time estimate	The time taken to complete the construction phase may be different from the estimated time		√		4	3
CO 2. Unforeseen ground/site conditions on new sites	Unforeseen ground/site conditions (ecological, archaeological, etc.) may lead to variations in the estimated costs or project delays or an inability to deliver		√		2	3
CO 3. Delay in gaining access to sites provided by the Government	A delay in gaining access to the sites may delay the entire project	√			1	2
CO 4. Delay in gaining access to sites not provided by the Government	A delay in gaining access to the sites may delay the entire project		√		2	2
CO 5. Availability of services/ Infrastructure etc. to provide service	The non-availability of necessary services/utilities		√		2	3
CO 6. Theft of/damage to equipment/materials	Use of sub-standard materials and/or theft and/or damage to equipment and materials may lead to unforeseen costs in terms of replacing damaged items, and delay		√		1	2

Risk	Description	Risk Allocation				
		Government	Private Sector Provider	Shared	Likelihood	Impact
CO 7. Responsibility for maintaining site safety	The Construction, Design and Management ("CDM") regulations must be complied with		√		2	2
CO 8. Third party claims	The risk refers to the costs associated with third party claims due to loss of amenity and ground subsidence on adjacent properties		√		1	2
CO 9. "Compensation Events"	An event of this kind may delay or impede the performance of the Contract construction phase and cause additional expense	√			1	2
CO 10. "Relief Events"	An event of this kind (outside of the Contractor's direct control) may delay or impede the performance of the Contract construction phase and cause additional expense and lead to time extension			√	2	2
CO 11. Force Majeure	In the event of Force Majeure additional costs will be incurred. Facilities may also be unavailable			√	1	4
CO 12. Termination due to Force Majeure	There is a risk that an event of Force Majeure will mean the parties are no longer able to perform the Contract			√	1	5

Risk	Description	Risk Allocation				
		Government	Private Sector Provider	Shared	Likelihood	Impact
CO 13. Main contractor default and sub-contractor cost for over-runs	In the case of main contractor default, additional costs may be incurred in appointing a replacement, and may cause a delay		√		1	3
CO 14. Poor project management	There is a risk that poor project management will lead to additional costs – e.g. if sub-contractors are not well managed		√		2	2
CO 15. Contractor/sub-contractor industrial action	Industrial action may cause the construction to be delayed, as well as incurring additional management costs		√		1	2
CO 16. Protester action against development	Protester action against the development may incur additional costs, such as security costs			√	1	1
CO 17. Failure to build to required building and environmental standards	Construction does not meet required standards		√		1	4

Operational Risks ("OP")

Risk	Description	Risk Allocation				
		Government	Private Sector Provider	Shared	Likelihood	Impact
OP 1. Waste composition change reducing throughput or performance of facility(s)	May impede ability of Contractor to deliver contractual waste diversion/ recycling requirements			√	3	3
OP 2. Latent defects in new build	Latent defects appear in the structure of the new build asset(s), which require repair		√		2	3
OP 3. Change in specification imposed by procuring entity	There is a risk that, during the operating phase of the project, the Government will require changes to the Contract's Service Specification	√			1	3
OP 4. Performance of sub-contractors	Poor management of sub-contractors can lead to poor co-ordination and under-performance by the Contractor. This may create additional costs in the provision of services		√		2	2
OP 5. Performance of Waste Collection service	Waste recycling targets, in particular, depend on the separate collection and delivery of source-segregated materials	√			2	2

Risk	Description	Risk Allocation				
		Government	Private Sector Provider	Shared	Likelihood	Impact
OP 6. Default by Contractor or sub-contractor	In the case of default by a Contractor or sub-contractor, there may be a need to make emergency provision. There may also be additional costs involved in finding a replacement		√		2	3
OP 7. "Relief Events"	An event of this kind may delay or impede the performance of the Contract and cause additional expense			√	2	2
OP 8. Force Majeure	In the event of Force Majeure additional costs will be incurred. Facilities may also be Unavailable			√	1	4
OP 9. Termination due to Force Majeure	There is a risk that an event of Force Majeure will mean the parties are no longer able to perform the Contract			√	1	5
OP 10. Obtaining and maintaining licences and consents, including those issued by the regulatory agencies	There may be failure to obtain licences and consents, many of which will require renewal on an annual basis. This would include failure to maintain environmental standards and to operate with defined limits.		√		2	3

Risk	Description	Risk Allocation				
		Government	Private Sector Provider	Shared	Likelihood	Impact
OP 11. Sub-standard plant operation and performance	The assets may not operate as intended and/or perform to required performance and/or environmental standards due to: - Sub –plant operation -Sub -standard maintenance - Sub-standard materials - Sub-standard quality of construction		√		2	2
OP 12. Responsibility for maintaining health and safety, quality and environmental standards	Cost of compliance with relevant health and safety, quality and environmental standards may be more than envisaged		√		2	2
OP 13. Increase/ gain of recyclate income	Recycling income may be greater than expected due to (i) the total volumes of waste presented for recycling being greater than projected (ii) market price for processed recyclables being above that projected			√	5	1

Risk	Description	Risk Allocation				
		Government	Private Sector Provider	Shared	Likelihood	Impact
OP 14. Reduction/loss of recyclate income/ or market	Re-cycling income may be less than budget due to: (i) the total volumes of wastes presented for re-cycling being less than that projected (ii) market price for processed recyclables being below that projected (iii) No markets secured for processed Waste (iv) No markets available and waste is disposed (v) Lower market price due to quality of processed recyclables		√		5	1
OP 15. Commercial waste income less than projected	Commercial waste income may be less than expected due to: - trade waste volumes being less than projected - trade waste tariffs being less than projected		√		2	2
OP 16. Incorrect estimated transport cost of providing services under the Contract.	The cost of providing these services may be different to the expected, because of unexpected changes in the cost of equipment, labour, utilities, and other supplies		√		4	3

Risk	Description	Risk Allocation				
		Government	Private Sector Provider	Shared	Likelihood	Impact
OP 17. Incorrect estimated cost of providing specific services under the contract: at point of market testing	The cost of providing these services may be different to the expected, because of unexpected changes in the cost of equipment, labour, utilities, and other supplies			√	4	3
OP 18. Incorrect estimated cost of maintenance and lifecycle replacement.	The cost of building and engineering maintenance and lifecycle replacement may be different to the expected costs		√		2	4
OP 19. Public Liability (caused by PSP)	Cost of third party claim for death, injury or other loss		√		2	3
OP 20. Non-performance of services	Payment will only be made by for services received		√		4	3
OP 21. Termination due to default by the procuring entity	The risk that the procuring entity defaults leading to Contract termination and compensation for the private sector	√			1	2
OP 22. Default by the operator leading to step-in by financiers	The risk that the operator or individual service providers default and financiers step-in leading to higher costs than agreed in the Contract		√		1	2

Risk	Description	Risk Allocation				
		Government	Private Sector Provider	Shared	Likelihood	Impact
OP 23. Termination due to default by the operator	The risk that the operator defaults and step-in rights are exercised by financiers but that they are unsuccessful leading to Contract termination		√		2	4
OP 24. Interface risks	The risk that differing aspects of the waste service (from collection to disposal) will not interface effectively			√	3	3

Residual Value Risks (“RV”)

Risk	Description	Risk Allocation				
		Government	Private Sector Provider	Shared	Likelihood	Impact
RV 1. Procuring entity no longer requires sites and facilities at end of Contract	The risk that the procuring entity will not require the assets at the end of the Contract period, and that the operator may be faced with decommissioning costs		√		2	4
RV 2. Decontamination of sites which are transferred at the end of the contract to either the Government or another incoming contractor	(i) Decontamination costs could be significant from any/all sites. (ii) Allowance should also be made for any known or predictable contamination at the start of the contract where operational 'asset' sites are transferred from the Government to the incoming contractor		√		3	3
RV 3. Disposal of surplus operational plant and equipment at the end of PPP contract if not required by the Council	Surplus operational plant and equipment may be expensive to de-commission and dispose of		√		4	2

Financial Risks ("FI")

Risk	Description	Risk Allocation				
		Government	Private Sector Provider	Shared	Likelihood	Impact
FI 1. Inflation	Inflation above that predicted at Contract signature			√	4	3
FI 2. Change in structure/ownership of PSP	The Contractor will continue to guarantee any performances as a result of any change in structure		√		2	2
FI 3. Insurance (I)	The Contractor provides all necessary for the operation		√		1	3
FI 4. Insurance premiums (ii)	Cost of insurance through Contract term – there is a risk that insurance premiums increase as a result of general market conditions		√		3	2
FI 5. Risk that facility is uninsurable	The risk that cost of financing increases above that used to initially price the Contract			√	1	3
FI 6. Interest rate risk up to financial close	The risk that cost of financing increases above that used to initially price the Contract	√			2	2

Risk	Description	Risk Allocation				
		Government	Private Sector Provider	Shared	Likelihood	Impact
FI 7. Interest rate risk after financial close	The risk that cost of financing increases above that used to initially price the Contract		√		4	4
FI 8. Foreign Exchange risk	The risk that the cost of solution increases as a result of exchange rate fluctuation		√		2	2
FI 9. Changes in the value of revenue streams (e.g. price of electricity generated)	The risk that the revenues from the project are: 1. Less and project base case 2. Greater than projected base case		√	√	4 4	4 4
FI 10. Changes in interest/LIBOR rates	The risk that the cost of solution increases as a result of changes in general interest rates	√			4	4

Performance Risks ("PE")

Risk	Description	Risk Allocation				
		Government	Private Sector Provider	Shared	Likelihood	Impact
PE 1. Failure to meet environmental and performance standards	There is a risk that operational and maintenance services ("O&M") will not provide the required quality of services and or conform to require performance and environmental standards		√		4	3
PE 2. Availability of facilities	There is a risk that some or all of the facilities will not be available for the use to which it they are intended. There may be costs involved in making the facility available		√		2	2
PE 3. Performance targets	Performance targets set by the Government may not be met due to: (i). Waste composition (see also Risk OP1 above)			√	4	3

Risk	Description	Risk Allocation				
		Government	Private Sector Provider	Shared	Likelihood	Impact
	(ii). Contractors performance		√		4	2
	(iii). Public participation			√	2	2
	(iv). Inadequate management		√		4	2
PE 4. Performance and Environmental Targets	(i). Failure to sort collected materials (ii).Failure to deliver according to delivery regime (iii). Failure of technology (iv). Inadequate management (v) Poor operation		All √		4	3

Demand and Composition Risks ("DM")

Risk	Description	Risk Allocation				
		Government	Private Sector Provider	Shared	Likelihood	Impact
DM 1. Changes in the volume of demand for services	Growth or reduction in waste tonnage against base case prediction	√			4	3
DM 2. Composition risk	Change in waste composition (may impact on Caloric Value for example)			√	4	2
DM 3. Contamination risk	Contamination of collected waste stream			√	3	2

Technology and Obsolescence Risks ("TE")

Risk	Description	Risk Allocation				
		Government	Private Sector Provider	Shared	Likelihood	Impact
TE 1. Unexpected changes in technology	Unexpected changes in technology may lead to a need to re-scale or re-configuration.	√			1	5
TE 2. Asset obsolescence	Buildings, plant and equipment may become obsolete during the Contract	√			1	5

Regulatory Risks ("RG")

Risk	Description	Risk Allocation				
		Government	Private Sector Provider	Shared	Likelihood	Impact
RG 1. Legislative / regulatory change: Discriminatory Change in Law	Where not foreseeable, a change in local authority specific legislation / regulations, may lead to a change in the requirements and variations in costs	√			3	4
RG 2. Legislative / regulatory change: waste industry specific	Where not foreseeable, a change in waste industry specific legislation / regulations may lead to a change in the requirements and variations in costs	√			4	2
RG 3. Legislative / regulatory change having capital cost consequences: general	Where not foreseeable legislation / regulations which have a capital cost consequence may lead to a change in requirements or variations in costs	√			4	3
RG 4. Legislative / regulatory change: General Change in Law	Non-specific changes to legislation / regulations may lead to change in requirements and variation in costs		√		4	2
RG 5. Compliance with existing and or foreseeable environmental regulations/legislation	The facilities may fail to meet existing environment regulations/legislation due to: - inadequate plant design - inadequate maintenance - use of sub-standard materials		√		1	4

Risk	Description	Risk Allocation				
		Government	Private Sector Provider	Shared	Likelihood	Impact
RG 6. Compliance with new environmental regulations/legislation	Where not foreseeable, to the extent the changes are discriminatory or specific, the facilities may fail to meet new environmental regulations/legislation	√			4	4

Import Duty Risks ("ID")

Risk	Description	Risk Allocation				
		Government	Private Sector Provider	Shared	Likelihood	Impact
ID 1. Changes in import duties payable	The scope and level of import duties may affect the cost of providing services	√			4	3

Risk Rating Matrix

#NAME?

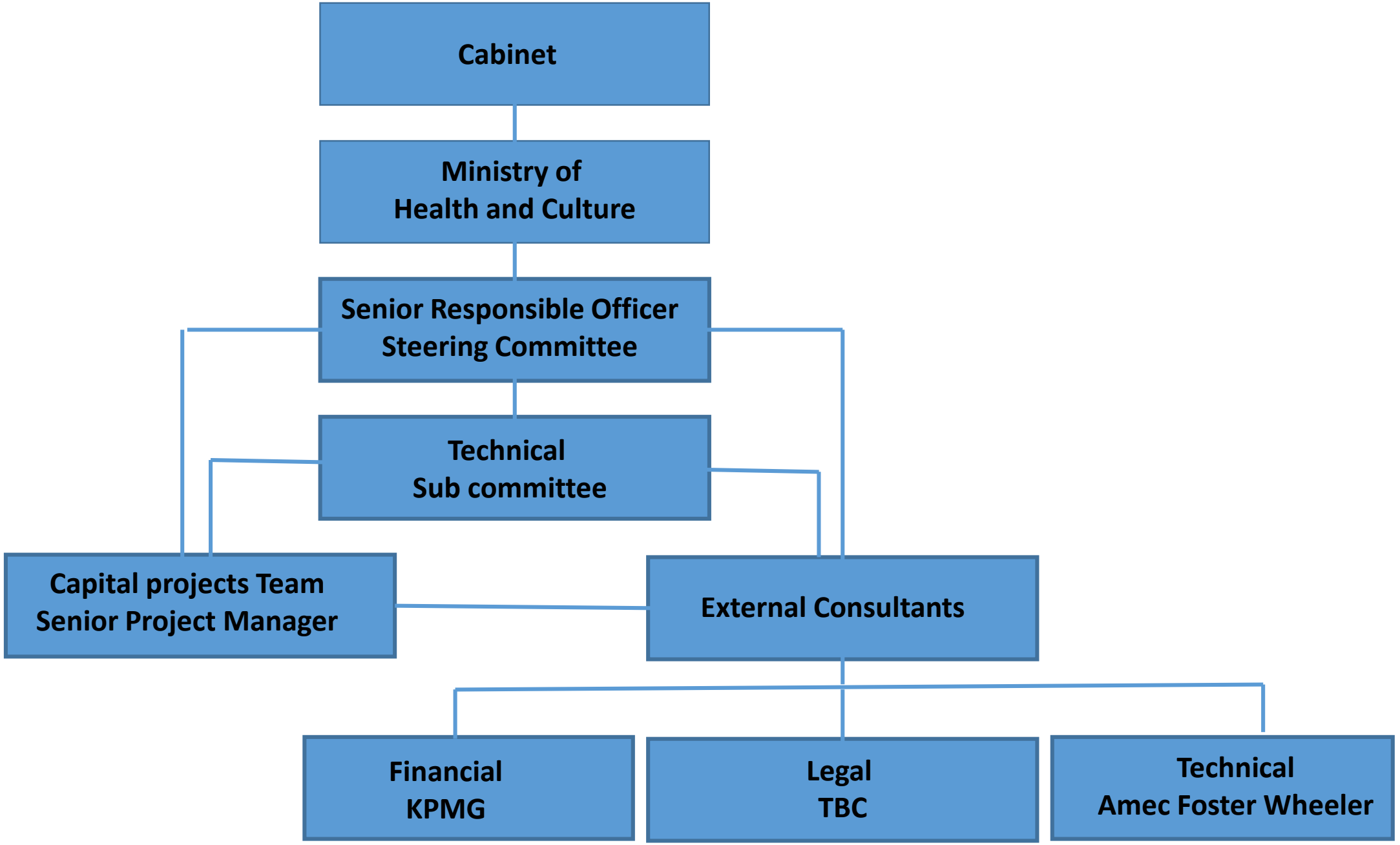
Likelihood / **Consequence/Impact**

	1	2	3	4	5
1	2	3	4	5	6
2	3	4	5	6	7
3	4	5	6	7	8
4	5	6	7	8	9
5	6	7	8	9	10

Assessment Criteria

Points	Category	Action Required
2	Acceptable	No exceptional actions required beyond good practice
3	Acceptable	No exceptional actions required beyond good practice
4	Manageable	Retain but ensure controls in place to reduce risk
5	Manageable	Retain but ensure controls in place to reduce risk
6	Undesirable	Attempt to avoid or transfer risk, seek alternatives
7	Undesirable	Attempt to avoid or transfer risk, seek alternatives
8	Intolerable	Must eliminate hazard or transfer risk
9	Intolerable	Must eliminate hazard or transfer risk
10	Intolerable	Must eliminate hazard or transfer risk

Appendix D
Decision Tree Organogram


Cabinet
Ministry of
Health and Culture
Senior Responsible Officer
Steering Committee
Technical
Sub committee
Capital projects Team
Senior Project Manager
External Consultants
Financial
KPMG
Legal
TBC
Technical
Amec Foster Wheeler

Appendix E
Risk Output Report

Cayman Islands – Solid Waste Management Outline Business Case

Risk allocation matrix - PSC

Planning Risks ("PL")

Risk	Description	Risk Allocation			Enter 1 to 5 in each column (see page 23)		Likelihood Percentages				Risk Cost		
		Government	Private Sector Provider ("PSP")	Shared	Likelihood	Impact	Min	Most Likely	Max	Mid range value	Min	Most likely	Max
PL 1. Cost estimates for obtaining planning approvals	(a) Estimated cost of receiving detailed planning permission is incorrect;	100%	0%		3	2	1.0%	5.0%	9.0%	1,750,000	17,500.00	87,500.00	157,500.00
	(b) Higher cost in satisfying unforeseen planning requirements	100%	50%		4	3	10.0%	47.5%	85.0%	3,750,000	375,000.00	1,781,250.00	3,187,500.00
PL 2. Delayed planning permission and site statutory approvals	A delay in receiving planning permission may have broader cost implications for the project	100%	0%		4	3	10.0%	47.5%	85.0%	3,750,000	375,000.00	1,781,250.00	3,187,500.00
PL 3. Rejection of planning application	Rejection of initial planning application will have knock on effect - delays, cost impact, and possible termination of Contract specification deliverables	100%			2	2	0.1%	0.5%	0.9%	1,750,000	1,750.00	8,750.00	15,750.00
PL 4. Planning permission conditions	Planning permission is granted with onerous conditions attached, which will have a knock on effect - delays, cost impact	100%	0%		2	2	0.1%	0.5%	0.9%	1,750,000	1,750.00	8,750.00	15,750.00
PL 5. Legal Agreements	Examples:	100%	0%		2	4	0.1%	0.5%	0.9%	10,000,000	10,000.00	50,000.00	90,000.00
	Land Access/Ownership Agreements delayed	0%									-	-	-
PL 6. Judicial Review	Judicial review may lead to overturning of planning consent or if not the process itself leading to delay to the timetable	100%	0%		2	2	0.1%	0.5%	0.9%	1,750,000	1,750.00	8,750.00	15,750.00
											782,750.00	3,726,250.00	6,669,750.00

Design Risks ("DS")

Risk	Description	Risk Allocation					Likelihood Percentages				Risk Cost		
		Council	Private Sector Provider	Shared	Likelihood	Impact	Min	Most Likely	Max	Mid range value	Min	Most likely	Max
DS 1. Defaults on Contract specifications (failure to design to brief)	Failure to translate the needs set out in the agreed Contract specifications, into the design		100%		1	4	0.0%	0.1%	0.1%	10,000,000	-	-	-
DS 2. Continuing development of design	The detail of the design should be developed within an agreed framework and timetable. A failure to do so may lead to addition design and construction		100%		1	3	0.0%	0.1%	0.1%	3,750,000	-	-	-
DS 3. Change in project content by the Government	The Government may require changes to the overall service specification - additional design and construction costs may be incurred	100%			1	3	0.0%	0.1%	0.1%	3,750,000	375.00	1,875.00	3,375.00
DS 4. Change in design required by operator	This is the risk that the operator will require changes to the design, leading to additional design costs	100%			3	1	1.0%	5.0%	9.0%	500,000	5,000.00	25,000.00	45,000.00
DS 5. Change in design required due to external influences	(a) There is a risk that the designs will need to change due to legislative or regulatory changes. (b) Planning issues and constraints may also lead to design changes.	100%			2	4	0.1%	0.5%	0.9%	10,000,000	10,000.00	50,000.00	90,000.00
DS 6. Failure to build to design	Misinterpretation of design or failure to build to agreed specification during construction may lead to additional design, construction or operational costs		100%		1	2	0.0%	0.1%	0.1%	1,750,000	-	-	-
											15,375.00	76,875.00	138,375.00

Construction Risks ("CO")

Risk	Description	Risk Allocation					Likelihood Percentages				Risk Cost		
		Council	Private Sector Provider	Shared	Likelihood	Impact	Min	Most Likely	Max	Mid range value	Min	Most likely	Max
CO 1. Incorrect time estimate	The time taken to complete the construction phase may be different from the estimated time		**100%**		4	3	10.0%	47.5%	85.0%	3,750,000	-	-	-
CO 2. Unforeseen ground/site conditions on new sites	Unforeseen ground/site conditions (ecological, archaeological, etc.) may lead to variations in the estimated costs or project delays or an inability to deliver		100%		2	3	0.1%	0.5%	0.9%	3,750,000	-	-	-
CO 3. Delay in gaining access to sites provided by the Government	A delay in gaining access to the sites may delay the entire project	100%			1	2	0.0%	0.1%	0.1%	1,750,000	175.00	875.00	1,575.00
CO 4. Delay in gaining access to sites not provided by the Government	A delay in gaining access to the sites may delay the entire project		n/a								-	-	-
CO 5. Availability of services/ Infrastructure etc. to provide service	The non-availability of necessary services/utilities		100%		2	3	0.1%	0.5%	0.9%	3,750,000	-	-	-
CO 6. Theft of/damage to equipment/materials	Use of sub-standard materials and/or theft and/or damage to equipment and materials may lead to unforeseen costs in terms of replacing damaged items, and delay		100%		1	2	0.0%	0.1%	0.1%	1,750,000	-	-	-
CO 7. Responsibility for maintaining site safety	The Construction, Design and Management ("CDM") regulations must be complied with		100%		2	2	0.1%	0.5%	0.9%	1,750,000	-	-	-
CO 8. Third party claims	The risk refers to the costs associated with third party claims due to loss of amenity and ground subsidence on adjacent properties		100%		1	2	0.0%	0.1%	0.1%	1,750,000	-	-	-
CO 9. "Compensation Events"	An event of this kind may delay or impede the performance of the Contract construction phase and cause additional expense	100%			1	2	0.0%	0.1%	0.1%	1,750,000	175.00	875.00	1,575.00
CO 10. "Relief Events"	An event of this kind (outside of the Contractor's direct control) may delay or impede the performance of the Contract construction phase and cause additional expense and lead to time extension	50%	50%		2	2	0.1%	0.5%	0.9%	1,750,000	875.00	4,375.00	7,875.00
CO 11. Force Majeure	In the event of Force Majeure additional costs will be incurred. Facilities may also be unavailable	50%	50%	.	1	4	0.0%	0.1%	0.1%	10,000,000	500.00	2,500.00	4,500.00
CO 12. Termination due to Force Majeure	There is a risk that an event of Force Majeure will mean the parties are no longer able to perform the Contract	50%	50%	.	1	5	0.0%	0.1%	0.1%	20,000,000	1,000.00	5,000.00	9,000.00
CO 13. Main contractor default and sub-contractor cost for over-runs	In the case of main contractor default, additional costs may be incurred in appointing a replacement, and may cause a delay		100%		1	3	0.0%	0.1%	0.1%	3,750,000	-	-	-

Risk allocation matrix - PSC

CO 14. Poor project management	There is a risk that poor project management will lead to additional costs – e.g. if sub-contractors are not well managed		100%		2	2	0.1%	0.5%	0.9%	1,750,000	-	-	-
CO 15. Contractor/sub-contractor industrial action	Industrial action may cause the construction to be delayed, as well as incurring additional management costs		100%		1	2	0.0%	0.1%	0.1%	1,750,000	-	-	-
CO 16. Protester action against development	Protester action against the development may incur additional costs, such as security costs	100%	0%		1	1	0.0%	0.1%	0.1%	500,000	50.00	250.00	450.00
											2,775.00	13,875.00	24,975.00

Cayman Islands – Solid Waste Management Outline Business Case

Risk allocation matrix - PSC

Operational Risks ("OP")

Risk	Description	Risk Allocation					Likelihood Percentages				Risk Cost		
		Council	Private Sector Provider	Shared	Likelihood	Impact	Min	Most Likely	Max	Mid range value	Min	Most likely	Max
OP 1. Waste composition change reducing throughput or performance of facility(s)	May impede ability of Contractor to deliver contractual waste diversion/ recycling requirements	100%	0%		3	3	1.0%	5.0%	9.0%	3,750,000	37,500.00	187,500.00	337,500.00
OP 2. Latent defects in new build	Latent defects appear in the structure of the new build asset(s), which require repair	100%	0%		2	3	0.1%	0.5%	0.9%	3,750,000	3,750.00	18,750.00	33,750.00
OP 3. Change in specification imposed by procuring entity	There is a risk that, during the operating phase of the project, the Council will require changes to the Contract's Service Specification	100%			1	3	0.0%	0.1%	0.1%	3,750,000	375.00	1,875.00	3,375.00
OP 4. Performance of sub-contractors	Poor management of sub-contractors can lead to poor co-ordination and under-performance by the Contractor. This may create additional costs in the provision of services	100%	0%		2	2	0.1%	0.5%	0.9%	1,750,000	1,750.00	8,750.00	15,750.00
OP 5. Performance of Waste Collection Authority	Waste recycling targets, in particular, depend on the separate collection and delivery of source-segregated materials	100%			2	3	0.1%	0.5%	0.9%	3,750,000	3,750.00	18,750.00	33,750.00
OP 6. Default by Contractor or sub-contractor	In the case of default by a Contractor or sub-contractor, there may be a need to make emergency provision. There may also be additional costs involved in finding a replacement	100%	0%		2	3	0.1%	0.5%	0.9%	3,750,000	3,750.00	18,750.00	33,750.00
OP 7. "Relief Events"	An event of this kind may delay or impede the performance of the Contract and cause additional expense	n/a											
OP 8. Force Majeure	In the event of Force Majeure additional costs will be incurred. Facilities may also be Unavailable	100%	0%		1	4	0.0%	0.1%	0.1%	10,000,000	1,000.00	5,000.00	9,000.00
OP 9. Termination due to Force Majeure	There is a risk that an event of Force Majeure will mean the parties are no longer able to perform the Contract	n/a											
OP 10. Obtaining and maintaining licences and consents, including those issued by the Environment Agency	There may be failure to obtain licences and consents, many of which will require renewal on an annual basis	100%	0%		2	3	0.1%	0.5%	0.9%	3,750,000	3,750.00	18,750.00	33,750.00
OP 11. Sub standard plant operation	The assets may not operate as intended due to: - Sub standard maintenance - Sub standard materials - Sub standard quality of construction	100%	0%		2	2	0.1%	0.5%	0.9%	1,750,000	1,750.00	8,750.00	15,750.00
OP 12. Responsibility for maintaining health and safety, quality and environmental standards	Cost of compliance with relevant health and safety, quality and environmental standards may be more than envisaged	100%	0%		2	2	0.1%	0.5%	0.9%	1,750,000	1,750.00	8,750.00	15,750.00
OP 13. Increase/ gain of recyclate income	Recycling income may be greater than expected due to (i) the total volumes of waste presented for recycling being greater than projected (ii) market price for processed recyclables being above that projected	100%	0%		5	1	85.0%	92.5%	100.0%	500,000	425,000.00	462,500.00	500,000.00
OP 14. Reduction/loss of recyclate income/ or market	Re-cycling income may be less than budget due to: (i) the total volumes of wastes presented for re-cycling being less than that projected (ii) market price for processed recyclables being below that projected (iii) No markets secured for processed Waste (iv) No markets available and waste is disposed (v) Lower market price due to quality of processed recyclables	100%	0%		1	1	0.0%	0.1%	0.1%	500,000	50.00	250.00	450.00
OP 15. Commercial waste income less than projected	Commercial waste income may be less than expected due to: - trade waste volumes being less than projected - trade waste tariffs being less than projected	100%	0%		2	2	0.1%	0.5%	0.9%	1,750,000	1,750.00	8,750.00	15,750.00
OP 16. Incorrect estimated transport cost of providing services under the Contract.	The cost of providing these services may be different to the expected, because of unexpected changes in the cost of equipment, labour, utilities, and other supplies	100%			4	3	10.0%	47.5%	85.0%	3,750,000	375,000.00	1,781,250.00	3,187,500.00
OP 17. Incorrect estimated cost of providing specific services under the contract: at point of market testing	The cost of providing these services may be different to the expected, because of unexpected changes in the cost of equipment, labour, utilities, and other supplies	100%			4	3	10.0%	47.5%	85.0%	3,750,000	375,000.00	1,781,250.00	3,187,500.00
OP 18. Incorrect estimated cost of maintenance and lifecycle replacement.	The cost of building and engineering maintenance and lifecycle replacement may be different to the expected costs	100%			2	4	0.1%	0.5%	0.9%	10,000,000	10,000.00	50,000.00	90,000.00
OP 19. Public Liability (caused by PSP)	Cost of third party claim for death, injury or other loss	100%			2	3	0.1%	0.5%	0.9%	3,750,000	3,750.00	18,750.00	33,750.00
OP 20. Non-performance of services	Payment will only be made by for services received	100%			4	3	10.0%	47.5%	85.0%	3,750,000	375,000.00	1,781,250.00	3,187,500.00
OP 21. Termination due to default by the procuring entity	The risk that the procuring entity defaults leading to Contract termination and compensation for the private sector	n/a											
OP 22. Default by the operator leading to step-in by financiers	The risk that the operator or individual service providers default and financiers step-in leading to higher costs than agreed in the Contract	n/a											
OP 23. Termination due to default by the operator	The risk that the operator defaults and step-in rights are exercised by financiers but that they are unsuccessful leading to Contract termination	n/a											
OP 24. Interface risks	The risk that differing aspects of the waste service (from collection to disposal) will not interface effectively	n/a											
											1,624,675.00	6,179,625.00	10,734,575.00

Residual Value Risks ("RV")

Risk	Description	Risk Allocation					Likelihood Percentages				Risk Cost		
		Council	Private Sector Provider	Shared	Likelihood	Impact	Min	Most Likely	Max	Mid range value	Min	Most likely	Max

Risk allocation matrix - PSC

RV 1. Procuring entity no longer requires sites and facilities at end of Contract	The risk that the procuring entity will not require the assets at the end of the Contract period, and that the operator may be faced with decommissioning costs	100%			2	4	0.1%	0.5%	0.9%	10,000,000	10,000.00	50,000.00	90,000.00
RV 2. Decontamination of sites which are transferred at the end of the PPP contract to either the Council or another incoming contractor	(i) Decontamination costs could be significant from any/all sites. (ii) Allowance should also be made for any known or predictable contamination at the start of the PPP contract where operational 'asset' sites are transferred from the Council to the incoming PPP contractor	100%			3	3	1.0%	5.0%	9.0%	3,750,000	37,500.00	187,500.00	337,500.00
RV 3. Disposal of surplus operational plant and equipment at the end of PPP contract if not required by the Council	Surplus operational plant and equipment may be expensive to de-commission and dispose of	100%			2	2	0.1%	0.5%	0.9%	1,750,000	1,750.00	8,750.00	15,750.00
											49,250.00	246,250.00	443,250.00

Cayman Islands – Solid Waste Management Outline Business Case

Risk allocation matrix - PSC

Financial Risks ("FI")

Risk	Description	Risk Allocation					Likelihood Percentages				Risk Cost		
		Council	Private Sector Provider	Shared	Likelihood	Impact	Min	Most Likely	Max	Mid range value	Min	Most likely	Max
FI 1. Inflation	Inflation above that predicted at Contract signature	n/a											
FI 2. Change in structure/ownership of PSP	The Contractor will continue to guarantee any performances as a result of any change in structure	n/a											
FI 3. Insurance (I)	The Contractor provides all necessary for the operation	100%			1	3	0.0%	0.1%	0.1%	3,750,000	375.00	1,875.00	3,375.00
FI 4. Insurance premiums (ii)	Cost of insurance through Contract term – there is a risk that insurance premiums increase as a result of general market conditions	100%			3	2	1.0%	5.0%	9.0%	1,750,000	17,500.00	87,500.00	157,500.00
FI 5. Risk that facility is uninsurable	The risk that cost of financing increases above that used to initially price the Contract	n/a											
FI 6. Interest rate risk up to financial close	The risk that cost of financing increases above that used to initially price the Contract	100%			2	2	0.1%	0.5%	0.9%	1,750,000	1,750.00	8,750.00	15,750.00
FI 7. Interest rate risk after financial close	The risk that cost of financing increases above that used to initially price the Contract	100%			4	4	10.0%	47.5%	85.0%	10,000,000	1,000,000.00	4,750,000.00	8,500,000.00
FI 8. Foreign Exchange risk	The risk that the cost of solution increases as a result of exchange rate fluctuation	n/a											
FI 9. Changes in the value of revenue streams (e.g. price of electricity generated)	The risk that the revenues from the project are: 1. Less and project base case 2. Greater than projected base case	100%	0%		4	4	10.0%	47.5%	85.0%	10,000,000	1,000,000.00	4,750,000.00	8,500,000.00
FI 10. Changes in interest/LIBOR rates	The risk that the cost of solution increases as a result of changes in general interest rates	n/a											
											2019625	9598125	17176625

Performance Risks ("PE")

Risk	Description	Risk Allocation					Likelihood Percentages				Risk Cost		
		Council	Private Sector Provider	Shared	Likelihood	Impact	Min	Most Likely	Max	Mid range value	Min	Most likely	Max
PE 1. Failure to meet performance standards	There is a risk that operational and maintenance services ("O&M") will not provide the required quality of services.	100%	100%		4	3	10.0%	47.5%	85.0%	3,750,000	375,000.00	1,781,250.00	3,187,500.00
PE 2. Availability of facilities	There is a risk that some or all of the facilities will not be available for the use to which it they are intended. There may be costs involved in making the facility available	100%	100%		2	2	0.1%	0.5%	0.9%	1,750,000	1,750.00	8,750.00	15,750.00
PE 3. Performance targets	Performance targets set by the Government may not be met due to:												
	(i). Waste composition (see also Risk OP1 above)	100%	50%		4	3	10.0%	47.5%	85.0%	3,750,000	375,000.00	1,781,250.00	3,187,500.00
	(ii). Contractors performance	n/a			4	2							
	(iii). Public participation	100%			2	2	0.1%	0.5%	0.9%	1,750,000	1,750.00	8,750.00	15,750.00
	(iv). Inadequate management	100%			4	2	10.0%	47.5%	85.0%	1,750,000	175,000.00	831,250.00	1,487,500.00
PE 4. Performance Targets	(i). Failure to sort collected materials (ii).Failure to deliver according to delivery regime (iii). Failure of technology (iv). Inadequate management	100%			3	3	1.0%	5.0%	9.0%	3,750,000	37,500.00	187,500.00	337,500.00
											966,000.00	4,598,750.00	8,231,500.00

Demand and Composition Risks ("DM")

Risk	Description	Risk Allocation					Likelihood Percentages				Risk Cost		
		Council	Private Sector Provider	Shared	Likelihood	Impact	Min	Most Likely	Max	Mid range value	Min	Most likely	Max
DM 1. Changes in the volume of demand for services	Growth or reduction in waste tonnage against base case prediction	100%			4	3	10.0%	47.5%	85.0%	3,750,000	375,000.00	1,781,250.00	3,187,500.00
DM 2. Composition risk	Change in waste composition (may impact on Caloric Value for example)	100%			4	2	10.0%	47.5%	85.0%	1,750,000	175,000.00	831,250.00	1,487,500.00
DM 3. Contamination risk	Contamination of collected waste stream	100%	0%		3	2	1.0%	5.0%	9.0%	1,750,000	17500	87500	157500
											567,500.00	2,700,000.00	4,832,500.00

Technology and Obsolescence Risks ("TE")

Risk	Description	Risk Allocation					Likelihood Percentages				Risk Cost		
		Council	Private Sector Provider	Shared	Likelihood	Impact	Min	Most Likely	Max	Mid range value	Min	Most likely	Max
TE 1. Unexpected changes in technology	Unexpected changes in technology may lead to a need to re-scale or re-configure the provision of services	100%			1	5	0.0%	0.1%	0.1%	20,000,000	2,000.00	10,000.00	18,000.00
TE 2. Asset obsolescence	Buildings, plant and equipment may become obsolete during the Contract	100%			1	5	0.0%	0.1%	0.1%	20,000,000	2000	10000	18000
											4,000.00	20,000.00	36,000.00

Cayman Islands – Solid Waste Management Outline Business Case

Risk allocation matrix - PSC

Regulatory Risks ("RG")

Risk	Description	Risk Allocation					Likelihood Percentages				Risk Cost		
		Council	Private Sector Provider	Shared	Likelihood	Impact	Min	Most Likely	Max	Mid range value	Min	Most likely	Max
RG 1. Legislative / regulatory change: Discriminatory Change in Law	Where not foreseeable, a change in local authority specific legislation / regulations, may lead to a change in the requirements and variations in costs	100%			3	4	1.0%	5.0%	9.0%	10,000,000	100,000.00	500,000.00	900,000.00
RG 2. Legislative / regulatory change: waste industry specific	Where not foreseeable, a change in waste industry specific legislation / regulations may lead to a change in the requirements and variations in costs	100%			4	2	10.0%	47.5%	85.0%	1,750,000	175,000.00	831,250.00	1,487,500.00
RG 3. Legislative / regulatory change having capital cost consequences: general	Where not foreseeable, non-local authority specific changes to legislation / regulations which have a capital cost consequence may lead to a change in requirements or variations in costs	100%			4	3	1.0%	5.0%	9.0%	10,000,000	100,000.00	500,000.00	900,000.00
RG 4. Legislative / regulatory change: General Change in Law	Non-local authority specific changes to legislation / regulations may lead to change in requirements and variation in costs	100%			4	2	10.0%	47.5%	85.0%	1,750,000	175,000.00	831,250.00	1,487,500.00
RG 5. Compliance with existing and or foreseeable environmental regulations/legislation	The facilities may fail to meet existing environment regulations/legislation due to: - inadequate plant design - inadequate maintenance - use of sub-standard materials	100%			1	4	10.0%	47.5%	85.0%	3,750,000	375,000.00	1,781,250.00	3,187,500.00
RG 6. Compliance with new environmental regulations/legislation	Where not foreseeable, to the extent the changes are discriminatory or specific, the facilities may fail to meet new environmental regulations/legislation	100%			4	4	10.0%	47.5%	85.0%	10,000,000	1000000	4750000	8500000
											1,925,000.00	9,193,750.00	16,462,500.00

Import Duty Risks ("ID")

Risk	Description	Risk Allocation					Likelihood Percentages				Risk Cost		
		Council	Private Sector Provider	Shared	Likelihood	Impact	Min	Most Likely	Max	Mid range value	Min	Most likely	Max
ID 1. Changes in Import Duties payable	The scope and level of import duties may affect the cost of providing services	100%			4	3	10.0%	47.5%	85.0%	3,750,000	375000	1781250	3187500
											375000	1781250	3187500

Total retained risk cost	**8,331,950.00**	**38,134,750.00**	**67,937,550.00**

Risk allocation matrix - DBFOM

Planning Risks ("PL")

Risk	Description	Risk Allocation			Enter 1 to 5 in each column (see page 23)		Likelihood Percentages				Risk Cost		
		Government	Private Sector Provider ("PSP")	Shared	Likelihood	Impact	Min	Most Likely	Max	Mid range value	Min	Most likely	Max
PL 1. Cost estimates for obtaining planning approvals	(a) Estimated cost of receiving detailed planning permission is incorrect;		100%		3	2	1.0%	5.0%	9.0%	1,750,000	-	-	-
	(b) Higher cost in satisfying unforeseen planning requirements	50%	50%		4	3	10.0%	47.5%	85.0%	3,750,000	187,500	890,625	1,593,750
PL 2. Delayed planning permission and site statutory approvals	A delay in receiving planning permission may have broader cost implications for the project		100%		4	3	10.0%	47.5%	85.0%	3,750,000	-	-	-
PL 3. Rejection of planning application	Rejection of initial planning application will have knock on effect - delays, cost impact, and possible termination of Contract specification deliverables	50%	50%		2	2	0.1%	0.5%	0.9%	1,750,000	875	4,375	7,875
PL 4. Planning permission conditions	Planning permission is granted with onerous conditions attached, which will have a knock on effect - delays, cost impact	50%	50%		2	2	0.1%	0.5%	0.9%	1,750,000	875	4,375	7,875
PL 5. Legal Agreements	Examples:	50%	50%		2	4	0.1%	0.5%	0.9%	10,000,000	5,000	25,000	45,000
	Land Access/Ownership Agreements delayed										-	-	-
PL 6. Judicial Review	Judicial review may lead to overturning of planning consent or if not the process itself leading to delay to the timetable	50%	50%		2	2	0.1%	0.5%	0.9%	1,750,000	875	4,375	7,875
											195,125	928,750	1,662,375

Design Risks ("DS")

Risk	Description	Risk Allocation					Likelihood Percentages				Risk Cost		
		Council	Private Sector Provider	Shared	Likelihood	Impact	Min	Most Likely	Max	Mid range value	Min	Most likely	Max
DS 1. Defaults on Contract specifications (failure to design to brief)	Failure to translate the needs set out in the agreed Contract specifications, into the design		100%		1	4	0.0%	0.1%	0.1%	10,000,000	-	-	-
DS 2. Continuing development of design	The detail of the design should be developed within an agreed framework and timetable. A failure to do so may lead to addition design and construction		100%		1	3	0.0%	0.1%	0.1%	3,750,000	-	-	-
DS 3. Change in project content by the Government	The Government may require changes to the overall service specification - additional design and construction costs may be incurred	100%			1	3	0.0%	0.1%	0.1%	3,750,000	375	1,875	3,375
DS 4. Change in design required by operator	This is the risk that the operator will require changes to the design, leading to additional design costs		100%		3	1	1.0%	5.0%	9.0%	500,000	-	-	-
DS 5. Change in design required due to external influences	(a) There is a risk that the designs will need to change due to legislative or regulatory changes. (b) Planning issues and constraints may also lead to design changes.	50%	50%		2	4	0.1%	0.5%	0.9%	10,000,000	5,000	25,000	45,000
DS 6. Failure to build to design	Misinterpretation of design or failure to build to agreed specification during construction may lead to additional design, construction or operational costs		100%		1	2	0.0%	0.1%	0.1%	1,750,000	-	-	-
											5,375	26,875	48,375

Construction Risks ("CO")

Risk	Description	Risk Allocation					Likelihood Percentages				Risk Cost		
		Council	Private Sector Provider	Shared	Likelihood	Impact	Min	Most Likely	Max	Mid range value	Min	Most likely	Max
CO 1. Incorrect time estimate	The time taken to complete the construction phase may be different from the estimated time		**100%**		4	3	10.0%	47.5%	85.0%	3,750,000	-	-	-
CO 2. Unforeseen ground/site conditions on new sites	Unforeseen ground/site conditions (ecological, archaeological, etc.) may lead to variations in the estimated costs or project delays or an inability to deliver		100%		2	3	0.1%	0.5%	0.9%	3,750,000	-	-	-
CO 3. Delay in gaining access to sites provided by the Government	A delay in gaining access to the sites may delay the entire project	100%			1	2	0.0%	0.1%	0.1%	1,750,000	175	875	1,575
CO 4. Delay in gaining access to sites not provided by the Government	A delay in gaining access to the sites may delay the entire project		100%		2	2					-	-	-
CO 5. Availability of services/ Infrastructure etc. to provide service	The non-availability of necessary services/utilities		100%		2	3	0.1%	0.5%	0.9%	3,750,000	-	-	-
CO 6. Theft of/damage to equipment/materials	Use of sub-standard materials and/or theft and/or damage to equipment and materials may lead to unforeseen costs in terms of replacing damaged items, and delay		100%		1	2	0.0%	0.1%	0.1%	1,750,000	-	-	-
CO 7. Responsibility for maintaining site safety	The Construction, Design and Management ("CDM") regulations must be complied with		100%		2	2	0.1%	0.5%	0.9%	1,750,000	-	-	-
CO 8. Third party claims	The risk refers to the costs associated with third party claims due to loss of amenity and ground subsidence on adjacent properties		100%		1	2	0.0%	0.1%	0.1%	1,750,000	-	-	-
CO 9. "Compensation Events"	An event of this kind may delay or impede the performance of the Contract construction phase and cause additional expense	100%			1	2	0.0%	0.1%	0.1%	1,750,000	175	875	1,575
CO 10. "Relief Events"	An event of this kind (outside of the Contractor's direct control) may delay or impede the performance of the Contract construction phase and cause additional expense and lead to time extension	50%	50%		2	2	0.1%	0.5%	0.9%	1,750,000	875	4,375	7,875
CO 11. Force Majeure	In the event of Force Majeure additional costs will be incurred. Facilities may also be unavailable	50%	50%	.	1	4	0.0%	0.1%	0.1%	10,000,000	500	2,500	4,500
CO 12. Termination due to Force Majeure	There is a risk that an event of Force Majeure will mean the parties are no longer able to perform the Contract	50%	50%	.	1	5	0.0%	0.1%	0.1%	20,000,000	1,000	5,000	9,000
CO 13. Main contractor default and sub-contractor cost for over-runs	In the case of main contractor default, additional costs may be incurred in appointing a replacement, and may cause a delay		100%		1	3	0.0%	0.1%	0.1%	3,750,000	-	-	-
CO 14. Poor project management	There is a risk that poor project management will lead to additional costs – e.g. if sub-contractors are not well managed		100%		2	2	0.1%	0.5%	0.9%	1,750,000	-	-	-
CO 15. Contractor/sub-contractor industrial action	Industrial action may cause the construction to be delayed, as well as incurring additional management costs		100%		1	2	0.0%	0.1%	0.1%	1,750,000	-	-	-
CO 16. Protester action against development	Protester action against the development may incur additional costs, such as security costs	50%	50%		1	1	0.0%	0.1%	0.1%	500,000	25	125	225
											2,750	13,750	24,750

Operational Risks ("OP")

Risk	Description	Risk Allocation			Likelihood	Impact	Likelihood Percentages			Mid range value	Risk Cost		
		Council	Private Sector Provider	Shared			Min	Most Likely	Max		Min	Most likely	Max
OP 1. Waste composition change reducing throughput or performance of facility(s)	May impede ability of Contractor to deliver contractual waste diversion/ recycling requirements	50%	50%		3	3	1.0%	5.0%	9.0%	3,750,000	18,750	93,750	168,750
OP 2. Latent defects in new build	Latent defects appear in the structure of the new build asset(s), which require repair		100%		2	3	0.1%	0.5%	0.9%	3,750,000	-	-	-
OP 3. Change in specification imposed by procuring entity	There is a risk that, during the operating phase of the project, the Council will require changes to the Contract's Service Specification	100%			1	3	0.0%	0.1%	0.1%	3,750,000	375	1,875	3,375
OP 4. Performance of sub-contractors	Poor management of sub-contractors can lead to poor co-ordination and under-performance by the Contractor. This may create additional costs in the provision of services		100%		2	2	0.1%	0.5%	0.9%	1,750,000	-	-	-
OP 5. Performance of Waste Collection Authority	Waste recycling targets, in particular, depend on the separate collection and delivery of source-segregated materials	100%			2	3	0.1%	0.5%	0.9%	3,750,000	3,750	18,750	33,750
OP 6. Default by Contractor or sub-contractor	In the case of default by a Contractor or sub-contractor, there may be a need to make emergency provision. There may also be additional costs involved in finding a replacement		100%		2	3	0.1%	0.5%	0.9%	3,750,000	-	-	-
OP 7. "Relief Events"	An event of this kind may delay or impede the performance of the Contract and cause additional expense	50%	50%		2	2	0.1%	0.5%	0.9%	1,750,000	875	4,375	7,875
OP 8. Force Majeure	In the event of Force Majeure additional costs will be incurred. Facilities may also be Unavailable	50%	50%		1	4	0.0%	0.1%	0.1%	10,000,000	500	2,500	4,500
OP 9. Termination due to Force Majeure	There is a risk that an event of Force Majeure will mean the parties are no longer able to perform the Contract	50%	50%		1	5	0.0%	0.1%	0.1%	20,000,000	1,000	5,000	9,000
OP 10. Obtaining and maintaining licences and consents, including those issued by the Environment Agency	There may be failure to obtain licences and consents, many of which will require renewal on an annual basis	50%	50%		2	3	0.1%	0.5%	0.9%	3,750,000	1,875	9,375	16,875
OP 11. Sub standard plant operation	The assets may not operate as intended due to: - Sub standard maintenance - Sub standard materials - Sub standard quality of construction	50%	50%		2	2	0.1%	0.5%	0.9%	1,750,000	875	4,375	7,875
OP 12. Responsibility for maintaining health and safety, quality and environmental standards	Cost of compliance with relevant health and safety, quality and environmental standards may be more than envisaged		100%		2	2	0.1%	0.5%	0.9%	1,750,000	-	-	-
OP 13. Increase/ gain of recyclate income	Recycling income may be greater than expected due to (i) the total volumes of waste presented for recycling being greater than projected (ii) market price for processed recyclables being above that projected	50%	50%		5	1	85.0%	92.5%	100.0%	500,000	212,500	231,250	250,000
OP 14. Reduction/loss of recyclate income/ or market	Re-cycling income may be less than budget due to: (i) the total volumes of wastes presented for re-cycling being less than that projected (ii) market price for processed recyclables being below that projected (iii) No markets secured for processed Waste (iv) No markets available and waste is disposed (v) Lower market price due to quality of processed recyclables		100%		1	1	0.0%	0.1%	0.1%	500,000	-	-	-
OP 15. Commercial waste income less than projected	Commercial waste income may be less than expected due to: - trade waste volumes being less than projected - trade waste tariffs being less than projected		100%		2	2	0.1%	0.5%	0.9%	1,750,000	-	-	-
OP 16. Incorrect estimated transport cost of providing services under the Contract.	The cost of providing these services may be different to the expected, because of unexpected changes in the cost of equipment, labour, utilities, and other supplies		100%		4	3	10.0%	47.5%	85.0%	3,750,000	-	-	-
OP 17. Incorrect estimated cost of providing specific services under the contract: at point of market testing	The cost of providing these services may be different to the expected, because of unexpected changes in the cost of equipment, labour, utilities, and other supplies		100%		4	3	10.0%	47.5%	85.0%	3,750,000	-	-	-
OP 18. Incorrect estimated cost of maintenance and lifecycle replacement.	The cost of building and engineering maintenance and lifecycle replacement may be different to the expected costs		100%		2	4	0.1%	0.5%	0.9%	10,000,000	-	-	-
OP 19. Public Liability (caused by PSP)	Cost of third party claim for death, injury or other loss		100%		2	3	0.1%	0.5%	0.9%	3,750,000	-	-	-
OP 20. Non-performance of services	Payment will only be made by for services received		100%		4	3	10.0%	47.5%	85.0%	3,750,000	-	-	-
OP 21. Termination due to default by the procuring entity	The risk that the procuring entity defaults leading to Contract termination and compensation for the private sector	100%			1	2	0.0%	0.1%	0.1%	1,750,000	175	875	1,575
OP 22. Default by the operator leading to step-in by financiers	The risk that the operator or individual service providers default and financiers step-in leading to higher costs than agreed in the Contract		100%		1	2	0.0%	0.1%	0.1%	1,750,000	-	-	-
OP 23. Termination due to default by the operator	The risk that the operator defaults and step-in rights are exercised by financiers but that they are unsuccessful leading to Contract termination		100%		2	4	0.1%	0.5%	0.9%	10,000,000	-	-	-
OP 24. Interface risks	The risk that differing aspects of the waste service (from collection to disposal) will not interface effectively	50%	50%		3	3	1.0%	5.0%	9.0%	3,750,000	18,750	93,750	168,750
											259,425	465,875	672,325

Residual Value Risks ("RV")

Risk	Description	Risk Allocation			Likelihood	Impact	Likelihood Percentages			Mid range value	Risk Cost		
		Council	Private Sector Provider	Shared			Min	Most Likely	Max		Min	Most likely	Max
RV 1. Procuring entity no longer requires sites and facilities at end of Contract	The risk that the procuring entity will not require the assets at the end of the Contract period, and that the operator may be faced with decommissioning costs		100%		2	4	0.1%	0.5%	0.9%	10,000,000	-	-	-
RV 2. Decontamination of sites which are transferred at the end of the PPP contract to either the Council or another incoming contractor	(i) Decontamination costs could be significant from any/all sites. (ii) Allowance should also be made for any known or predictable contamination at the start of the PPP contract where operational 'asset' sites are transferred from the Council to the incoming PPP contractor		100%		3	3	1.0%	5.0%	9.0%	3,750,000	-	-	-
RV 3. Disposal of surplus operational plant and equipment at the end of PPP contract if not required by the Council	Surplus operational plant and equipment may be expensive to de-commission and dispose of		100%		2	2	0.1%	0.5%	0.9%	1,750,000	-	-	-

Financial Risks ("FI")

Risk	Description	Risk Allocation			Likelihood	Impact	Likelihood Percentages			Mid range value	Risk Cost		
		Council	Private Sector Provider	Shared			Min	Most Likely	Max		Min	Most likely	Max
FI 1. Inflation	Inflation above that predicted at Contract signature	50%	50%		4	3	10.0%	47.5%	85.0%	3,750,000	187,500	890,625	1,593,750
FI 2. Change in structure/ownership of PSP	The Contractor will continue to guarantee any performances as a result of any change in structure		100%		2	2	0.1%	0.5%	0.9%	1,750,000	-	-	-
FI 3. Insurance (I)	The Contractor provides all necessary for the operation		100%		1	3	0.0%	0.1%	0.1%	3,750,000	-	-	-
FI 4. Insurance premiums (ii)	Cost of insurance through Contract term – there is a risk that insurance premiums increase as a result of general market conditions		100%		3	2	1.0%	5.0%	9.0%	1,750,000	-	-	-
FI 5. Risk that facility is uninsurable	The risk that cost of financing increases above that used to initially price the Contract	50%	50%		1	3	0.0%	0.1%	0.1%	3,750,000	188	938	1,688
FI 6. Interest rate risk up to financial close	The risk that cost of financing increases above that used to initially price the Contract	100%			2	2	0.1%	0.5%	0.9%	1,750,000	1,750	8,750	15,750
FI 7. Interest rate risk after financial close	The risk that cost of financing increases above that used to initially price the Contract		100%		4	4	10.0%	47.5%	85.0%	10,000,000	-	-	-
FI 8. Foreign Exchange risk	The risk that the cost of solution increases as a result of exchange rate fluctuation		100%		2	2	0.1%	0.5%	0.9%	1,750,000	-	-	-
FI 9. Changes in the value of revenue streams (e.g. price of electricity generated)	The risk that the revenues from the project are: 1. Less and project base case 2. Greater than projected base case	50%	50%		4	4	10.0%	47.5%	85.0%	10,000,000	500,000	2,375,000	4,250,000
FI 10. Changes in interest/LIBOR rates	The risk that the cost of solution increases as a result of changes in general interest rates	100%			4	4	10.0%	47.5%	85.0%	10,000,000	1,000,000	4,750,000	8,500,000
											1,689,438	8,025,313	14,361,188

Performance Risks ("PE")

Risk	Description	Risk Allocation			Likelihood	Impact	Likelihood Percentages			Mid range value	Risk Cost		
		Council	Private Sector Provider	Shared			Min	Most Likely	Max		Min	Most likely	Max
PE 1. Failure to meet performance standards	There is a risk that operational and maintenance services ("O&M") will not provide the required quality of services.		100%		4	3	10.0%	47.5%	85.0%	3,750,000	-	-	-
PE 2. Availability of facilities	There is a risk that some or all of the facilities will not be available for the use to which it they are intended. There may be costs involved in making the facility available		100%		2	2	0.1%	0.5%	0.9%	1,750,000	-	-	-
PE 3. Performance targets	Performance targets set by the Government may not be met due to:												
	(i). Waste composition (see also Risk OP1 above)	50%	50%		4	3	10.0%	47.5%	85.0%	3,750,000	187,500	890,625	1,593,750
	(ii). Contractors performance		100%		4	2	10.0%	47.5%	85.0%	1,750,000	-	-	-
	(iii). Public participation	50%	50%		2	2	0.1%	0.5%	0.9%	1,750,000	875	4,375	7,875
	(iv). Inadequate management		100%		4	2	10.0%	47.5%	85.0%	1,750,000	-	-	-
PE 4. Performance Targets	(i). Failure to sort collected materials (ii).Failure to deliver according to delivery regime (iii). Failure of technology (iv). Inadequate management		100%		3	3	1.0%	5.0%	9.0%	3,750,000	-	-	-
											188,375	895,000	1,601,625

Demand and Composition Risks ("DM")

Risk	Description	Risk Allocation			Likelihood	Impact	Likelihood Percentages			Mid range value	Risk Cost		
		Council	Private Sector Provider	Shared			Min	Most Likely	Max		Min	Most likely	Max
DM 1. Changes in the volume of demand for services	Growth or reduction in waste tonnage against base case prediction	100%			4	3	10.0%	47.5%	85.0%	3,750,000	375,000	1,781,250	3,187,500
DM 2. Composition risk	Change in waste composition (may impact on Caloric Value for example)	50%	50%		4	2	10.0%	47.5%	85.0%	1,750,000	87,500	415,625	743,750
DM 3. Contamination risk	Contamination of collected waste stream	50%	50%		3	2	1.0%	5.0%	9.0%	1,750,000	8,750	43,750	78,750
											471,250	2,240,625	4,010,000

Technology and Obsolescence Risks ("TE")

Risk	Description	Risk Allocation			Likelihood	Impact	Likelihood Percentages			Mid range value	Risk Cost		
		Council	Private Sector Provider	Shared			Min	Most Likely	Max		Min	Most likely	Max
TE 1. Unexpected changes in technology	Unexpected changes in technology may lead to a need to re-scale or re-configure the provision of services	100%			1	5	0.0%	0.1%	0.1%	20,000,000	2,000	10,000	18,000
TE 2. Asset obsolescence	Buildings, plant and equipment may become obsolete during the Contract	100%			1	5	0.0%	0.1%	0.1%	20,000,000	2,000	10,000	18,000
											4,000	20,000	36,000

Regulatory Risks ("RG")

Risk	Description	Risk Allocation			Likelihood	Impact	Likelihood Percentages			Mid range value	Risk Cost		
		Council	Private Sector Provider	Shared			Min	Most Likely	Max		Min	Most likely	Max
RG 1. Legislative / regulatory change: Discriminatory Change in Law	Where not foreseeable, a change in local authority specific legislation / regulations, may lead to a change in the requirements and variations in costs	100%			3	4	1.0%	5.0%	9.0%	10,000,000	100,000	500,000	900,000
RG 2. Legislative / regulatory change: waste industry specific	Where not foreseeable, a change in waste industry specific legislation / regulations may lead to a change in the requirements and variations in costs	100%			4	2	10.0%	47.5%	85.0%	1,750,000	175,000	831,250	1,487,500
RG 3. Legislative / regulatory change having capital cost consequences: general	Where not foreseeable, non-local authority specific changes to legislation / regulations which have a capital cost consequence may lead to a change in requirements or variations in costs	100%			4	3	10.0%	47.5%	85.0%	3,750,000	375,000	1,781,250	3,187,500
RG 4. Legislative / regulatory change: General Change in Law	Non-local authority specific changes to legislation / regulations may lead to change in requirements and variation in costs		100%		4	2	10.0%	47.5%	85.0%	1,750,000	-	-	-
RG 5. Compliance with existing and or foreseeable environmental regulations/legislation	The facilities may fail to meet existing environment regulations/legislation due to: - inadequate plant design - inadequate maintenance - use of sub-standard materials		100%		1	4	0.0%	0.1%	0.1%	10,000,000	-	-	-
RG 6. Compliance with new environmental regulations/legislation	Where not foreseeable, to the extent the changes are discriminatory or specific, the facilities may fail to meet new environmental regulations/legislation	100%			4	4	10.0%	47.5%	85.0%	10,000,000	1,000,000	4,750,000	8,500,000
											1,650,000	7,862,500	14,075,000

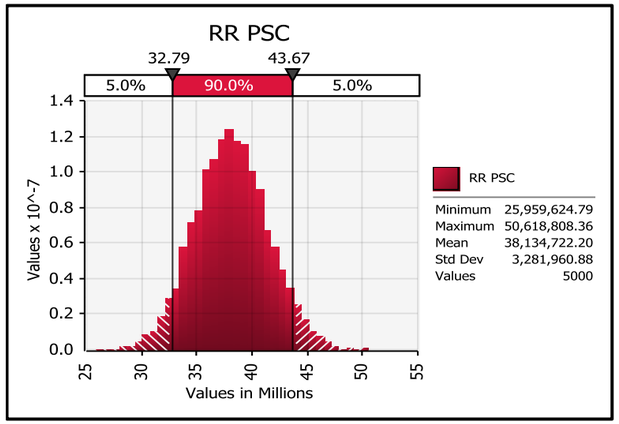
Import Duty Risks ("ID")

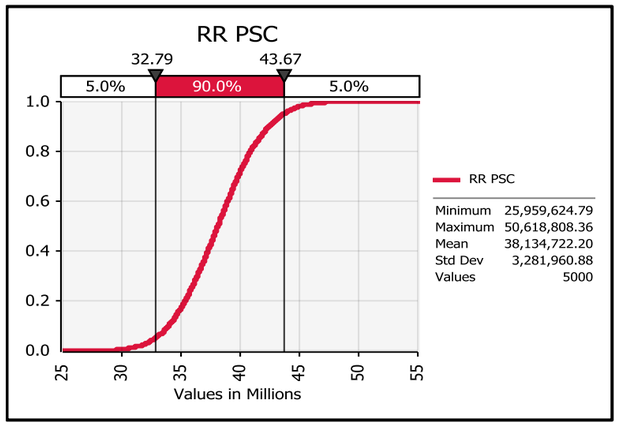
Risk	Description	Risk Allocation			Likelihood	Impact	Likelihood Percentages			Mid range value	Risk Cost		
		Council	Private Sector Provider	Shared			Min	Most Likely	Max		Min	Most likely	Max
ID 1. Changes in Import Duties payable	The scope and level of import duties may affect the cost of providing services		100%		4	3	10.0%	47.5%	85.0%	3,750,000	-	-	-
											-	-	-
									Total retained risk cost		**4,465,738**	**20,478,688**	**36,491,638**

@RISK Output Report for RR PSC O176

Performed By: Page, Lize

Date: Wednesday, May 04, 2016 11:01:19 AM





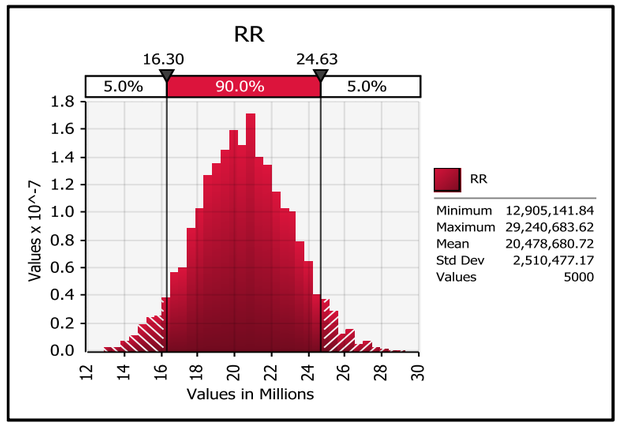
Simulation Summary Information	
Workbook Name	Risk allocation Revised 3 May 2016.x
Number of Simulations	1
Number of Iterations	5000
Number of Inputs	101
Number of Outputs	2
Sampling Type	Latin Hypercube
Simulation Start Time	04/05/2016 11:01
Simulation Duration	00:00:05
Random # Generator	Mersenne Twister
Random Seed	694081822

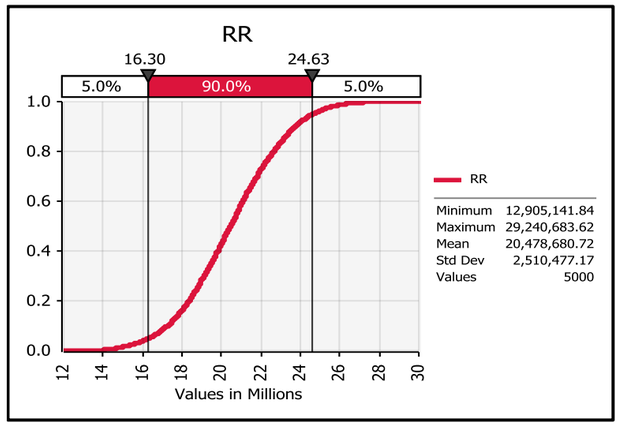
Summary Statistics for RR PSC			
Statistics		**Percentile**	
Minimum	25,959,624.79	**5%**	32,787,938.89
Maximum	50,618,808.36	**10%**	33,946,351.46
Mean	38,134,722.20	**15%**	34,705,619.96
Std Dev	3,281,960.88	**20%**	35,343,670.14
Variance	1.07713E+13	**25%**	35,891,563.32
Skewness	0.056749728	**30%**	36,363,359.99
Kurtosis	2.951362086	**35%**	36,842,211.97
Median	38,108,047.04	**40%**	37,256,680.05
Mode	38,233,005.59	**45%**	37,679,258.51
Left X	32,787,938.89	**50%**	38,108,047.04
Left P	5%	**55%**	38,551,744.32
Right X	43,669,251.55	**60%**	38,923,616.16
Right P	95%	**65%**	39,361,171.61
Diff X	10,881,312.67	**70%**	39,813,188.07
Diff P	90%	**75%**	40,319,321.81
#Errors	0	**80%**	40,858,290.70
Filter Min	Off	**85%**	41,560,515.85
Filter Max	Off	**90%**	42,407,359.30
#Filtered	0	**95%**	43,669,251.55

@RISK Output Report for RR O176

Performed By: Page, Lize

Date: Wednesday, May 04, 2016 11:01:14 AM





Simulation Summary Information	
Workbook Name	Risk allocation Revised 3 May 2016.xlsx
Number of Simulations	1
Number of Iterations	5000
Number of Inputs	101
Number of Outputs	2
Sampling Type	Latin Hypercube
Simulation Start Time	04/05/2016 11:01
Simulation Duration	00:00:05
Random # Generator	Mersenne Twister
Random Seed	694081822

Summary Statistics for RR			
Statistics		**Percentile**	
Minimum	12,905,141.84	**5%**	16,296,246.03
Maximum	29,240,683.62	**10%**	17,263,144.60
Mean	20,478,680.72	**15%**	17,878,023.30
Std Dev	2,510,477.17	**20%**	18,372,425.45
Variance	6,302,495,644,066.08	**25%**	18,763,028.61
Skewness	0.017190952	**30%**	19,116,837.83
Kurtosis	2.821601064	**35%**	19,490,943.51
Median	20,445,255.16	**40%**	19,820,303.59
Mode	20,929,119.98	**45%**	20,132,515.18
Left X	16,296,246.03	**50%**	20,445,255.16
Left P	5%	**55%**	20,778,807.49
Right X	24,632,414.99	**60%**	21,070,668.67
Right P	95%	**65%**	21,433,544.37
Diff X	8,336,168.96	**70%**	21,817,554.54
Diff P	90%	**75%**	22,191,695.73
#Errors	0	**80%**	22,634,286.88
Filter Min	Off	**85%**	23,135,976.00
Filter Max	Off	**90%**	23,752,886.60
#Filtered	0	**95%**	24,632,414.99